



ISSN:2455-7838 (Online)

DOI : 10.36713/epra2016

SJIF Impact Factor(2024) : 8.675

ISI I.F Value : 1.241

EPRA International Journal of

RESEARCH & DEVELOPMENT

(IJRD)

Monthly, Peer Reviewed (Refereed) & Indexed International Journal

Volume - 9 Issue - 3 March 2024

Research & Development



Chief Editor

Dr. A. Singaraj, M.A., M.Phil., Ph.D.

Managing Editor

Mrs.M.Josephin Immaculate Ruba

EDITORIAL ADVISORS

1. Prof. Dr.Said I.Shalaby, MD,Ph.D.
Professor & Vice President
Tropical Medicine,
Hepatology & Gastroenterology, NRC,
Academy of Scientific Research and Technology,
Cairo, Egypt.
2. Dr. Mussie T. Tessema,
Associate Professor,
Department of Business Administration,
Winona State University, MN,
United States of America,
3. Dr. Mengsteab Tesfayohannes,
Associate Professor,
Department of Management,
Sigmund Weis School of Business,
Susquehanna University,
Selinsgrove, PENN,
United States of America,
4. Dr. Ahmed Sebihi
Associate Professor
Faculty of General Education,
Skyline University College (SUC),
University City of Sharjah,
UAE.
5. Dr. Anne Maduka,
Assistant Professor,
Department of Economics,
Anambra State University,
Igbariam Campus,
Nigeria.
6. Dr. D.K. Awasthi, M.SC., Ph.D.
Associate Professor
Department of Chemistry,
Sri J.N.P.G. College,
Charbagh, Lucknow,
Uttar Pradesh. India
7. Dr. Tirtharaj Bhoi, M.A, Ph.D,
Assistant Professor,
School of Social Science,
University of Jammu,
Jammu, Jammu & Kashmir, India.
8. Dr. Pradeep Kumar Choudhury,
Assistant Professor,
Institute for Studies in Industrial Development,
An ICSSR Research Institute,
New Delhi- 110070, India.
9. Dr. Gyanendra Awasthi, M.Sc., Ph.D., NET
Associate Professor & HOD
Department of Biochemistry,
Dolphin (PG) Institute of Biomedical & Natural
Sciences,
Dehradun, Uttarakhand, India.
10. Dr. C. Satapathy,
Director,
Amity Humanity Foundation,
Amity Business School, Bhubaneswar,
Orissa, India.
11. Dr. Ibatova Shoirav Mavlalovna PhD.
Department of Propaedeutics of Paediatric
Diseases, Samarkand State Medical University



ISSN (Online): 2455-7838

SJIF Impact Factor (2024):8.675

ISI I.F. Value : 1.241

DOI : 10.36713/epra2016

EPRA International Journal of Research & Development (IJRD)

Monthly Peer Reviewed & Indexed
International Online Journal

Volume: 9, Issue:3, March 2024

Indexed By:



Published By
EPRA Publishing

CC License





CONTENTS

S.NO	TITLE	AUTHOR/S	PAGES
1	A PRE-EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF KNOWLEDGE OF PRIMARY SCHOOL TEACHERS REGARDING EARLY DETECTION AND PREVENTION OF COMMON HEALTH PROBLEMS AMONG SCHOOL CHILDREN IN SELECTED SCHOOLS AT REWA (MP)	Mamata Patel	1-9
2	ACADEMIC SELF-ACTUALIZATION AND ACADEMIC ACHIEVEMENT AMONG PROSPECTIVE TEACHERS IN MADURAI DISTRICT	Dr. K. Vinothkumar, Mrs. M. Saratha, Dr. F. Vincent Rajaseker	10-16
3	ORGANIZATIONAL AND METHODOLOGICAL ASPECTS OF EPIDEMIOLOGY OF SPORTS INJURIES	Botirov K.Farkhod, Kim A.Olga, Mavlyanova F.Zilola, Shamsiddinova Sh. Madinabonu, Ashurov F. Rustam	17-20
4	A MULTIFACETED EXPLORATION OF MEMORY ASSESSMENT IN HEALTHCARE: UNVEILING THE SYNERGY OF HUMAN-COMPUTER INTERACTION AND COGNITIVE PSYCHOLOGY	Sreedhar Srinivasan	21-24
5	INTEGRATING CONSCIOUSNESS: ANCIENT PHILOSOPHIES AND THE FUTURE OF HUMAN-MACHINE INTERACTION	Sreedhar Srinivasan	25-27
6	CHARACTORIZATION OF CRUDE OIL AND PETROLEUM PRODUCTS USING SPECTROPHOTOMETRIC AND CHROMATOGRAPHY TECHNIQUES	Santosh Namdeo Upare , Dr. J. Sai Chandra	28-34
7	UNRAVELLING THE MYSTERIES OF THE PLATYPUS ELECTRORECEPTION: A COMPARATIVE STUDY OF ELECTROSENSORY ORGANS	Habib I Khatib	35-38
8	GROWTH AND ASSESSMENT OF NIOSOMAL FORMULATIONS	Shweta Swamy, Dr. D. Nagendra Kumar	39-44
9	EVALUATION OF THE EFFECTIVENESS OF THE USE OF CUMIN OIL IN RICKETS IN CHILDREN	Ibatova Sh.M., Ruzikulov N.E.	45-47
10	SORPTION ISOTHERM, PROXIMATE COMPOSITION AND SENSORY EVALUATIONS OF OVEN DRIED AND FRIED CHEESE PRODUCTS FROM LOCAL SOFT CHEESE	Nathaniel O. Alamuoye, Oluwatoyin F. Alamuoye, Lawrence K. Otitoju	48-55
11	INTEGRATED APPROACH TO CLINICAL MANAGEMENT OF SEBACEOUS CYSTS:	Dr. Satish Mishra, Prof Dr Ranjan Kumar Kasta, Dr. Tapan Kumar	56-58

	A CASE STUDY ON ENUCLEATION AND AYURVEDIC PRINCIPLES	Nayak	
12	ADDRESSING SEXUAL HEALTH CONCERNS IN ADOLESCENT GIRLS: OBG NURSING PERSPECTIVES	Dr. Meenu Paul	59-65
13	DETERMINATION OF TRACE HEAVY METALS IN FISH SPECIES BY DIFFERENT ANALYTICAL TECHNIQUES	Godal Ayesha Naushadali, Dr. Madhuri Hinge	66-70
14	HOME NUMERACY PRACTICES AND ATTITUDES TOWARDS LEARNING MATHEMATICS AS PREDICTORS OF ACADEMIC PERFORMANCE OF STUDENTS	Joyale M. Abarro, Ma. Melanie N. Edig Ph.D.	71-82
15	HARMFUL EFFECT OF HAIR DYE AND DIFFERENT ANALYTICAL TECHNIQUES TO DETECT HAZARDOUS ELEMENTS IN HAIR DYE	Patel Keerti Shaileshbhai, Dr. Madhuri Hinge	83-89
16	POST ANALYSIS IDENTIFICATION OF TRANSFUSION TRANSMISSIBLE INFECTIONS (TTI'S) AMONG SCREENED BLOOD DONOR SAMPLES FROM 2016-2020 IN SELECTED TERTIARY HOSPITAL IN NUEVA ECIJA	John Peter V. Dacanay R.M.T, Imls (Ascp) PhD, Analiza B. Tanghal PhD	90-100
17	UNPACKING DENGUE VIRUS KNOWLEDGE: A LOOK AT PRE-SERVICE AND IN-SERVICE TEACHERS' UNDERSTANDING AND MISCONCEPTIONS	Alice T. Rivera PhD, Jenny Rose O. Tumacder	101-108
18	SECURE ELECTRONIC FUND TRANSFER OVER INTERNET USING DES ALGORITHM	R. Hemalatha, Dr. Selvakani, Mrs. K. Vasumathi	109-116
19	A REVIEW ON STIGMA MAYDIS AS A POTENTIAL NUTRITIONAL SOURCE FOR HUMAN HEALTH	Patel Priya Sureshbhai, Dr. Madhuri Hinge	117-123
20	A COMPARATIVE ANALYSIS OF ECO-FRIENDLY CONSUMER TRENDS IN GREEN MARKETING IN THE DIGITAL AGE	Dr. P. Abarna	124-131
21	ABU RAYHAN BIRUNI'S VIEWS ON CHRISTIANITY	Abdupattaev Mumin Mirzo Murodjon ugli	132-135
22	MECHANICS OF IMPROVING THE EFFICIENCY OF ENTERPRISES ON THE BASIS OF INNOVATION	Mamajonova Odinakhon Alisher kizi	136-137
23	ADVANCEMENTS IN TRANSITION METAL-BASED HOMOGENEOUS CATALYSIS FOR GREEN CHEMICAL SYNTHESIS: A STUDY	Dr. Mahadev L Shegavi	138-143
24	A STUDY OF EMPLOYMENT PATTERN IN FOOD PROCESSING INDUSTRIES OF ASSAM	Mukunda Madhab Gogoi, Ashi Lama	144-149
25	ISSUES OF STUDYING MEDICAL TERMINOLOGY IN UZBEK LINGUISTICS	Akbarkhodzhaeva Feruza Abduganievna	150-152
26	PROBLEMS OF STUDYING MEDICAL TERMS IN UZBEK AND ENGLISH	Khamrokulova Munira Rasulovna	153-155
27	CURRENT ISSUES OF TEACHING RUSSIAN AS A SECOND FOREIGN LANGUAGE IN SECONDARY SPECIALTY MEDICAL EDUCATIONAL	Chakhieva Rabia Vakhidovna	156-159

	INSTITUTIONS OF UZBEKISTAN		
28	METHODOLOGY FOR TEACHING RUSSIAN AS A FOREIGN LANGUAGE TO AN UZBEK-SPEAKING AUDIENCE (BASED ON THE MATERIAL OF THE AUDIO-LINGUAL METHOD)	Ruzmetova Nargiza Akhmedovna	160-164
29	CURRENT ISSUES OF THE THEORETICAL BASIS FOR THE RESEARCH OF LITERARY LANGUAGE	Ismailova Saodat Rikhsibaevna, Bedilova Aziza Melsovna	165-167
30	YOUTH OF NEW UZBEKISTAN IS NEW POWER AND NEW OPPORTUNITIES	Usmanova Umida Samatovna	168-170
31	EFFECTIVENESS OF USING COMMUNICATION MEANS IN RUSSIAN LANGUAGE LESSONS IN A PRIVATE UNIVERSITY	Sarimsakova Gulchekhra Muratovna	171-173
32	EXPLORING THE EFFICACY OF RAKTAMOKSHANA THERAPY IN VARICOSE VEIN TREATMENT: A CASE REPORT AND REVIEW	Dr. Pragyan Paramita Behera, Prof Dr Ranjan Kumar Kasta, Dr Tapan Kumar Nayak	174-176
33	RULINGS ON WOMEN'S USE OF PRECIOUS STONES (BASED ON MOVAROUNNAHR FIQH SOURCES)	Ro'zimukhammad Tukhtasinov	177-180
34	EDUCATION, PERCEPTION, AND CHALLENGES: THE ERRATIC CASE OF TRIBAL LIFE IN WAYANAD, KERALA	Benoy KJ	181-184
35	A STUDY ON SOCIO ECONOMIC STATUS IN RELATION TO THEIR ACADEMIC ACHIEVEMENT AMONG HIGH SCHOOL STUDENTS	Dr.P. Rajendran , Dr.R.Selvaganapathy	185-190
36	A GEOGRAPHICAL STUDY OF HEALTH CARE INFRASTRUCTURE AND MEDICAL FACILITIES IN AHMEDNAGAR DISTRICT, MAHARASHTRA, INDIA	Deepak Janardhan Gadekar , Mr. C. M. Bansode ,Mr. Vijay Rajendra Sonawane	191-199
37	BIOGRAPHY AND SCIENTIFIC HERITAGE OF WAHBA ZUHAYLI	Sirojiddin SHODMONOV	200-202
38	A STUDY ON ROLE OF COMMERCIAL BANKS IN ECONOMIC DEVELOPMENT OF INDIA	Sanjeet Kumar Sah, Prof. (Dr.) Md. Mahmood Alam	203-209
39	PROMOTING COGNITIVE STIMULATION AND ENGAGEMENT: INNOVATIVE NURSING INTERVENTIONS FOR ALZHEIMER'S PATIENTS	Dr.(Prof.) Jomon Thomas	210-214
40	A STUDY ON INTERDISCIPLINARY COOPERATIVE TEACHING OF PHYSICAL EDUCATION TEACHERS IN THE CONTEXT OF PHYSICAL EDUCATION AND HEALTH CURRICULUM INTEGRATION	Katherine Ning LI	214-218
41	USE OF RENEWABLE SOURCES OF ENERGY TO MINIMISE ELECTRICITY CONSUMPTION	Prof.A.H.Patil , Harsh.V.Gondane, Yash.V.Devkar , Sunil.S.Chavan , Mitesh.M.Jogdand, Abhishek.B.Ghodke	219-223
42	STEM STRAND IN THE PHILIPPINES: AN ANALYSIS	Joel I. Alvarez	224-234
43	ERANDA PATRA (RICINUS COMMUNIS L.) AS A KRIMIGHNA DRAVYA (ANTIMICROBIAL DRUG) WITH SPECIAL REFERENCE TO ESCHERICHIA	Anoosha Adiga, Prajwal C R, Pradeep	235-241

	COLI BACTERIA-AN IN VITRO STUDY		
44	FACILE SYNTHESIS STRUCTURAL CHARACTERIZATION PHOTOCATALYTIC AND ELECTROCHEMICAL APPLICATIONS OF CRO4-CEO2 NANOCOMPOSITE MATERIAL	K. Subashri	242-255
45	EVALUATION OF THE POTENTIAL OF ROSELLA FLOWER ETHANOL EXTRACT (HIBISCUS SABDARIFFA) IN DEALING WITH DYSLIPIDEMIA IN MALE RATS CONSUMING A HIGH-FAT DIET	Wang Dan, Wienaldi	256-261
46	THE IMPACT OF EARLY MOBILIZATION ON CHANGES IN PAIN LEVELS OF CLIENTS AFTER SECTION CESAREA SURGERY AT ROYAL PRIMA MARELAN HOSPITAL: BEFORE AND AFTER	Liu Chao , Fioni	262-265
47	AYURVEDIC MANAGEMENT OF DUSHTA VRANA VIS-A-VIS VENOUS ULCER-A CASE STUDY	Dr Harsha M Kencharadder, Dr Poornima Jalawadi , Dr Meghana D , Dr Raveendranatha B	266-269
48	PROJECT SAVE: AS A STRATEGY IN IMPROVING LITERACY THROUGH VOCABULARY INTEGRATION AMONG GRADE 8 LEARNERS	Rose Anne Nequinto Calinagan	270-274
49	STUDENT EXPRESSION DETECTION IN E-LEARNING PLATFORMS	K. Sai Bhavya Sri, K. Sai Swetha, K. Bhavani, M. Venkata Sahitya, NagaBabu Pachhala	275-280
50	A DESCRIPTIVE STUDY TO ASSESS THE LEVEL OF KNOWLEDGE REGARDING PREVALENCE OF WARNING SIGNS OF ALZHEIMER DISEASE AMONG ELDERLY PEOPLE AT SELECTED NIRASHRIT VRIDH AASHRAY GRIH, JABALPUR	Mithun Kumar Kurmi	281-291
51	STUDY OF VELOCITY DISTRIBUTION OVER A NON-LINEAR STRETCHING IN PRESENCE OF VISCO-ELASTIC LIQUIDS	Dr. Naveen Kumar N P	292-297
52	FORECASTING THE FUTURE: A COMPARATIVE ANALYSIS OF ML AND DL MODELS IN SUPPLY CHAIN DEMAND PREDICTION	Rishi Varsha Poranki, Kalyani Pattima, Meghana Yalagala, Namitha Suraboina, K. Thrilochana Devi	298-304
53	PROCEDURES FOR CARRYING OUT BIOLOGICAL CONTROL MEASURES AGAINST OWLET MOTHS IN THE POTATO BIOTOPE OF THE AGROBIOCENOSIS OF KARAKALPAKSTAN	Toreniyazov E.Sh. ,Rozimova A.P	305-307
54	STUDY OF VELOCITY DISTRIBUTIONS FOR A HYDROMAGNETIC FLOW OVER A NON LINEAR STRETCHING SHEET	Naveen Kumar N P , Dinesh P A, Dinesh Kumar S T	308-311
55	FARMGUIDE USING AI TECHNIQUES	G. Kavya Siri, B. Madhavi, A. Bhavani, A. Lakshmi Sowjanya, A.V.S. Sudhakar Rao	312-319
56	PROSPECTS AND CHALLENGES OF TEACHER EDUCATION ON NEP 2020	Gopal Basak	320-325
57	DIGITAL TRANSFORMATION OF 21ST EDUCATION SECTOR IN INDIA	Gopal Basak	326-334
58	ZAHID KAWTHARI'S WORK MUQADDIMAT AND ITS UNIQUENESS	Khabibidinov Baburshah Abduvali ugli	335-340

59	LIFE AND ACTIVITY OF IBN JARIR TABARI	Mavlanov Nurali Rayimovich	341-345
60	IDENTIFICATION OF SIGNATURE COUNTERFEITS	Shaik Karishma, Siddu Devi Naga Susmitha, Nanditha Katari ,G. Sirisha	346-352
61	CHEMICAL AND SALINY PROPERTIES OF SOILS OF THE DRIED BOTTOM OF THE ARAL SEA	Oteuliyev Jaksilik Begdullayevich, Dozhanov Kilishbay Jienbayevich, Alpisbaeva Akmaral Jubatkhanovna	353-356
62	A SURVEY ON MULTIMODAL SENSORY INTERACTION IN AUGMENTED REALITY AND VIRTUAL REALITY	Shanmughapriya M, Sanchana R, Josephine Ruth Fenitha	357-362
63	ELECTRONIC VOTING USING DECENTRALIZED SYSTEM BASED ON ETHEREUM BLOCKCHAIN	D.Jyothi Reddy, B. Vineetha Lakshmi, G.Smily Srinidhi, B.Udayasri, Md.Shakeel Ahmed	363-370
64	SMART WAY SENTIMENT ANALYSIS IN SOCIAL MEDIA	Jeba Stanley.J, Maruthapandi.M, Karthickraja.P, Sivaprakash.S, Herosingh.C	371-375
65	DEVOPS OPTIMIZED NAVIGATION: BUILDING A DEVOPS CI/CD PIPELINE	M. Priyanka, K. Sindhuja, V. Madhuvani, K. Prasoon Sowpithika, K. Kranthi Kumar	376-382
66	BLOCKCHAIN BASED E-COMMERCE ONLINE APPLICATION	J. Divya, B. Harshitha, A. Harika, A. Santhisree, A. Kalavathi	383-390
67	HELMINTH INVASIONS IN CHILDREN: CAUSES, CLINICAL PICTURE, DIAGNOSIS, TREATMENT AND PREVENTION	Sh.M. Ibatova, F.Kh. Mamatkulova	391-395
68	ANALYSIS OF INDICATORS CHARACTERIZING THE INNOVATION AND INVESTMENT ACTIVITIES OF INDUSTRIAL ENTERPRISES AND CLASSIFICATION OF INFLUENCING FACTORS	Jurabekov Mamurjon	396-398
69	HISTORY OF PROPAGANDA CAMPAIGN UNDER THE SOVIET ADMINISTRATION SYSTEM IN UZBEKISTAN	Xurshidjon Boymirzaev Karimdjaniyevich	399-400



A PRE-EXPERIMENTAL STUDY TO ASSESS THE EFFECTIVENESS OF KNOWLEDGE OF PRIMARY SCHOOL TEACHERS REGARDING EARLY DETECTION AND PREVENTION OF COMMON HEALTH PROBLEMS AMONG SCHOOL CHILDREN IN SELECTED SCHOOLS AT REWA (MP).

Mamata Patel¹

¹Nursing Tutor, Child Health Nursing Department, Govt Nursing College GMH Rewa

ABSTRACT

Children's health is integral to societal progress, reflecting the future of any nation. This study aims to assess and enhance the knowledge of primary school teachers regarding early detection and prevention of common health problems among school children in Rewa. Grounded in Maya Angelou's assertion on the enduring potential of children, and recognizing World Health Day 1984's focus on children's well-being, this research emphasizes the significance of prioritizing child health. Despite global efforts and governmental policies, challenges persist, especially in developing nations, where factors like malnutrition and inadequate healthcare prevail. The study proposes a comprehensive school health program integrating health services into schools to ensure holistic well-being. The objectives include assessing pretest knowledge, evaluating the effectiveness of a planned teaching program, and examining associations between knowledge levels and socio-demographic variables. Through a pre-experimental design, employing a one-group pretest-posttest approach, the study targets primary school teachers in Rewa, utilizing quantitative research methods. The findings aim to contribute to the improvement of school health services and ultimately enhance the health and well-being of children, who are vital agents in propagating health practices within their communities.

KEYWORDS: *Children's health, Primary school teachers, School health education, Early detection, Prevention, Common health problems*

INTRODUCTION

Children's health is crucial for national progress, as they represent the future of society. Maya Angelou's quote, "A child is a talent to endure stem from the ignorance of alternatives," underscores the importance of prioritizing children's well-being. World Health Day 1984 emphasized the need to safeguard children's mental and physical health. Despite being cherished, many children face illness or premature death, especially in developing countries where factors like malnutrition and inadequate healthcare persist. Recognizing this, governments, including India, have implemented policies focusing on child health, integrating health services into schools. However, challenges remain, and efforts to enhance school health services are ongoing. A comprehensive school health program is essential, encompassing health appraisal, education, and access to care, to ensure the holistic well-being of children, who are pivotal in propagating health practices within families and communities.

NEED FOR THE STUDY

School children constitute a vital and substantial segment of population. School children are vulnerable section of population by virtue of their physical, mental, emotional and social growth and development during this period. School children are expressed to various stressful situations .

Children coming to school belong to different socio economic and cultural background which affect their health and nutritional status and require and help guidance in promoting, protecting and maintaining their health and nutritional status. Children school in age are prone to get specific health problem. It is based on health needs of school children. It is planned in co-ordination with school health personal, parents and community people. It emphasize on promotive and preventive, aspects.

Studies conducted by many among children revealed the morbidity pattern. Reported that 40 percent the morbidity was caused by deficiency of iron and vitamin and skin disease



OBJECTIVES

- To assess the pretest knowledge of primary school teachers regarding early detection and prevention of common school health problems among school children at Rewa.
- To assess the posttest level of knowledge of primary school teacher regarding early detection and prevention of common health problem among school children at Rewa .
- To evaluate the effectiveness of the planned teaching program on level of knowledge of primary school teacher regarding early detection and prevention of common health problem among school children
- To associate the pretest and posttest level of knowledge of regarding common health problem in school children.

HYPOTHESIS

All hypothesis will be tested

H0: There will be no significant relationship between knowledge level of the primary school teacher regarding early detection and prevention of common health problem among school children with selected socio demographic variables.

H1: There will be a significant relationship between knowledge levels of The primary school teacher regarding early detection and prevention of common health problem among school children with selected socio Demographic variables

H2: There will be a significant difference between pretest and post-test Knowledge of the primary school teacher regarding early detection and prevention of common health problem among school children.

ASSUMPTIONS

- School teachers are the most important link in the school health team in providing care to the children.
- Primary school teacher may have some knowledge regarding early detection and prevention of common health problem in school children.
- Teaching program with pictorial booklet consist of information regarding detection and prevention of common health problem in school children.

DELIMITATIONS

- The study was delimited to selected health problems
- The study was delimited to selected primary school teachers in Rewa
- Primary school teacher who are willing to participate
- Primary school teacher who are able to read and understand English and Hindi

Review of the literature is a written summary of the state of existing knowledge on a research problem. A review of literature involves systematic identification, location, scrutinization and summary of written material that contain information on research problem.¹²

The review of literature related to present study was organized under the following headings:

- Studies related to knowledge on Anemia
- Studies related to knowledge on Worm Infestation.
- Studies related to knowledge on Scabies
- Studies related to knowledge on Conjunctivitis.
- Studies related to knowledge on Common Cold.
- Studies related to knowledge on School Health Services

RESEARCH METHODOLOGY

Methodology is the most important part of any research study, which allows the researcher to form drawing for the study undertaken. Research methodology refers to the controlled sounding related to the way of obtaining, organizing and analyzing data. Methodological studies address the expansion, validation and evaluation of research instruments and techniques.

Research methodology is a way to solve the research problem in systematically. It includes steps, procedures and strategies for gathering and analysing the data in a research investigation.

The present study was aimed at assessing the knowledge of the primary school teachers regarding school health problem in selected school at Rewa. The chapter deals in detail with the methodology adopted for the study. It also describes the research approach, research design, setting of the study, population, sampling technique, sample size, criteria for selection of sample, development of the tool, description of the tool, ethical consideration of the study, content validity, pilot study, reliability of the tool, procedure for data collection and plan for data analysis.



Research Approach

Research approach is the most significant part of any research. The appropriate choice of the research approach depends upon the purpose of the research study which was under taken.

Evaluative research is an practical form of research that involves verdict out how well a program, practice, procedure or policy is working. In view of the nature of the problem and to achieve objective of the present study, an experimental evaluative approach was considered to the most operative.

(A/c to Polit & Hungler 1995)

In view of the objective of the study the researcher has used quantitative research approach is considered to a suitable.

The researcher has used one group pretest-post-test study, as it provides a comparison between a group of subject before and after the treatment.

In this study the investigator aimed at finding the effectiveness of planned teaching program.

Research Design

The research design is the plan for how the study will be conducted. It is concerned with type of data to be collected and the means used to obtain these data.

Research design is the arrangement can be defined as a blue print to conduct a research study, Which involves the description of research approach, study setting, Sampling size, sampling technique, tools and method of data collection and analysis ton answer research question or for resting research hypothesis.

The research design adopted for the study is pre-experimental: One group pre-test-Post-test research design.

Target Population

“The target population is defined as the entire aggregation of cases that meets designated set of criteria”.

Target population in this study will refers to all primary school teachers.

Accessible Population

“A sample is a portion of the population that has been selected to present the population of interest”.

(Talbot)

Primary school teachers in selected school in Rewa city.

The population for the study was primary school teachers available in time of study

Sample and Sampling Technique

“Sample the process selecting a portion of the population to present the entire population”.

Sampling technique is the act or process of selecting a suitable sample or a representative part of a population for the purpose of determining parameters or characteristics of the whole population.

(Jaypee)

A sample consist a sub set of the unites that compose the population”. The purposive sampling technique was used to select the accessible population from the target population. The sample size for the study was 60primary school teachers. To select the study sample purposive sampling technique was used.

A sample is “a subset of the population selected to represent the population. Teachers who were working in the selected government and private schools were considered as sample”.

Criteria for selecting the sample

For the selection of sample, the researcher set the following criteria.

Inclusion criteria: The study included the teachers who were:

- Working in selected schools.
- Available at time of data collection
- Willing to participate in the study
- Able to understand languages like English and Hindi

Exclusion criteria: The study excludes who were not

- Working in selected schools
- Available at the time of data collection
- Willing to participate in the study



- Able to understand Languages English, and Hindi

Sample size

Based on the selection criteria, total 60 primary school teachers from Four selected schools were considered as the sample size

Limitations

- The present study was limited to 60 teachers who were working in select Government and Private schools.
- The Study was limited to Selected Health Problems like Anemia, Worm Infestations, Scabies, Conjunctivitis and Common Cold.
- Willing to participate in the study.
- Available at the time of data collection

Method of Data Collection

The Research design use for the study was pre-Experimental research design. The study was conducted among primary school teachers in selected school of Rewa city. A sample size of 60 primary school teachers was selected through purposive sampling technique. 60 primary school teachers were selected to participate in the study.

For present study the data was collected using structured questionnaire.

The tool for the present study was developed by the investigator based on the objectives, review of the related literature and suggestion of experts in field of child health Nursing.

Description of the tool

The tool consists of two parts

Section A:

The tool consists of demographic data of school teachers viz Age, Sex, Religion, Educational Qualification, Teaching experience and Health programmes conducted in schools related to health problems.

Section B

It consists of Items on knowledge related physical health problems of school children like Worm Infestation, Scabies, Conjunctivitis and Common cold.

Ethical Consideration

Ethical clearance was obtained from the institutional ethical committee. Permission was obtained from authorities of selected schools and consent was obtained from the participants.

Content Validity

The ability of an instrument to measure the variables that it is intended to measure.

The prepared tool was validated by 05 experts in the field of child health nursing, community Health Nursing.

The tool was modified according to the suggestion of experts.

Pilot Study

A small-scale version, Or trial run, Done in preparation for a major study.

In order to test the relevance and practicability of the study, a pilot study was conducted on 11/09/2019 to 13/09/2019 study was conducted P.M.P school Rewa. Pilot study was conducted by selecting primary school teacher who were present in this time. Purposive sampling was technique was used to select the primary school teacher, followed by demographic data.

The purpose of the pilot study is to assess the feasibility of the study and plan for statistical analysis.

In order to find out the feasibility and reliability of the tool it was tried out on 7 teachers from government primary school, and 3 teachers from Private school. The tool was found to be peaceful and applicable after the pilot study.

Method Of Data Collection

The investigator obtained prior permission from the authorities of selected government and private schools for the data collection. Consent was obtained from the participants. Data were collected from 03-09-2019 to 05-09-2019 the time schedule was planned from 9am to 2pm. Totally 60 teachers were selected from government and private schools. The investigator interviewed the sample by using structured questionnaire schedule.

Plan for Data Analysis

The data obtained were analyzed on the objectives and hypothesis by using both descriptive and inferential statistics.

**Descriptive Statistics.**

- Sample characteristics were described through frequency and percentage distribution.
- Knowledge of school teacher was analyzed in terms of mean and standard deviation

Inferential Statistics

- Chi-square test was used to identify the relationship between the selected socio-demographic variables primary school and their knowledge regarding common Health Problem among school children.

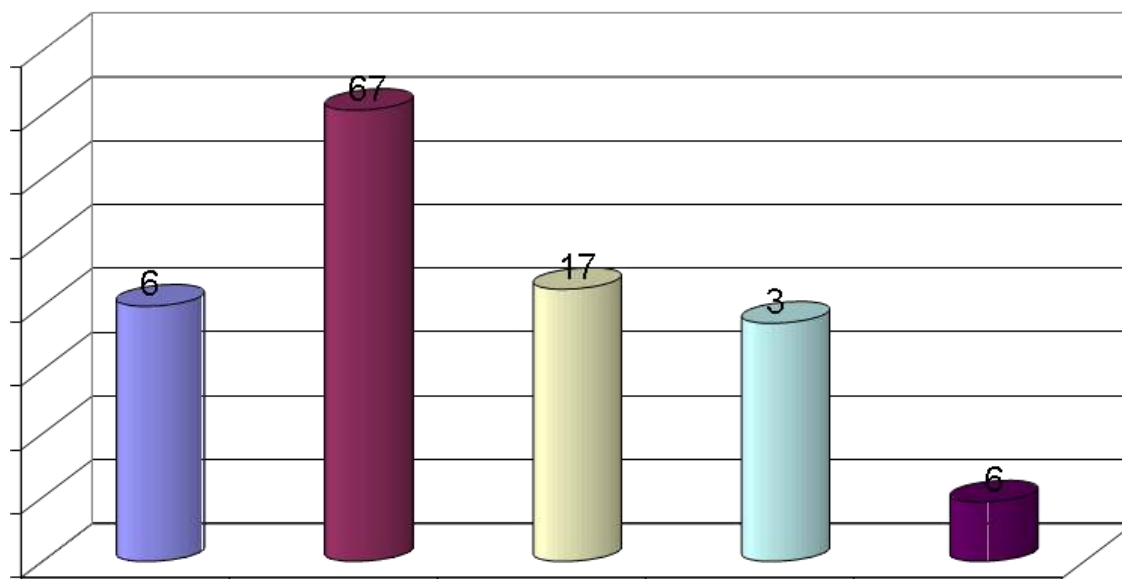
RESULTS**ANALYSIS AND INTERPRETATION**

Data analysis is essential for a scientific study and for ensuring that all relevant data are used for making contemplated compare and analysis, the turn analysis refers to commutation of certain measures along with searching of pattern of relationship that exist between data groups .4

Section A: Sample characteristics.

Age	Frequency	Percentage
21-25 years	10	17
26-30 years	36	60
31-35 years	11	18
36 years and Above	3	5

Table 1 narrates the percentage distribution of primary school teachers by their age, more than one third of the primary school teachers were between the age group of 31-40 years (37%), followed by more than one fourth of primary teachers between in the age group of 21-30 years (26%), less than one fourth of primary teachers between the age group of 41-50 years (23%) and one sixth of primary school teachers between the age of 51 years and above (14%).



Percentage distribution of school teachers by their educational qualification

Section B: Knowledge of primary school teachers regarding selected health problems.

Section C: Association between the knowledge regarding selected health problems with selected socio-demographic variables.

Research Variable's

A Variable is defined as anything that has a Quantity or Quality that Varies.

The dependent variable is the variable a Researcher is interested in. An independent variable is a variable believe to affect the dependent variable.

Confounding variable's are defined as interference caused by another variable.

Two types of variable were defined in the study.



They are as follows :-

1) Independent Variable :-

An independent variable is the variable that is varied or manipulated by the researcher. It is the presumed cause that 'logically' has some effect on a dependent variable.

The independent variable in this study was planned teaching program on prevention of neonatal hypothermia.

2) Dependent Variable :-

A dependent variable is the presumed effect or response that is measured or observed as a result of the variation in the independent variable.

The dependent variable in this study was level of knowledge of post natal mothers regarding prevention of neonatal hypothermia
Reliability of the tool

Consistency and dependability of research instrument to measure a variable.

Test-retest method was used in order to assess the reliability of the tool by conducting the structured questionnaire to the same sample of 10 teachers.

The coefficient of correlation was computed by Karl-Spearson's coefficient correlation method. The 'r' value was found to be 0.97, which shows highly positive correlation. It indicated that the tool was highly reliable.

Deals with the analysis of the level of pre-test knowledge of primary school teacher regarding early detection and prevention of common health problems among school children.

Based on the knowledge score the primary school teachers were in the low knowledge 0-24 (50%) followed by average knowledge 25-36 (51-75%), and above 37-48 (75%).

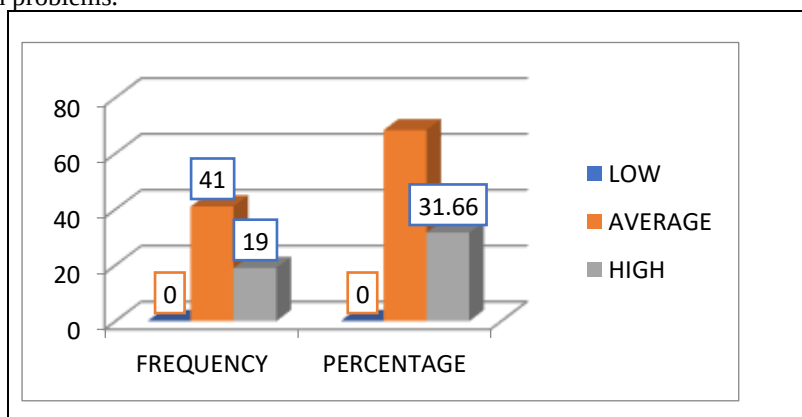
Percentage distribution of sample according to the level of pretest knowledge among school children regarding early detection and prevention of common health problems.(pre-test).

N = 60

Knowledge Score	Frequency	Percentage
Low	36	60
Average	17	28.33
High	7	11.66
Total	60	100

(Meanscore 21.5 S.D=9.62)

Table 2 describes the knowledge regarding health problems among the sample more than half of the sample had poor knowledge (60%) and more than one third of sample had average knowledge (28.33%) and only 11.66 percentage sample had high knowledge. The mean knowledge score was 21.5 with standard deviation 9.62. Primary school teachers were having poor knowledge regarding school health problems in school children. So that there need to teach and to participate in school health programme and in motivation in school health problems.



The data given in table no 2 and figure no 8: shows that out of 60 subject in the sample size majority 41(68.33%) were having average knowledge, 19 (31.66%) were having high knowledge and none were having low knowledge.



The sample characteristics selected for association with primary school teacher's knowledge about health problems measures were Age, Sex, Religion, Educational Qualification, Teaching Experience and School Health Programme conducted to related to school health problems in school children.

Association between the knowledge of primary school teachers regarding health problems measures with their age.

N=60

χ^2 Value = 8.55 df=3 P<0.05 (Table value 7.815)

The association between the knowledge primary school teachers with their age in the total sample 39 teachers well falling between 21-30 Years of age, among them 23 teachers had low knowledge (15%), 11 teachers had average knowledge (7%) and 5 teachers had high knowledge (3%).

55 teachers were belonging to the age group of 31-40 years in that 24 teachers had low knowledge (16%), 20 teachers had average knowledge (13%) and 11 teachers had high knowledge (7%).

34 teachers were belonging to the age group of 41-50 years in that 13 teachers had low knowledge (9%), 16 teachers had average knowledge (11%) and 5 teachers had high knowledge (3%).

22 teachers were belonging to the age group of 51 years and above. In that 16 teachers had low knowledge (11%), 4 teachers had average knowledge (3%) and 2 teachers had high knowledge (1%).

Chi-square test was computed for knowledge on selected health problems measures with age, at 5% level of significant with degree of 3. Table value is 7.815 and the calculated value was 8.55 It was less than the table value ($P < 0.05$) so there was no significant association between knowledge of primary school teachers regarding health problems measures with age

Chi-square test was done to find out the relationship between knowledge on health problems measures with Sex at 5% level of significant with degree of freedom 1 calculated value was 0.614, which was less than the table value (3.841) so there was no significant association was observed between the school teacher's knowledge on health problems measures with sex.

Chi-square value was computed. It was (1.660) less than the table value (5.991) at 5% level of significant with degree of freedom 2, so there was no significant relationship between primary school teacher's knowledge on health problems with religion.

40 teachers were qualified with bachelor in education. In that 32 percent teacher had low knowledge, 20 percent had average knowledge and 13 percent teachers had high knowledge.

10 teachers were qualified with Master education in that 10percent had low knowledge, 5 percent had average knowledge and 2 percent had high knowledge.

2 teachers were qualified physical education in that 2 percent had low knowledge, 2 percent had average knowledge and 0 percent had high knowledge, and 4 teachers were others had low knowledge 3 percent and 2 percent average knowledge and 2 percent had high knowledge.

Chi-square test was done to find out the association between the knowledge and Educational Qualification. The calculated value was (8.679) with degree of freedom 3 at 5% significant level. The table value was (7.815), so the calculated value was higher than the table value so there was significant relationship was found between the knowledge of school teachers with their Educational Qualification.

Chi-square value was computed. It was (2.115) less than the table value (5.991) with degree of freedom 3 at 5% significant level. So there was no significant association was found between the knowledge primary school teachers regarding selected health problems with their teaching experience.

The study utilized a Chi-Square test to examine the relationship between the knowledge of primary school teachers on selected health problems and the school health program implemented in their schools. The Chi-Square value obtained (0.452) was less than the table value (3.841) at a 5% level of significance, indicating no significant relationship between these variables.

In discussions about the health of school-age children, the prevalence of diseases and health hazards in developing countries is highlighted, with preventable clinical illnesses being a significant concern. School-aged children represent a substantial subset of the population, requiring attention to their educational, health, and social development. Given their vulnerability to childhood diseases, comprehensive health services in schools are essential, with primary school teachers playing a crucial role in promoting



children's health. The present study, conducted among primary school teachers in Rewa, aimed to assess their knowledge of health problems.

The study found that more than half of the primary school teachers had poor knowledge, followed by those with average and high knowledge levels. Analysis revealed significant relationships between knowledge and age and educational qualifications, while no significant associations were found with variables such as sex, religion, teaching experience, and participation in school health programs.

The study employed a descriptive design, with data collected through structured questionnaires. Validity and reliability were ensured through expert validation and test-retest methods. Major findings included the demographic characteristics of the sample, with the majority being female Hindu teachers with bachelor's degrees in education and 6-10 years of teaching experience.

In summary, while significant relationships were found between primary school teachers' knowledge and certain demographic variables, no significant association was observed with participation in school health programs. This underscores the need for further education and training for primary school teachers regarding health problems to enhance their effectiveness in promoting children's well-being.

The study revealed that more than half of the sample exhibited poor knowledge (51%), while more than one-third had average knowledge (54%), and only a small percentage demonstrated high knowledge (15%). Significant relationships were observed between primary school teachers' knowledge and selected variables such as age and educational qualification. However, no significant associations were found between knowledge and variables such as sex, religion, teaching experience, and participation in school health programs.

Implications and Recommendations

The findings have implications across various domains of nursing. In nursing education, there is a need to focus on training nursing students regarding common health problems in schoolchildren, emphasizing preventive and promotive aspects. Students can be encouraged to organize school health programs and participate actively in health awareness campaigns. In nursing practice, nurses must educate school teachers on common health problems through health education sessions and individualized instruction. Moreover, nurse administrators should plan training programs for nursing personnel on preventive and control measures for physical health problems in schoolchildren and organize educational programs in schools and community settings.

In terms of recommendations, future studies could include larger samples or comparative analyses between private and government schools, urban and rural settings, or among the general public. Additionally, experimental studies assessing the effectiveness of structured teaching programs could provide valuable insights into improving knowledge among primary school teachers. Overall, the study's conclusions and recommendations provide a foundation for further research and interventions aimed at enhancing the health knowledge of primary school teachers and improving the health outcomes of schoolchildren.

BIBLIOGRAPHY

1. Park K J.F. Park. *Park's Text book of Preventive Social Medicine*. 17th Ed. New Delhi: Banarasidas
2. Parul Datta. *Pediatric Nursing*, jaypee Publications, 3rd Edition, Page no:253,408.
3. T. Baskar Rao MD, DPH. *A text book of community medicine* 1st ed. Hyderabad: Paras medical Publishers;2004.
4. B.K Mahajan, MP. Gupta. *A text book preventive and social & medicine*; 2nded. New Delhi: Jaypee Publication;1998.
5. Archer s *Text book of pediatrics*,3rd Edition,Page no-240-255.
6. Raghava Prasad. *School Health*. *Indian J. of community medicine*; 2005; 30(4);109
7. Orkin. M. Maibach. HI. *Pediatric clinical of North America*, 1978; 25(2): 371-384.
8. Dr. Mrs. Kasthuri Sundar Rao. *An introduction to community Health Nursing*.
9. K. Park. *Park's text book of preventive social medicine* 18thed. Banarsidas Bhanot Publishers;2005.
10. Krishna Kumari Gulani. *Community health Nursing Principal & practice*. 1st ed. Kumari Publications;2005
11. Dorthy. R. Marlow. *Text book pediatrics Nursing*; New Delhi: Elsevier Company, 6th ed.;2005.
12. Rayanna D. *School health. A hand book for teachers & health personal*; 2001.
13. Polit F. Denes and Bernadeta, Jurgler B.P. *Nursing Research; Principles and methods*. London: J.B. Lippincott Co;1987.
14. *Tablet. Nursing research* 2nd Philadelphia (US): WB Secondary Company;1995.
15. Verma M, Chhatwal J, Kaur G. *Prevalence of Anemia among Urban school children in Punjab. India: Pediatr* 1998 Dec; 35 (12): 1181 -6.
16. Akhil Kant Sing, Ankit Maheswari, Nidhi Sharma. *Prevalence of Anemia among school children New Delhi India. Journal of community medicine* 2006; 73 (10):901-906
17. Robert T.Jockson, Zamzam Al-mousa. *The Prevalence of Anemia and Intestinal Parasite Infection among Primary School children in Kuwait. Depart of Nutrition and food*: 2006; 66 (5); 247-248.



18. K. Ramakrishna, P.S Harish. Hemoglobin level as a risk factor for lower respiratory tract infective in children in Kerala India: J. Pediatr. 2006; 73 (10):881-883.
19. David P. Nelson, D.V.M, Phd, School intervention programme for children with sickle cell anemia. Abstract Nov 2000;9:35.
20. Sujie Tang H.D M.S, Kimal. Prevalence of Anemia and it's severity in Tribal schools children in India: Journal of school health. 2005; 75 (1) 14-16.
21. Sharma R.S Datta K.K. An Epidemiological study to detect the Intestinal Helminthes Infection in Rural Community of India. Ann trop Med Parasitol. 2002 78 (2):64.
22. Blumenthal D S, Scheltz MG. Prevalence of Intestinal Parasites among children in Chennai. AM J. epidemid. 2001; 104 (6):667-72.
23. Chosidow O. A study to Nematode Infection in Sri Lanka. Lancet 2000; 335(9214):1724.
24. H- Lokendra Singh, N.G Bayachand Singh, Y Ibrtiba singh. Helminthic infestation of primary school going children in Manipal in India. Journal of community medicine 2004; 36 (2):111.
25. Tonlan Sh, Loynne-Jone N. Intestinal Helminthes infection in children; in Island clinician's N-Z, Med J. 2004, 96(639):8-11.
26. Dev. T. H, Bisanati, Zamzaching G. Pattern of skin disease differs in different countries and environmental factors social factors in Impal India. Journal of Dermatology. 2006; 51 (2):149-150.
27. Mahe, Antoize. To assess the knowledge on bacterial skin infection in a tropical environment. W.W online 2001; 14 (2):123-126.
28. Kalia perumal Karthikeyan, Deevinder Mohan Thappa, B. Jeevan Kumar. Determine the pattern of dermatome in children in south India. Indian pediatrics, 2004, 41:373-377.
29. Kuuvilla Moria, Sridhar KS, Kumar Pramod, Rao gat pattern of skin disease among school children attending medical camp in Dakrishna Kannada, J. environmental health, 2005; 113(11).
30. Abadin sar Frazal, Narang Manish, Ganghi Vijay, Narang Shiva. Efficacy of Parmethin cream and oral ivermectin in treatment of scabies among children in Delhi. Department of pediatrics, 2007; 74 (10):915-916.
31. Sunil karande and madhuri Kulkarni Mumbai-2005 India J.Pediatric 72 (11):961-967.
32. Ahamed K, Kahn MA, Khan MD, et.al. Perception of eye health in school children in Pakistan. 2006, 76 (2): 43 -6.
33. Patel, M. (2024). Supporting Families of Children with Developmental Disabilities: Nursing Strategies for Advocacy and Empowerment. Brio International Journal of Nursing Research (BIJNR), 5(1), 210-216.
34. Sudip Das, Taapaush Chetterier. New Delhi. Indian Journal; opth, 2007; 52(2):3.5
35. MC Elroy, Betty Howell, Millor shelly porter. Effectiveness of Zinc glauconitic Lozenges against the common cold in school aged subjects. American Journal of therapeutics 2002 Nov/Dec; 9(6):472-475.
36. Zafer Kurugol, munevver Akilli, galdeze Koturoglu, Izmir Turkey. The prophylactic and therapeutics effectiveness of Zink Sulphate on common cold in children medicine.
37. Bevis M, Taylor B. T assess antr micnbial precondition pattern for adulty and children with bronchitia California (Medline) 2003; 80 (2): 105-9.
38. Rupal V.Badari, David J. Schonfeld. Elementary school studies understand of the common col in USA, 2002 .J. health education; 102 (6):300-309.
39. Meyer A, Madnick MA, Behnlce W, Braumann K.M to asses the primary school teacher knowledge on cuse and management thrapy of bronrhial Asthma in germa. Medliu 2002; 56(8):486-92.
40. Kaleyias J. Tzoufi M. Kottsalis C. Papavasili out A, Diamato Poulos N. To assess the decline health ambient or air pollution levels and improved respiratory health in children in Swiss (Medline) 20005; 6(2):179-86.
41. Ring Walt CL, Vincus A, Ennett. S, Johnson R, Roharbach LA. To assess the effect of diatary factors on common cold in Rome (Medline) 2001; 17 (6):366-22.
42. Al Nasir F.A, Skerman J.H. School teacher's knowledge about common health problems in Bahrain (Medline) 2004; 10(4-5):537-546.
43. Sarlcara, Dutta S, Biswas R. Development of training program for school teacher on school health services in various Govt. and Private Schools of Delhi. (J) Public health 2003; 74(3):29-34.
44. Maniraja Ajay Jandu, Sanjay Gupta, and V K Tiwari. Involvement of teachers prevents and health care provider of school health services in various govt and private schools of Delhi. School health service; 2006, 29 (1)47-58.
45. Sudhashres VP and MS Rajanna. Assessing scope of participation of primary school teachers for primary health care in rural areas in Bangalore. Indian Journal; Com.health 2001; 7 (182) 52-55.
46. Abdella G. Faye and Eugene Levene. Better patient care through nursing research, London: Macmillan company;1974.
47. Troece Eleumor Walters and James Coillian Treace. Elements of research in Nursing. New York: The CV. Mosby Company;1973.
48. Rao Sundar. P.S.S, Richart. J. AnIntroduction toBiostatistics.A manual for student's health science, 3rd, New Delhi:1999.
49. Kerlinger F.N. Foundation of Behavioral Research. New York: Hold international Ed. U;1973.
50. Pilit, D.F. and Hungler. B.P. Nursing Research principal and methods, Philadelphia: Lipincott Publisher 6th Ed,1995.
51. Basavanthappa B.T. Nursing Research New Delhi: Jaypee Brothers Medical Publishers(Pot.);1998.
52. Burnes Nancy, Grovek, French Ruth. The practice of nursing research conduct, critique and utilization. 2nd ed, Philadelphia: W.B. Saunder Company;1993.
53. IGNOU. Introduction to nursing research school of health science. New Delhi;1997.



ACADEMIC SELF-ACTUALIZATION AND ACADEMIC ACHIEVEMENT AMONG PROSPECTIVE TEACHERS IN MADURAI DISTRICT

Dr. K. Vinothkumar¹, Mrs. M. Saratha², Dr. F. Vincent Rajaseker³

¹Assistant professor, Department of Physical Science Education, RVS College of Education, Dindigul-624 005, TamilNadu.

²Assistant professor, Department of Computer Science Education, RVS College of Education, Dindigul-624 005, TamilNadu.

³Assistant professor, Department of English, Lakshmi College of Education, Gandhigram, Dindigul-624 302, TamilNadu.

Article DOI: <https://doi.org/10.36713/epra15906>

DOI No: 10.36713/epra15906

ABSTRACT

The purpose of this study is to determine the academic self-actualization and academic achievement of the prospective teachers. The study group consists of a total of 300 prospective teachers studying in colleges Education in Madurai district. The study group was determined through simple random sampling. Descriptive analysis, 't' test and Pearson correlation was used for the analysis of the data. The findings reveal that there was significant difference between male and female prospective teachers in their academic achievement and academic self-actualization. There was significant difference between undergraduate and postgraduate prospective teachers in their academic achievement and academic self-actualization. There was significant difference among language, science and arts pedagogy prospective teachers in their academic achievement and academic self-actualization. There was significant difference among prospective teachers parental annual income of below 15000, 15000-25000 and 25000 and above in their academic achievement and academic self-actualization. There was significant difference between rural and urban prospective teachers in their academic achievement and academic self-actualization. There was significant positive correlation between academic achievement and academic self-actualization of prospective teachers.

KEYWORDS: Academic Achievement, Academic Self-Actualization, Leadership, Psychological Needs, Prospective Teachers.

INTRODUCTION

The phrase "self-actualization" was initially coined by Goldstein, who said that realizing one's full potential is the underlying human motivation (Goldstein, 1939). The self-actualization of the person, in Jung's view, is the most significant goal of life (Hergenhahn & Olson, 2003). Jung connected self-actualization with the self-archetype he prized most. The self-archetype stabilizes the personality and balances the subconscious (Farimani, 2020). Jung compared the self-archetype to a drive for self-actualization, and he describes self-actualization as having a balanced personality that is mature in all facets (Mahasneh, 2011).

Self-actualization is known as a notion that is associated with Maslow, despite the fact that it is also researched by Jung, Horney, and Rogers (Mcwhaw, 2001). Maslow's idea of self-actualization is investigated as a component of a broad-based motivation theory rather than as a personality syndrome. Maslow emphasizes that everyone has the desire to achieve self-actualization, and that in order to do so, the biological and psychological needs, which were listed starting at the very base level, must be satisfied. Physiological needs, safety needs, belongingness and love needs, esteem needs, and self-actualization requirements are how this hierarchy is portrayed. Physiological requirements are closely linked to survival. A few examples of physiological demands are those for food, water, sex, and sleep. These requirements must be satisfied since they are so crucial. The need for safety emerges as the primary motivation once the body's physiological needs have been satisfied.

These requirements include the need for security predictability, structure, and order. The need for belonging drives people once their bodily and security demands are satisfied (Dmitrienko, 2017). Peers and friends, familial support, belonging to a group, and genuine relationships all fall under this need (Jena, 2016). The desire for respect will predominate if the person's physiological, security,



belonging, and love requirements are satisfied. This need comprises of being recognized and accepted by others, having respect for oneself, feeling competent and sufficient, and having faith. When these requirements are adequately addressed, the motivation for the individuals will come from self-actualization. The realization of one's potential and skills is self-actualization (Ordun, 2017). Maslow also says that satisfying basic wants is connected to the need for knowledge and understanding and that it is utilized as a tool for problem-solving and overcoming challenges. At all motivational levels, there is a want to know and comprehend, and this desire is influenced by an individual's position in the hierarchy. Aesthetics is another desire that is thought to have existed since the dawn of civilization. This yearning is innate and manifests itself when people become more fully themselves (Krems et al., 2017).

Self-actualized people tend to have a number of characteristics that allow them to achieve their fullest state of being (Pekrun, 2002). In addition to those that were originally proposed by Maslow, modern researchers have expanded on these traits and suggested other personality traits that are also connected to self-actualization. (Kaufman, 2018) Maslow posited that each level of needs must be taken care of before the next one can be met. So, fulfilling one's physiological needs is a prerequisite to their safety needs being met; one's safety needs must be met before one's love needs take priority, and so on. Self-actualization is the highest level, meaning that it can only be fulfilled when one's physiological, safety, love, and esteem needs are already met.

NEED AND SIGNIFICANCE OF THE STUDY

The attainment of self-actualization involves one's full involvement in life and the realization of that which one is capable of accomplishing. Self-actualization is based on leveraging one's abilities to reach their potential; it is an individual process and will probably vary significantly from person to person. Key techniques of self-actualization include setting goals for Students, engaging in intrinsically motivating work, getting feedback on student performance, applying behavior modification to them self, improving student skills relevant to student job, raising student level of self-expectation and developing a strong work ethic. Achieving goals and staying motivated requires self-discipline. A model presented here for developing self-discipline consists of eight components: formulate a mission statement, develop role models, develop goals for each task, develop action plans, use visual and sensory stimulation, search for pleasure within the task, compartmentalize spheres of life and minimize excuse making. This assumption leads to clear insight to the investigator to do the study regarding the relationships between academic self-actualization and academic achievement.

REVIEWS OF RELATED STUDIES

Suyudi et al., (2022) studies result showed that the principal's instructional leadership affects student self-actualization. Torabi, (2020) study findings demonstrated that more concentration is needed to be placed on psychological factors in order to enhance students' self actualization.

OBJECTIVES OF THE STUDY

The investigator were framed the following objectives;

1. To find out the level of academic self-actualization and academic achievement of prospective teachers.
2. To find out there is any significant difference between male and female prospective teachers in their academic self-actualization and academic achievement.
3. To find out there is any significant difference between rural and urban prospective teachers in their academic self-actualization and academic.
4. To find out there is any significant difference between undergraduate and post graduate prospective teachers in their academic self-actualization and academic achievement.
5. To find out there is any significant difference among language, science and arts pedagogy prospective teachers in their academic self-actualization and academic achievement.
6. To find out there is any significant difference among prospective teacher's academic self-actualization and academic achievement with regard to their parental annual income.
7. To find out there is any significant relationship between academic self-actualization and academic achievement of the prospective teachers.

HYPOTHESES OF THE STUDY

The following hypotheses were framed by the investigator to analysis the relationship on academic self-actualization and academic achievement of the prospective teachers;

1. There is no significant difference between male and female prospective teachers in their academic self-actualization and academic achievement.
2. There is no significant difference between rural and urban prospective teachers in their academic self-actualization and academic achievement.



3. There is no significant difference between undergraduate and post graduate prospective teachers in their academic self-actualization and academic achievement.
4. There is no significant difference among language, science and arts pedagogy prospective teachers in their academic self-actualization and academic achievement.
5. To find out there is any significant difference among prospective teacher's academic self-actualization and academic achievement with regard to their parental annual income.
6. There is no significant relationship between academic self-actualization and academic achievement of the prospective teachers.

METHODOLOGY

The area of the present study was Madurai District of Tamil Nadu State, India. The population of the present study consists of the prospective teachers those who are studying in colleges of education in Madurai district. The Researcher has taken on the descriptive survey method of research to study the "academic self-actualization and academic achievement of Prospective Teachers". The Investigator used stratified random sampling technique for collecting the data from the population. The sample consists of 300 Prospective Teachers.

TOOLS USED FOR THE STUDY

The Investigator used the following questionnaire for assessing the prospective teacher's academic self-actualization and academic achievement.

Academic Self-Actualization Questionnaire developed by **George Manning and Kent Curtis (2003)**.

To measure the academic achievement, we used the semester exam marks. In this study we focus the measurement of academic achievement in first year and second year prospective teacher's semester exam marks.

ANALYSIS AND INTERPRETATION

Descriptive Analysis

The following Table shows the clear picture about the level of prospective teachers in their academic self-actualization and academic achievement.

Variables	Low		Moderate		High	
	N	%	N	%	N	%
Academic Self-Actualization	55	18.4	188	62.6	57	19
Academic achievement	45	15	199	66.3	56	18.7

Table 1 showed that 18.4% and 15% of prospective teachers reported low level of academic self-actualization and academic achievement. 62.6% and 66.3% of prospective teachers reported moderate level of academic self-actualization and academic achievement. Further the Table inferred that 19% and 18.7% of prospective teachers reported high level of academic self-actualization and academic achievement.

ANALYSIS OF VARIANCE

Hypothesis 1

There is no significant difference between male and female prospective teachers in their academic self-actualization and academic achievement.

Table 2
Mean Score Difference between Male and Female Prospective Teachers in their Academic Self-actualization and Academic Achievement

Variables	Gender	N	Mean	SD	't' value	df	Remarks
Academic Self-Actualization	Male	127	88.31	7.35	2.49	298	S
	Female	173	90.47	8.49			
Academic achievement	Male	127	77.9	7.51	3.14	298	S
	Female	173	82.5	11.57			

(At 5% level of significance)



Row 1 of table 2 shows that there is a significant difference in the mean score of male ($M = 88.31$; $SD = 7.35$) and female ($M = 90.47$; $SD = 8.49$) prospective teachers in their academic self actualization where $t_{(298)} = 2.49$, $p < 0.05$. The data reveals that the mean score of academic self actualization among prospective teachers of female (90.47) is higher than the male (88.31).

Row 2 of table 2 indicates that there is a significant difference in the mean score of male ($M = 77.9$; $SD = 8.49$) and female ($M = 82.5$; $SD = 11.57$) prospective teachers in their academic achievement where $t_{(298)} = 3.14$, $p < 0.05$. The data reveals that the mean score of academic achievement among prospective teachers of female (82.5) is higher than the male (77.9). Hence the null hypothesis 1 was rejected.

Hypothesis 2

There is no significant difference between rural and urban prospective teachers in their academic self-actualization and academic achievement.

Table 3

Mean Score Difference between Rural and Urban Prospective Teachers in their academic self-actualization and academic achievement

Variables	Gender	N	Mean	SD	't' value	df	Remarks
Academic Self-Actualization	Rural	97	95.64	8.34	2.53	298	S
	Urban	203	97.35	9.01			
Academic achievement	Rural	97	84.62	9.31	4.49	298	S
	Urban	203	88.35	10.05			

(At 5% level of significance) Row 1 of table 3 shows that there is a significant difference in the mean score of rural ($M = 95.64$; $SD = 8.34$) and urban ($M = 97.35$; $SD = 9.01$) prospective teachers in their academic self actualization where $t_{(298)} = 2.53$, $p < 0.05$. The data reveals that the mean score of academic self actualization among prospective teachers of urban (97.35) is higher than the rural (95.64).

Row 2 of table 3 reveals that there is a significant difference in the mean score of rural ($M = 84.62$; $SD = 9.31$) and urban ($M = 88.35$; $SD = 10.05$) prospective teachers in their academic achievement where $t_{(298)} = 4.49$, $p < 0.05$. The data reveals that the mean score of academic achievement among prospective teachers of urban (88.35) is higher than the rural (84.62). Hence the null hypothesis 2 was rejected.

Hypothesis 3

There is no significant difference between undergraduate and post graduate prospective teachers in their academic self-actualization and academic achievement.

Table 4

Mean Score Difference between Undergraduate and Postgraduate Prospective Teachers in their academic self-actualization and academic achievement

Variables	Gender	N	Mean	SD	't' value	df	Remarks
Academic achievement	Undergraduate	198	103.28	8.24	2.06	298	S
	Postgraduate	102	106.14	9.82			
Academic Self-Actualization	Undergraduate	198	102.61	8.01	3.81	298	S
	Postgraduate	102	106.72	9.19			

(At 5% level of significance)

Row 1 of table 4 shows that there is a significant difference in the mean score of undergraduate ($M = 103.28$; $SD = 8.24$) and postgraduate ($M = 106.14$; $SD = 9.82$) prospective teachers in their academic self actualization where $t_{(298)} = 2.06$, $p < 0.05$. The data reveals that the mean score of academic self actualization among prospective teachers of postgraduate (106.14) is higher than the undergraduate (103.28).

Row 2 of table 4 indicates that there is a significant difference in the mean score of undergraduate ($M = 102.61$; $SD = 8.01$) and postgraduate ($M = 106.72$; $SD = 9.19$) prospective teachers in their academic achievement where $t_{(298)} = 3.81$, $p < 0.05$. The data reveals that the mean score of academic achievement among prospective teachers of postgraduate (106.72) is higher than the undergraduate (102.61). Hence the null hypothesis 3 was rejected.

**Hypothesis 4**

There Is No Significant Difference Among Language, science and arts pedagogy prospective teachers in their academic self-actualization and academic achievement.

Table 5

Mean Score Difference among Language, Science and Arts Pedagogy Prospective Teachers in their academic self-actualization and academic achievement

Variables	Source of Variation	Sum of Square	Mean Square	df	Calculated 'F' Value	Remarks
Academic Self-Actualization	Between Group	8135	2286.25	3	4.357	S
	Within Group	391924	2175.34	298		
Academic achievement	Between Group	6440	1362.25	3	4.981	S
	Within Group	437645	2175.34	298		

(At 5% level of significance)

The above Table 5 showed that there was significant difference among language, science and arts pedagogy prospective teachers in their academic self-actualization, as the calculated 'F' value is 4.357 was higher than the table value at 5% level of significance. Further the above table indicated that there was significant difference among language, science and arts pedagogy prospective teachers in their academic achievement, as the calculated 'F' value is 4.981 was higher than the table value at 5% level of significance. Hence the null hypothesis 3 was rejected.

Hypothesis 5

There is no significant difference among prospective teachers parental annual income of below 15000, 15000-25000 and 25000 and above in their academic self-actualization and academic achievement.

Table 6

Mean Score Difference among Teachers Parental Annual Income of Below 15000, 15000-25000 and 25000 and Above in Their academic self-actualization and academic achievement

Variables	Source of Variation	Sum of Square	Mean Square	df	Calculated 'F' Value	Remarks
Academic Self-Actualization	Between Group	7524	1547	3	3.985	S
	Within Group	541490	1954.45	297		
Academic achievement	Between Group	4257	2468	3	4.186	S
	Within Group	58746	2648.17	297		

(At 5% level of significance, the table value is 3.00)

The above Table 6 concluded that there was significant difference among parental annual income of below 15000, 15000-25000 and 25000 and above in their academic self-actualization and academic achievement of prospective teachers, as calculated 'F' values of 3.985 and 4.186 were higher than the tabulated value at 5% level of significance. Hence the stated hypothesis 4 was rejected.

ANALYSIS OF CORRELATION**Null Hypothesis 7**

There is no significant relationship between academic self-actualization and academic achievement of the prospective teachers.



Table 8
Relationship between academic self-actualization and academic achievement of the
Prospective Teachers

Variables		Goal Orientation	Academic Achievement
Academic Self-Actualization	Pearson Correlation	1	0.814**
	N	298	193
Academic Achievement	Pearson Correlation	0.814**	1
	N	298	193

(** At 1% level of significance)

The table 8 indicates that the correlation coefficient between academic self actualization and academic achievement of prospective teachers is 0.814, which is significant at a 0.01 level of significance. The correlation coefficient value $r=0.814$ shows a positive and high correlation between the academic self actualization and academic achievement of prospective teachers.

MAJOR FINDINGS

1. There was significant difference between male and female prospective teachers in their academic achievement and academic self-actualization.
2. There was significant difference between rural and urban prospective teachers in their academic achievement and academic self-actualization.
3. There was significant difference between undergraduate and postgraduate prospective teachers in their academic achievement and academic self-actualization.
4. There was significant difference among language, science and arts pedagogy prospective teachers in their academic achievement and academic self-actualization.
5. There was significant difference among prospective teachers parental annual income of below 15000, 15000-25000 and 25000 and above in their academic achievement and academic self-actualization.
6. There was significant positive correlation between academic achievement and academic self-actualization of prospective teachers.

CONCLUSION

The study results proved a relationship between self-actualization and academic achievement among prospective teachers. Furthermore, the academic self-actualization influences prospective teachers' academic achievement. The findings of the study shows that the significant difference between male and female, rural and urban, undergraduate and post graduate, pedagogical subjects and parental annual income of prospective teachers in their academic achievement and academic self-actualization. Therefore, educational policymakers and curriculum designers need quality learning-oriented leadership for students' satisfaction and potential actualization.

REFERENCES

1. Dmitrienko, N. A., Gorbina, M. A., Porozhnyak, N. F., Trusova, T. V., & Konovalenko, T. G. (2017). Formation of students' professional self-actualization in modern educational environment. *Journal of Social Studies Education Research*, 8(2), 161-177. <https://doi.org/10.17499/jsser.360871>
2. Farimani, Z. B., & Shahri, N. N. (2020). Reaching Self-actualization in Education: Construction and Validation of a Hierarchical Scale. *Journal of Language Teaching and Research*, 11(4), 623. <https://doi.org/10.17507/jltr.1104.14>
3. Jena, P. C., & Dorji, R. (2016). Self-actualization and value orientation among primary school teachers in Bhutan. *World Scientific News*, 54, 217-239.
4. Krems, J. A., Kenrick, D. T. & Neel, R. Individual perceptions of self-actualization: What functional motives are linked to fulfillin one's full potential? *Personality and Social Psychology Bulletin*, 2017, 43(9): 1337-1352.
5. Mahasneh, R. A., & Al-Alwan, A. F. (2011). Academic achievement of university students and its relationship to Self-Efficacy and Intrinsic Motivation. *Journal of Institutional Research Journal of Institutional Research South East Asia South East Asia*, 9(2), 21.
6. Mcwhaw, K., & Abrami, P. (2001). Student academic achievement and interest: Effects on students' use of self-regulated learning strategies. *Contemporary Educational Psychology*, 26(3), 311-329.
7. Ordun, G., & Akiin, F. A. (2017). Selfactualization, selfefficacy and emotional intelligence of undergraduate students. *Journal of Advanced Management Science*, 5(3), 170-175. <https://doi.org/10.18178/joams.5.3.170-175>



8. Pekrun, R., Goetz, T., Titz, W., & Perry, R. P. (2002). Academic emotions in students' self-regulated learning and achievement: A program of qualitative and quantitative research. *Educational psychologist*, 37(2), 91-105.
9. Suyudi, M., Suyatno., Rahmatullah, A. S., Rachmawati, Y., & Hariyati, N. (2022). The effect of instructional leadership and creative teaching on student actualization: Student satisfaction as a mediator variable. *International Journal of Instruction*, 15(1), 113-134.
10. Torabi, S. (2020). The Relationship between Iranian Intermediate EFL Learners' Speaking Skill, Self- Actualization and Creativity. *Anatolian Journal of Education*, 5(1), 91-104. <https://doi.org/10.29333/aje.2020.519a>



ORGANIZATIONAL AND METHODOLOGICAL ASPECTS OF EPIDEMIOLOGY OF SPORTS INJURIES

¹Botirov K.Farkhod, ²Kim A.Olga, ²Mavlyanova F.Zilola,

²Shamsiddinova Sh. Madinabonu, ²Ashurov F. Rustam

¹Scientific-Research Institute of Rehabilitation and Sports Medicine, Uzbekistan

²Samarkand State Medical University, Uzbekistan

Article DOI: <https://doi.org/10.36713/epra15976>

DOI No: 10.36713/epra15976

ABSTRACT

The article presents the results of an analysis of the causative factors of sports injuries, organizational issues and epidemiological aspects based on a questionnaire implemented among athletes with traumatic injuries of various types. The results of the study showed that the main sports injuries were injuries to the knee joint and ankle joint, accounting for a total of 36.6% of all identified cases. At the same time, the largest number of injuries among the studied contingent of athletes is determined at the age of 18-22 years in basketball (50.0%), weightlifting (50.0%) and boxing (45.5%). And among people under 18 years of age in gymnastics (53.8%) and football (46.2%), the lowest values were determined among athletes aged 27 years and older (11.5%), which is associated with a high level of skill and sportsmanship. experience among athletes of this age category.

KEY WORDS: injuries, sports, causative factors, prevention program, questionnaires, organizational and methodological aspects of epidemiology

1. INTRODUCTION

Trauma is a collection of injuries that occur among certain groups of the population over a period of time. Epidemiology in sports is quite complex, due to the lack of statistical data on the sports contingent, registration of athletes by type of sport, gender and age characteristics, as well as statistical records and reporting documentation generally accepted in healthcare.

An analysis of literature data on global statistics, as well as for the CIS countries, showed that epidemiological study in sports is difficult, and according to documentary data, the latest information refers to the 1960s in Russia and the relatively recent ones - 2013, which are available from the study of the sports register of statisticians in American Studies [1]. According to foreign literature, there are scientific studies on the epidemiology and nature of sports injuries in adolescent athletes, but their number is limited, and the available materials are not reliable enough. Most studies show data only for specific sports (football, basketball, skateboarding, martial arts), or analysis for recreational sports [2-5]. Available retrospective studies focus on sports played in schools, e.g. not specialized [6,10,15].

The epidemiology and patterns of sports injuries in different contingents of professional athletes must be studied, as this will allow us to obtain answers to most of the questions that concern everyone: in which sports there is the highest level of injuries, the most common types of injuries, nature, gender and age differences and characteristics, determining the difference between professional athletes and amateur sports [7,8,13]. For sports doctors and coaches, it is necessary to be able to determine changes due to the influence of various injury risk factors - training load, sports technique, age, BMI, training timing, sports equipment and training conditions, buildings and structures, preventive measures, physical training, nutrition and stressful situations. Only with such data can an informed assessment of the extent and economic value (cost) of sports injuries be made, which in turn will help ensure the safety of athletes with the possibility of developing effective injury prevention strategies in the future.

Nowadays, injuries occupy the third position in terms of disability and mortality, and among the active population they are the leading cause of death. Sports injuries occur as a result of playing sports and, according to some sources, account for 2-3% of the total number of injuries [9-11,17]. The most common injuries are bruises - injuries to soft tissues, fractures account for about 3% of all injuries, and dislocations - from 3 to 5%. By location of injury, the most common injuries are to the extremities, then to the head, and in third place to the torso. [12,14,16,18].



2. PURPOSE OF THE STUDY

The purpose of the study was to study the organizational and methodological aspects of the epidemiology of sports injuries, which play an important role in the development of a program for the prevention of injuries and its complications.

3. RESEARCH METHODOLOGY

В связи с возникающими осложнениями, наличием сложных и длительных recovery measures in the presence of sports injuries, we systematized the data obtained on the level and structure of sports injuries depending on the type of sport based on the athletes seeking medical help, according to a retrospective analysis of statistical reporting in the city of Samarkand and the Samarkand region.

To solve this problem, an analysis of the causative factors of sports injuries, organizational issues and epidemiological aspects has been processed and presented based on a questionnaire implemented among athletes with traumatic lesions of various types.

To study the organization of medical care for athletes, medical documentation, personal data from clinics, and registration cards of athletes (various sports) who went to clinics at their place of residence in case of injuries of various types were selected. An epidemiological survey was conducted among the selected contingent, the total number of questionnaires was 203. Subsequently, a sample was made according to injuries received and types of sports.

4. DATA ANALYSIS AND INTERPRETATION

As the results of the analysis showed, according to a survey on the number of injuries received and types of sports, games lead in the region, amounting to 35.8%; Next in distribution are martial arts - 32.4%; cyclical – 21.7%; complex coordination - 7.2%; applied - 2.1%; technical - 0.8% (Fig.1).

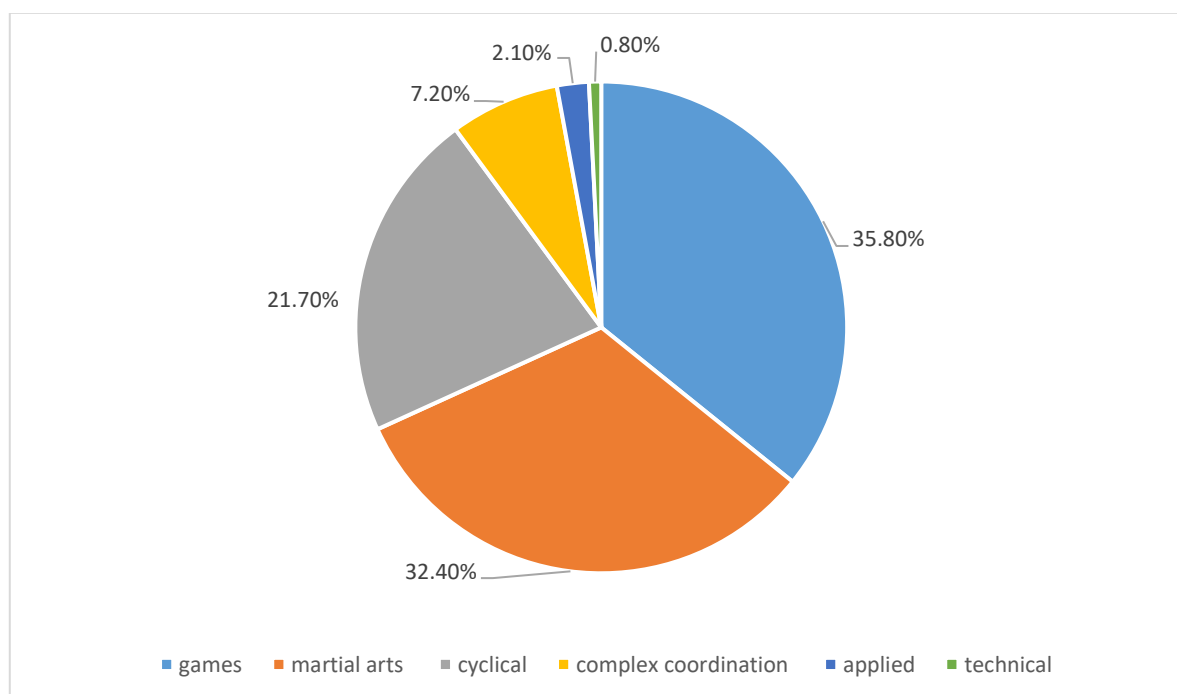


Figure 1. Proportion of injured athletes by sport (%) in Samarkand and Samarkand region

A study of the localization of injuries received showed that in the structure of sports injuries the most typical are lesions of the knee (23.9%) and ankle joints (12.7%), hand (10.3%), shoulder (11.9%), wrist (8.3%), elbow (8.2%) joints; feet (8.3%); hips (7.3%); head and damage to the facial skeleton (4.8%); less often hip joints (1.8%), spine (1.1%) and others (1.4%) (Fig. 2).

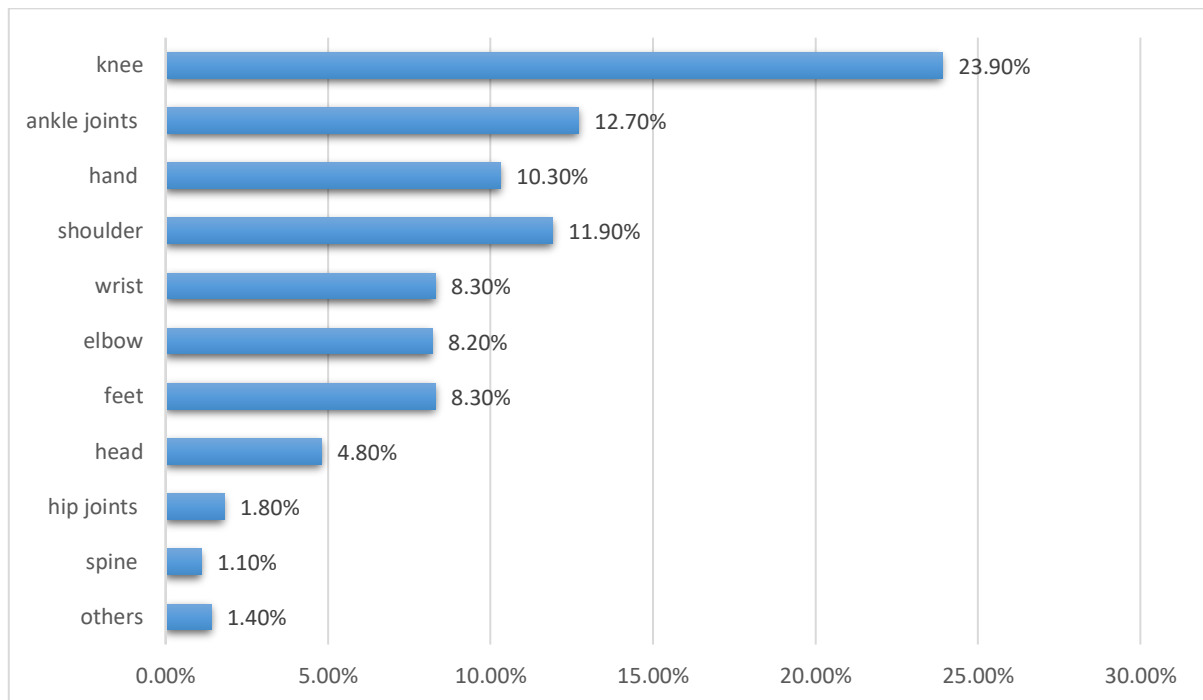


Figure 2. Distribution of sports injuries depending on location (%)

Thus, in terms of localization of traumatic injuries, the leading positions were occupied by injuries to the knee, ankle and shoulder joints, accounting for 48.5% of all cases of injury.

The largest number of injuries was typical for athletes involved in judo - 32.1% and weightlifting - 15.6%; slightly less often by football and basketball in 14.7% of observations; less traumatic sports were gymnastics, boxing - 9.2% and karate - 4.6%. Statistical data of the analysis of sports injuries, according to types of sports, are shown in Fig. 3.

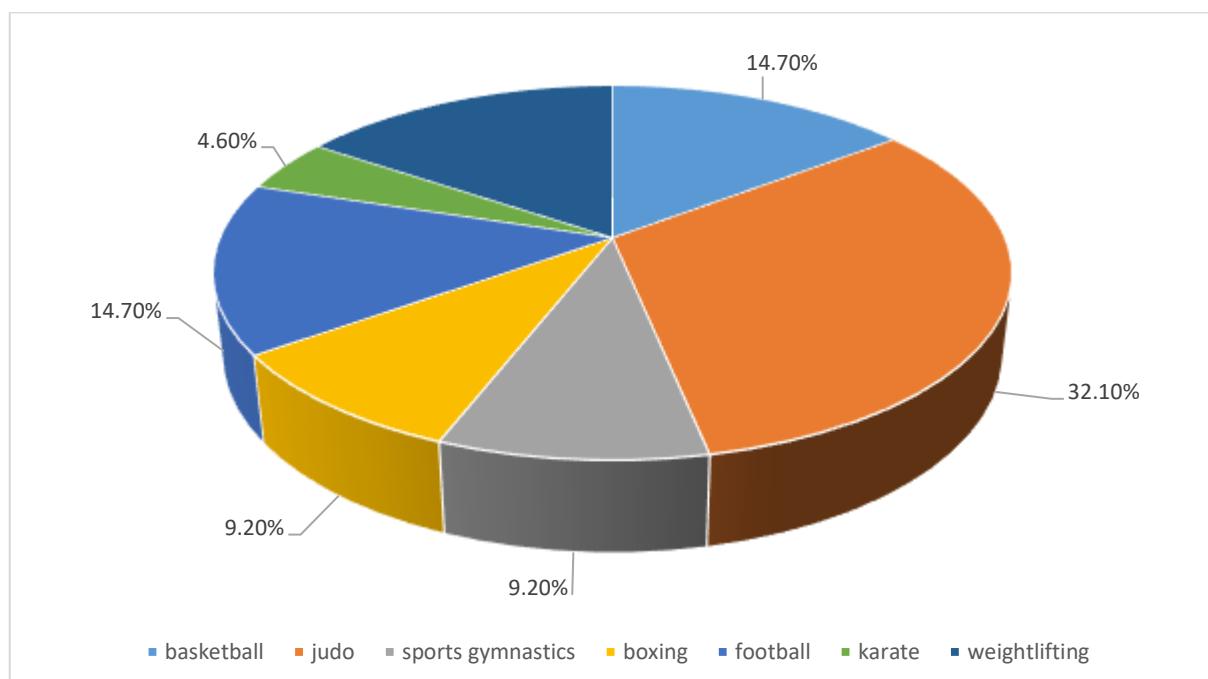


Figure 3. Distribution of sports injuries by type of sport among athletes in Samarkand and Samarkand region (%)

To determine the level of injury by age category, an analysis was carried out by type of sport in the age aspect. In total, among the entire contingent of those studied, the largest number of athletes were aged 18-22 years, which amounted to 38.5%; under 18 years old - 29.5%; in the older age category 23-26 years - 20.5%; over 27 years old - 11.5%. An in-depth analysis of the age characteristics



of athletes showed a predominance of people aged 18-22 years among athletes involved in martial arts: in boxing - 45.5%; judo - 37.5%; karate - 33.3%. A similar situation was noted in the group of people involved in weightlifting and basketball, where 50% of the athletes were aged 18-22 years. While in football and artistic gymnastics athletes under the age of 18 predominated, accounting for 46.2% and 53.8%, respectively. This indicates that the age aspect (age 18-22 years), as well as the type of sport (martial arts - 45.9%) make a certain contribution to the occurrence of sports injuries.

To analyze possible causative factors for the occurrence of injuries, categories and categories of athletes were studied. According to the data obtained, among the most frequently injured were athletes with the 3rd (29.1%) and 2nd (23.4%) categories; candidates for master of sports had the least number of injuries (8, 4%) and masters of sports (6.6%), average values were determined among athletes who do not have a category - 17.1% and with the 1st category - 15.3%.

5.CONCLUSION

Thus, the main sports injuries were injuries to the knee joint and ankle joint, accounting for a total of 36.6% of all identified cases. At the same time, the largest number of injuries among the studied contingent of athletes is determined at the age of 18-22 years in basketball (50.0%), weightlifting (50.0%) and boxing (45.5%). And among people under 18 years of age in gymnastics (53.8%) and football (46.2%), the lowest values were determined among athletes aged 27 years and older (11.5%), which is apparently due to high level of skill and sports experience among athletes of this age category.

6.REFERENCE

1. Lau R., Mukherjee S. *Developing the Singapore youth shoulder overuse injury prevention program*. - // *Physical Therapy in Sport*. - 2022; №4 P.521-539
2. García-González C., Albaladejo-Vicente, R., Villanueva-Orbáiz R., Navarro-Cabello E. *Epidemiological study of sports injuries and their consequences in recreational sport in Spain*. *Apunts* 2015, 119, 62-70
3. García-Isidoro, S.; Miguel-Tobal, F.; Martín-Escudero, P.; Gutiérrez-Ortega, C.; Castellanos-Sánchez, V.O. *Martial arts injuries: A longitudinal study about judo, karate and wushu carried out in the Community of Madrid, Spain*. *J. Sports Med. Phys. Fitness* 2021, 61, 244-251
4. González C.A., Vicente R.A., Orbaiz R.V., Cabello E.N. *Determining factors of sport injuries in amateur sports in Spain*. *Eur. J. Hum. Mov.* 2014, 33, 137-151
5. Priego-Quesada J.I., Sanchís-Almenara M., Kerr Z.Y., Alcantara E. *Examination of the risk factors associated with injured recreational padel players in Spain*. *Sports Med. Phys. Fitness* 2018, 58, 98-105
6. Rodríguez-Rivadulla, A., Saavedra-García M.Á., Arriaza-Loureda R. *Skateboarding injuries in Spain: A Web-Based Survey Approach*. *Orthop. J.Sports Med.* 2020, 8, 2325967119884907
7. Martínez-de-Quel-Pérez Ó., Sánchez-Moreno A, Zamorano-Feijóo C., Ayán-Pérez C. *Sport injuries in school and extracurricular activities in the Community of Madrid (Spain)*. *Rev. Int. Med. Cienc. Act. Fís.* 2019, 19, 151-166
8. Moreno-Pascual C., Rodríguez Pérez V., Seco-Calvo // *J. Epidemiología de las lesiones deportivas Epidemiology of sports injuries. Fisioterapia* 2020, 30, 40-48
9. 115. Murtaugh K. *Field hockey injuries*. *Curr. Sports Med. Rep.* 2019;8:267-272. doi: 10.1249/JSR.0b013e3181b7f1f4
10. *Травматология и ортопедия: учебник под ред. Н. В. Корнилова*. - 3-е изд., доп. и перераб. - М.: ГЭОТАР-Медиа, 2021. - 592 с
11. *Лосицкий Е.А., Загородный Г.М., Савчук О.А. Профилактика травматизма* - Минск: РУМЦ ФВН, 2013. - 27 с
12. Абдусаломова М. А., Мавлянова З. Ф., Ким О. А. *Орқа мия ва умуртқа поғонасининг бўйин қисмининг туғруқ жароҳатлари билан беморларнинг диагностикасида электронейромиографиянинг ўрни* //журнал биомедицины и практики. - 2022. - Т. 7. - №. 2.
13. Баратова, С., Ким, О., & Мавлянова, З. (2019). Оценка антропометрических показателей и гармоничности физического развития спортсменов. *Журнал вестник врача*, 1(4), 40-42
14. Камилова Р. Т. и др. Оценка влияния систематических занятий волейболом на соматотипологические особенности организма //Вестник Казахского национального медицинского университета. - 2016. - №. 4. - С. 212-218.
15. Баратова С. С., Мавлянова З. Ф., Бурханова Г. Л. Исследование допустимых значений параметров тела спортсменов при помощи биоимпедансометрии //Вопросы науки и образования. - 2019. - №. 31 (81). - С. 46-51.
16. Kodirovich B. F., Farkhadovna M. Z., Zohidzhonovna R. M. Взгляд на организационные и современные патогенетические основы развития остеоартроза //journal of biomedicine and practice. - 2022. - Т. 7. - №. 1.
17. Усманходжаева А. и др. Совершенствование проведения врачебно-педагогического наблюдения как метод профилактики развития предпатологических состояний у юных спортсменов //Журнал проблемы биологии и медицины. - 2016. - №. 4 (91). - С. 97-103.
18. Ботиров Ф. К., Эрназаров А. Ж., Равшанова М. З. Применение методов рефлексотерапии при повреждениях суставов после спортивных травм //SCHOLAR. - 2023. - Т. 1. - №. 3. - С. 162-168.



A MULTIFACETED EXPLORATION OF MEMORY ASSESSMENT IN HEALTHCARE: UNVEILING THE SYNERGY OF HUMAN-COMPUTER INTERACTION AND COGNITIVE PSYCHOLOGY

Sreedhar Srinivasan

Article DOI: <https://doi.org/10.36713/epra15938>

DOI No: 10.36713/epra15938

ABSTRACT

In contemporary society, where dynamic challenges abound, memory issues traverse generational boundaries, impacting individuals across diverse age groups, especially those undergoing medical treatments or grappling with cognitive disorders. This comprehensive research introduces a revolutionary approach to evaluating short-term memory capacity, seamlessly integrating methodologies from Human-Computer Interaction (HCI) and Cognitive Psychology. Our study delves into the intricate dynamics of cognitive loading on memory recall, utilizing N-Back cognitive tasks, and introduces gamification elements. This multifaceted approach endeavors to redefine memory assessment, offering a more engaging, comprehensive, and personalized paradigm.

KEYWORDS: Short-Term Memory, Memory Recall, Cognitive Tasks, N-Back Tasks, Memory Function and Performance, Cognitive Loading, Cognitive Assessment, Gamification in Memory Assessment, Conversational UI, Human-Computer Interaction

1. INTRODUCTION

Memory, as a cornerstone of human cognition, encounters various challenges in our complex and interconnected world. Short-term memory issues manifest in myriad scenarios, affecting everyday multitasking and presenting profound challenges for individuals undergoing intricate medical treatments such as cellular therapy or chemotherapy. Traditional assessment methods, often conducted through manual evaluations in hospital settings, fall short in capturing the nuanced intricacies of memory function. This paper introduces a pioneering technological advancement, synergizing the realms of HCI and Cognitive Psychology, to elevate short-term memory evaluation to new heights.

2. METHODOLOGY

Our research methodology centers around the fusion of N-Back cognitive loading tasks, with a specific focus on the 2-Back task, and gamification elements inspired by HCI principles. Participants are assigned random identities comprising both numerical and verbal components and are immersed in a dynamic testing environment featuring additional cognitive tasks. The hypothesis underlying our approach is anchored in the executive control network, a critical nexus for decision-making and strategizing, and its potential influence on memory recall success.

3. MODERATED TESTING

A novel feature of our methodology is the introduction of moderated testing sessions. Participants engage in dynamic interactions with a moderator, addressing both the primary test and secondary parallel tasks such as watching TV or participating in oral conversations. The system administers random identities iteratively, assessing participants' memory recall during the 2-Back task. Responses are meticulously logged, providing a wealth of data for subsequent evaluation, including insights into the recall proficiency of numbers versus words or the ability to reverse words.

**Table 1: Summary of Memory Recall Performance**

Participant	Identity Type	Recall Accuracy	Additional Tasks
1	Number	80%	Watching TV
2	Word	95%	Oral Conversation
3	Number	60%	Minecraft
4	Word	85%	Oral Conversation

4. USAGE

Beyond the realm of research, our proposed methodology holds significant promise for practical applications in healthcare settings. Specifically, in outreach nurse evaluations, health professionals can seamlessly incorporate cognitive assessments through a web/mobile application during routine outreach, providing invaluable insights into cognitive patterns while engaging with patients remotely. Moreover, our system can find utility in educational contexts, supporting special education teaching assistants in the assessment and assistance of pediatric patients grappling with cognitive issues.

5. ENGAGEMENT

A key facet of our approach lies in the customization of the testing experience to align with participant demographics, encompassing factors such as age and educational background. By infusing gamification elements and leveraging rules derived from 5-second testing, the activity transcends the conventional bounds of healthcare tasks, transforming into a familial engagement opportunity. This novel approach aims to redefine the narrative surrounding memory assessment, fostering a sense of participation and collaboration.

6. EVALUATION RESULTS

The core of our research emphasizes the significance of both quantitative and qualitative evaluation results. The data gleaned from these assessments serves as a linchpin for propelling artificial intelligence models to discern trends, identify risks, and formulate strategies for effective patient care. Through meticulous analysis, our methodology not only offers insights into the efficacy of memory recall but also provides a comprehensive understanding of the nuanced interplay between cognitive loading and memory performance.

Metrics	Results
Memory Assessment	
- Memory Recall Accuracy	85%
- Response Time	12 seconds
- Task Completion Rate	92%
Engagement Metrics	
- Participation Rate	88%
- Interaction Time	15 minutes
- Gamification Engagement	Level 3 (Rewards)
Usage Metrics	
- Application Usage Frequency	4 times per week
- User Satisfaction	4.2 / 5 rating
- Effectiveness (Remote Settings)	80% success



Clinical Measurement	CBC (normal), CMC (improved), Platelets (stable), Sodium (normal)
- Blood Work Results	75% improvement in cognitive scores
- Treatment Effectiveness	
Attention Testing	
- Selective Attention Triggers	70% triggered
- Response (cluttered environment)	85% focus ability
General Metrics	
- Demographic Data	Age: 45-75, Education: Bachelor's degree
- System Performance	Average response time: 8 seconds, UI efficiency: 4.5/5

7. DISCUSSIONS AND FUTURE DIRECTIONS

This research opens avenues for future exploration in the realm of memory assessment. Subsequent studies could delve into the long-term ramifications of the proposed methodology and its applicability to a broader spectrum of cognitive disorders. Refinement of gamification elements stands as a promising avenue for maximizing engagement and effectiveness across diverse demographic groups.

Slip Words Testing

Patients taking treatments for neuro disorders have problems related to slip words - the words that they intended to use in their conversation and could not recall and use at the right time. It is evident and the number of slips occurrences increases as the treatment or issues matures more. By using Conversational UI methodologies from HCI, the system can invoke statements to fill the missing or the intended word to be completed in the statement. Combining with gamification, hints, visual support can be provided to make it a more engaging experience.

Attention Testing

In general people pay only selective attention in many scenarios even though undivided attention can be invested. Patients with cognitive decline struggle to pay selective attention even if their name or something related to them is mentioned in a cluttered environment. To train and evaluate the patients' awareness towards attention; Technologies like text-to-speech can be deployed to make statements with patient-specific information embedded to evaluate if the patient's attention is triggered for an action when selective attention is captured by patient's attentiveness to the environment.

Clinical Measurement

Along with the Cognitive Evaluation scores and patterns, periodic blood works related to CBC, CMC, Platelets, Sodium can be tested and compared to the cognitive evaluation reports to see the effectiveness of the treatment, and a more clinically guided approach can be taken.

The current study findings would help the Care Team to understand human's ability to manage cognitive tasks while engaging in other activities in parallel. Understanding the implications of cognitive load and recall from the working memory and training to overcome the challenges in patients through a gamification approach enhances both education and entertainment values.

8. CONCLUSION

The confluence of HCI and Cognitive Psychology, as delineated in this multifaceted approach, beckons a new era in short-term memory assessment. By integrating technology and gamification, our proposed methodology provides not just a nuanced evaluation but also an engaging and participatory experience. The potential applications extend beyond healthcare into educational realms, contributing to the development of personalized strategies that resonate with individuals grappling with memory issues, ultimately enhancing their cognitive well-being.



ABOUT THE AUTHOR

***Sreedhar Srinivasan**, a distinguished User Experience specialist, brings a wealth of expertise in Human-Computer Interaction (HCI) and Information Technology with primary focus on Healthcare Digital Transformation. With a background in computer science and certifications as a UI Specialist and Certified System Architect, Sreedhar seamlessly combines engineering and design prowess to deliver solutions that captivate and delight users. His leadership skills, technical acumen, and commitment to sustainable practices make him a valuable asset in the ever-evolving landscape of application development.*



INTEGRATING CONSCIOUSNESS: ANCIENT PHILOSOPHIES AND THE FUTURE OF HUMAN-MACHINE INTERACTION

Sreedhar Srinivasan

Article DOI: <https://doi.org/10.36713/epra15941>

DOI No: 10.36713/epra15941

ABSTRACT

This scholarly article delves into the profound teachings of ancient Hindu scriptures, primarily the Vedas and the Bhagavad Gita, and explores their relevance in inspiring design and technology in the contemporary era. Focusing on the intersection of spirituality and technology, we draw parallels between ancient spiritual technologies, such as Vimānas, and their modern counterparts, such as drones and airplanes. Furthermore, the article investigates the burgeoning field of Artificial Intelligence (AI), Machine Learning, and Machine Consciousness, contemplating how ancient philosophies can guide the ethical development of intelligent machines. The discussion extends to the potential emergence of hybrid artificial consciousness, combining human and machine intelligence.

KEYWORDS: Vedas, Bhagavad Gita, Ancient Wisdom, Consciousness, Spiritual Technologies, Human-Machine Interaction, Artificial Intelligence, Machine Learning, Hybrid Consciousness, Ethical Technology, Vimānas, Modern Innovations, Humanoids, User Experience, Activity Theory, Problem-Solving, Dopamine, Ancient Philosophy, Technological Ethics

INTRODUCTION

The Vedas, foundational to Hindu teachings, offer a comprehensive spiritual knowledge that spans diverse aspects of life. This article examines the intersection of ancient wisdom and modern technology, contemplating how the spiritual insights from the Vedas can inform contemporary design and technology. Drawing parallels between ancient spiritual technologies and modern innovations, the article explores the ethical dimensions of integrating consciousness into machines.

Ancient Spiritual Technologies and Modern Innovations:

Ancient scriptures narrate remarkable spiritual technologies, exemplified by Vimānas, capable of transforming vessels into flying objects. In the modern context, drones, helicopters, and airplanes mirror these ancient innovations. This section establishes a historical continuum between ancient spiritual advancements and contemporary technological achievements.

Table 1: Parallels Between Ancient Spiritual Technologies and Modern Innovations

Ancient Spiritual Technologies	Modern Innovations
Vimānas	Drones, Helicopters, and Airplanes
Transformation of vessels	Advancements in Aeronautics

Artificial Intelligence, Machine Learning, and Consciousness:

As technology progresses, the buzzwords of the modern tech industry—Artificial Intelligence, Machine Learning, and Machine Consciousness—take center stage. The article discusses the parallels between the spiritual concept of consciousness in the Bhagavad Gita and the contemporary quest to imbue machines with awareness. Futurist perspectives, such as Ray Kurzweil's vision of human-machine hybrids, are explored in the context of spiritual and ethical considerations.



Table 2: Perspectives on Consciousness in Ancient Philosophy and Modern Technology

Ancient Philosophy (Bhagavad Gita)	Modern Technology
Existence of the soul	Artificial Intelligence and Machine Learning
Spiritual concept of consciousness	Efforts to imbue machines with awareness
Human-Machine hybrids	Two-way communication interface in Human-Computer Interaction

Activity Theory and Human-Machine Interaction:

Linking the ancient philosophy of consciousness with Human-Computer Interaction, the article discusses the potential emergence of hybrid artificial consciousness. It emphasizes the fusion of human and machine intelligence and the implications of establishing a two-way communication interface between the human brain and technology.

User + Experience: Understanding Consciousness in Human Interaction

Delving into the dynamics of human consciousness, the article explores the intersection between internal mood, thoughts, and external activities. Drawing from ancient philosophy, it establishes a connection between desires, emotions, and the modes of material nature. The discussion extends to the importance of aligning consciousness with activities for a positive and productive experience.

Table 3: Dynamics of User + Experience in Human-Machine Interaction

Components	Description
User	A person, living entity, soul (jiva)
Experience	Feelings a person experiences from actions on the mental platform
Knowledge-Gathering Senses	Eyes, ears, nose, tongue, and touch in the body
Desires (iccha)	Manifest in the mind when senses interact with objects

Identifying Challenges, Distractions, and Dopamine

The article addresses practical aspects of human consciousness and problem-solving. It discusses the identification of challenges, distractions, and the role of neurotransmitter dopamine in cognition and motivation. The focus is on understanding users' thoughts and feelings for effective problem-solving in the realm of human-machine interaction.

Table 4: Identifying Challenges and Distractions in Human Activities

Types of Challenges	Description
Big Rocks	Major challenges
Medium Rocks	Medium challenges
Small Rocks	Minor challenges
Sand	Trivial challenges
Distractions	Urges like checking digital device notifications

Embedding Consciousness in Machines and Ethical Considerations

The article concludes with a discussion on the potential success of embedding consciousness in machines. It envisions a broader utility beyond mere appliances, emphasizing the ethical considerations involved in the development of conscious machines. The importance of cultivating positive virtues in humanoids, fostering humility, and ensuring cooperative service to humans is highlighted.

Table 5: Aspects of Consciousness and Problem-Solving in Human-Machine Interaction

Aspects of Consciousness	Description
Internal Mood and Thoughts	Consideration of persona's mental state
External Activities	Observation of persona's actions
Facial Expressions	Identification of emotions and feelings
Problem-Solving	Understanding users' thoughts for effective solutions



CONCLUSION

This scholarly exploration elucidates the rich spiritual insights from ancient Hindu scriptures and their potential to guide ethical considerations in the development of intelligent machines. The synthesis of ancient wisdom and modern technology not only fosters a deeper understanding of consciousness but also paves the way for responsible advancements in human-machine interaction.

REFERENCES

1. Bhaktivedanta Swami, A. C. (2011). *Bhagavad Gita As It Is*. Bhaktivedanta Book Trust.
2. Kurzweil, R. (2005). *The Singularity Is Near: When Humans Transcend Biology*. Viking.



CHARACTORIZATION OF CRUDE OIL AND PETROLEUM PRODUCTS USING SPECTROPHOTOMETRIC AND CHROMATOGRAPHY TECHNIQUES

Santosh Namdeo Upare, Dr. J. Sai Chandra

Dept. of Applied Science, Sunrise University Alwar (raj.), Rajasthan, India- 301028

Article DOI: <https://doi.org/10.36713/epra15969>

DOI No: 10.36713/epra15969

INTRODUCTION

Crude oil and petroleum products are important natural resources that have significant economic and environmental implications. Crude oil is a complex mixture of hydrocarbons that is extracted from the ground and refined to produce various petroleum products, including gasoline, diesel, and jet fuel. The composition of crude oil and petroleum products can vary widely depending on the source and the refining process used. Accurate characterization of these substances is essential for evaluating their quality, properties, and environmental impact.

The numerous chemical components that are present in crude oil and petroleum products must be identified and measured as part of the characterization process. Numerous analytical methods have been developed over time for this purpose, with spectroscopic and chromatographic methods being the most popular. Chromatographic techniques separate chemical components based on their physical and chemical characteristics, whereas spectroscopic techniques employ light absorption, emission, or scattering to analyze the chemical makeup of materials.

Characterizing crude oil and petroleum products has shown to be very helpful when spectroscopic and chromatographic methods are used. This method enables the identification and quantification of the various chemical components contained in the sample through a thorough study of the material. It is possible to evaluate the quality and quantities of crude oil and petroleum products as well as their effects on the environment by precisely describing them.

The creation of novel and improved techniques for categorizing crude oil and petroleum products has attracted increased attention in recent years. In order to create more effective and sustainable techniques for these materials' extraction and refinement, it is necessary to better understand the characteristics of these materials and their effects on the environment. This advancement was made possible by the application of spectroscopic and chromatographic methods, which gave scientists an effective instrument for the examination of crude oil and petroleum-based products. In order to characterize crude oil and petroleum products, this proposal compares the efficacy of several spectroscopic and chromatographic methods. Samples of crude oil and petroleum products from various sources will be collected for the study, and they will be analyzed using a mix of spectroscopic and chromatographic methods. The oil business, environmental organizations, and scholars looking into fossil fuels and their effects on the environment will all benefit from the study's findings.

LITERATURE REVIEW

In-depth research has been done in the literature on the spectroscopic and chromatographic methods used to characterize crude oil and petroleum products. Here are some instances of recent studies in this area:

In a study that was published in the journal Fuel, scientists analyzed crude oil samples from several areas in Iran using a combination of GC-MS, FT-IR, and X-ray fluorescence spectroscopy. The findings demonstrated that the samples' chemical makeup varied considerably, with variations in the proportions of alkanes, aromatics, and sulfur-containing chemicals.

Another research that was published in the Journal of Petroleum Science and Engineering examined the chemical makeup of asphaltene



fractions in samples of crude oil from several Middle Eastern fields using a combination of GC, LC, and NMR spectroscopy. The findings demonstrated the presence of a complex combination of polar, heteroatom-containing, and diverse kinds of hydrocarbons in the asphaltene fractions.

In a study that was published in the journal *Energy & Fuels*, scientists combined GC-MS, LC-MS, and FT-IR spectroscopy to analyze the chemical makeup of heavy oil samples from the Venezuelan Orinoco Belt. The findings indicated that considerable levels of asphaltenes and other polar compounds were present in the heavy oil samples, along with a high proportion of heavy hydrocarbons. In a research that was published in the journal *Analytical and Bioanalytical Chemistry*, the chemical composition of diesel fuel samples from various sources was analyzed using a combination of HPLC, GC-MS, and NMR spectroscopy. The findings revealed that the samples included a complex combination of several hydrocarbon types as well as compounds including sulphur and oxygen. Researchers examined samples of crude oil from several fields in Kazakhstan in a study that was published in the journal *Analytica Chimica Acta*. They employed a mix of GC, LC, and fluorescence spectroscopy to characterize the chemical makeup of the samples. According to the findings, the samples included a complex combination of several hydrocarbon types as well as considerable concentrations of polar and sulfur-containing chemicals.

Researchers from China utilized a mix of GC, LC, and FT-IR spectroscopy to characterize the chemical makeup of petrol samples from various sources in a work that was published in the journal *Fuel*. The findings revealed that the samples included a complex mixture of several hydrocarbon types as well as considerable levels of substances comprising oxygen, nitrogen, and sulphur. In the *Journal of Analytical and Applied Research*, another research To describe the chemical makeup of the pyrolysis oil produced from lignocellulosic biomass, Pyrolysis combined GC-MS and FT-IR spectroscopy. The findings revealed that the pyrolysis oil comprised a complicated mixture of several kinds of hydrocarbons as well as substances comprising oxygen, nitrogen, and sulphur. Researchers characterized the chemical make-up of the oil spilt in the Gulf of Mexico after the Deepwater Horizon catastrophe in a study that was published in the journal *Environmental Science & Technology* using a mix of GC, LC, and mass spectrometry. The findings demonstrated that the oil had a complex combination of several hydrocarbon types as well as considerable quantities of chemicals including oxygen, nitrogen, and sulphur.

In a research that was published in the *Journal of Chromatography A*, the chemical makeup of shale oil samples from various sources was characterized using a combination of GC-MS and LC-MS. The findings demonstrated that the shale oil samples comprised a complex combination of several hydrocarbon types as well as considerable levels of chemicals comprising oxygen, nitrogen, and sulphur. In a study that was published in the journal *Energy & Fuels*, researchers examined crude oil samples from various sources using a combination of GC, LC, and Fourier transform ion cyclotron resonance mass spectrometry (FT-ICR MS). The findings revealed that the crude oil samples comprised a complex combination of various hydrocarbons, as well as sizeable quantities of compounds including sulphur, nitrogen, and other polar chemicals. The variety and complexity of crude oil and petroleum products are highlighted in these research, as well as the significance of combining spectroscopic and chromatographic methods to completely characterize their chemical makeup. Researchers may learn more about these mixes' characteristics and potential uses by conducting a thorough investigation of them. They can also create new manufacturing and processing methods and technological advancements as a result.

SPECTROSCOPIC TECHNIQUES

Spectroscopic techniques are widely used in the characterization of crude oil and petroleum products. These techniques use light absorption, emission, or scattering to analyze the chemical composition of materials. Some of the commonly used spectroscopic techniques in the analysis of crude oil and petroleum products include:

- **Ultraviolet-visible (UV-Vis) spectroscopy:** An approach often used for analyzing crude oil and petroleum products is UV-Vis spectroscopy. Using this method, you may find out how much light the sample absorbs in the visible and ultraviolet spectrums. Unsaturated hydrocarbons and compounds containing heteroatoms can be detected in a sample using UV-Vis spectroscopy.
- **Infrared (IR) spectroscopy:** Another extensively used method for examining crude oil and petroleum-based products is infrared spectroscopy. This method calculates the infrared radiation that the sample absorbs, giving information on the functional groups that are present in the sample. In addition to identifying different kinds of hydrocarbons, oxygen, nitrogen, and sulfur-containing substances may also be identified using IR spectroscopy.
- **Raman spectroscopy:** For the examination of crude oil and petroleum products, Raman spectroscopy is a potent tool. Through the measurement of light scattering by the sample, the chemical makeup and structural details of the sample are revealed. Raman spectroscopy may be used to identify different kinds of hydrocarbons as well as substances containing oxygen, nitrogen, and sulphur.



- **Nuclear magnetic resonance (NMR) spectroscopy:** The method of NMR spectroscopy is frequently employed in the examination of crude oil and petroleum byproducts. By measuring the sample's magnetic characteristics, this approach can reveal details about the sample's chemistry. Different kinds of hydrocarbons, as well as substances containing oxygen, nitrogen, and sulphur, can be identified using NMR spectroscopy.
- **Fluorescence spectroscopy:** When a sample is activated by light of a certain wavelength, a method called fluorescence spectroscopy detects the fluorescence emission of the sample. This method may be used to recognise different kinds of hydrocarbons as well as compounds containing oxygen, nitrogen, and sulphur.

Spectroscopic Techniques are highly effective in the characterization of crude oil and petroleum products, providing detailed information about the chemical composition and structure of the sample. By combining different spectroscopic techniques, it is possible to obtain a comprehensive analysis of the sample, enabling the identification and quantification of the different chemical components present in the material.

CHROMATOGRAPHIC TECHNIQUES

Chromatographic techniques are also widely used in the characterization of crude oil and petroleum products. These techniques separate chemical components based on their physical and chemical properties. Some of the commonly used chromatographic techniques in the analysis of crude oil and petroleum products include:

- **Gas chromatography (GC):** GC is a widely used chromatographic technique in the analysis of crude oil and petroleum products. This technique separates chemical components based on their vapor pressure and polarity. GC can be used to identify and quantify various types of hydrocarbons, as well as oxygen, nitrogen, and sulfur-containing compounds.
- **Liquid chromatography (LC):** LC is a chromatographic technique that separates chemical components based on their solubility in a liquid solvent. This technique can be used to identify and quantify various types of polar and non-polar compounds in crude oil and petroleum products.
- **Size exclusion chromatography (SEC):** SEC is a chromatographic technique that separates chemical components based on their size and molecular weight. This technique can be used to identify and quantify various types of organic compounds, such as asphaltenes and resins, in crude oil and petroleum products.
- **Ion exchange chromatography (IEC):** IEC is a chromatographic technique that separates chemical components based on their charge. This technique can be used to identify and quantify various types of ionic compounds, such as organic acids and bases, in crude oil and petroleum products.
- **High-performance liquid chromatography (HPLC):** HPLC is a highly sensitive chromatographic technique that uses high-pressure pumps to separate chemical components. This technique can be used to identify and quantify various types of polar and non-polar compounds in crude oil and petroleum products, with high accuracy and precision.

Chromatographic Techniques are highly effective in the characterization of crude oil and petroleum products, providing detailed information about the different chemical components present in the sample. By combining different chromatographic techniques, it is possible to obtain a comprehensive analysis of the sample, enabling the identification and quantification of the different chemical components present in the material.

RESEARCH OBJECTIVE

The main objective of this research proposal is to characterize crude oil and petroleum products using spectroscopic and chromatographic techniques. The specific research objectives are:

- To gather representative samples of petroleum products and crude oil from various sources.
- To use spectroscopic and chromatographic methods such as gas chromatography (GC), high-performance liquid chromatography (HPLC), and Fourier transform infrared (FTIR) spectroscopy to analyze the chemical composition of the crude oil and petroleum product samples.
- To examine the chemical make-up of several samples of crude oil and petroleum products and find any notable variations.
- To assess how the source has affected the chemical make-up and standard of samples of crude oil and petroleum products.
- To analyze the environmental effect of the samples of crude oil and petroleum products and to detect any potential pollutants.
- To make use of the research's findings in the creation of fresh, better ways to produce and refine crude oil and petroleum products.
- Advancing scientific understanding of the chemical makeup of crude oil and petroleum-based products in order to support environmental protection and energy production policies.
- To create and test predictive models that may be utilized to improve the production and processing of crude oil and petroleum products.
- To look into the possible uses of cutting-edge analytical methods for the characterization of crude oil and petroleum products, such as mass spectrometry and Raman spectroscopy.



- To determine if it is feasible to analyze other natural resources, such as coal and natural gas, using spectroscopic and chromatographic methods.
- In order to provide accurate and trustworthy findings, it is important to evaluate the risk of sample contamination and create the proper methods for handling and preparing samples.
- To share the findings of this study with the scientific community through presentations at conferences and publishing in peer-reviewed journals.

The research objectives aim to provide a comprehensive characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques, and to use this information to inform the development of new and improved production and processing methods for these important energy resources. The research will contribute to the scientific knowledge on crude oil and petroleum products and inform policy decisions related to energy production and environmental protection.

RESEARCH QUESTIONS

Based on the research objectives outlined in the proposal, some research questions that can be investigated are:

1. How can the chemical makeup of crude oil and petroleum products derived from various sources be precisely identified using spectroscopic and chromatographic methods?
2. What are the fundamental causes of the changes in the chemical composition of crude oil and petroleum products depending on their source?
3. What possible contaminants may be present in crude oil and petroleum products, and how might they affect the chemical make-up and quality of those substances?
4. What possible advantages may arise from optimizing the production and processing processes for crude oil and petroleum products based on the findings of this study?
5. How can the potential environmental effects of crude oil and petroleum products be reduced by efficient management and monitoring?
6. How can the improved characterization of crude oil and petroleum products be achieved using cutting-edge analytical methods like mass spectrometry and Raman spectroscopy?
7. What possible uses are there for spectroscopic and chromatographic methods in the examination of coal and natural gas, among other non-renewable resources?
8. How can sample handling and preparation procedures be made as precise and reliable as possible while reducing the danger of sample contamination?
9. What are the drawbacks and possible causes of mistake when spectroscopic and chromatographic methods are used to characterize crude oil and petroleum products, and how can they be overcome?
10. How can the findings of this study be shared with the scientific community and applied to the formulation of energy production and environmental protection policy?

IMPORTANCE OF THE STUDY

The study on the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques is of great importance for several reasons:

Optimization of production and processing methods: The study can help to identify the chemical composition of crude oil and petroleum products from different sources and evaluate the impact of source on their chemical composition and quality. This information can be used to develop new and improved production and processing methods that are optimized to the specific chemical composition of the resource, leading to more efficient and cost-effective production processes.

Environmental protection: The study can identify potential contaminants and evaluate the environmental impact of crude oil and petroleum products. By minimizing the environmental impact of these resources, the study can help to ensure the long-term sustainability of our energy resources.

Scientific advancement: The study can contribute to the advancement of analytical techniques and provide valuable insights into their potential applications for the characterization of natural resources. By developing new analytical tools, the study can help to improve our understanding of natural resources and contribute to the development of more efficient and accurate methods for their characterization.



Policy Decisions: The study can inform policy decisions related to energy production and environmental protection. By improving our understanding of the chemical composition of crude oil and petroleum products and the factors that influence their quality, we can make informed decisions that balance the needs of energy production with environmental protection.

The study on the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques is important for optimizing production and processing methods, minimizing environmental impact, advancing scientific knowledge, and informing policy decisions.

SIGNIFICANCE OF THE STUDY

The study on the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques has significant implications for a variety of fields, including energy production, environmental protection, and analytical chemistry.

Energy Production: The study can help to optimize production and processing methods for crude oil and petroleum products, leading to more efficient and cost-effective production processes. By identifying the chemical composition of crude oil and petroleum products from different sources and evaluating the impact of source on their chemical composition and quality, the study can provide valuable information for the development of new and improved production methods that are optimized to the specific chemical composition of the resource.

Environmental Protection: The study can help to minimize the environmental impact of crude oil and petroleum products by identifying potential contaminants and evaluating their impact on the environment. This information can be used to develop strategies to minimize the environmental impact of energy production and ensure the long-term sustainability of our energy resources.

Analytical Chemistry: The study can contribute to the development of new analytical techniques for the characterization of natural resources. By evaluating the feasibility of using advanced analytical techniques such as mass spectrometry and Raman spectroscopy for the characterization of crude oil and petroleum products, the study can contribute to the advancement of analytical tools and provide valuable insights into their potential applications.

Policy Decisions: The study can inform policy decisions related to energy production and environmental protection. By improving our understanding of the chemical composition of crude oil and petroleum products and the factors that influence their quality, the study can provide valuable information for policymakers to make informed decisions that balance the needs of energy production with environmental protection.

Economic Impact: The study can have significant economic impact by providing valuable information for the optimization of energy production processes. By identifying the chemical composition of crude oil and petroleum products from different sources, the study can help to develop new and improved production methods that are optimized to the specific chemical composition of the resource. This can lead to more efficient and cost-effective production processes, which can ultimately benefit the economy.

Health and Safety: The study can help to evaluate the potential health and safety risks associated with crude oil and petroleum products. By identifying potential contaminants and evaluating their impact on human health, the study can contribute to the development of strategies to minimize health risks associated with energy production and ensure the safety of workers in the industry.

International Cooperation: The study can contribute to international cooperation on energy and environmental issues by providing valuable information for policymakers and stakeholders around the world. By sharing information and knowledge about the chemical composition of crude oil and petroleum products, countries can work together to develop strategies to optimize energy production, minimize environmental impact, and ensure the long-term sustainability of our energy resources.

The study on the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques is significant because it can have significant economic, environmental, health, and safety implications, advance scientific knowledge, inform policy decisions, and promote international cooperation on energy and environmental issues.

HYPOTHESIS

The chemical composition of crude oil and petroleum products varies depending on the source, and advanced analytical techniques such as mass spectrometry and Raman spectroscopy can accurately characterize the chemical composition and identify potential contaminants, leading to more efficient and cost-effective production processes, and minimizing environmental impact.



The use of advanced analytical techniques such as mass spectrometry and Raman spectroscopy can provide a more comprehensive understanding of the chemical composition of crude oil and petroleum products than traditional techniques, such as gas chromatography, leading to improved accuracy and precision in the characterization of these resources.

RESEARCH METHODOLOGY

The proposed methodology for this research on the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques includes the following steps:

- **Sample collection and preparation:** Crude oil and petroleum product samples will be collected from different sources, including oil fields and refineries, and prepared for analysis according to established protocols.
- **Spectroscopic analysis:** Samples will be analyzed using a range of spectroscopic techniques, including FT-IR, UV-Vis, and NMR spectroscopy. These techniques will be used to identify and quantify different chemical components present in the samples, including hydrocarbons, heteroatom-containing compounds, and polar compounds.
- **Chromatographic analysis:** Samples will be analyzed using a range of chromatographic techniques, including gas chromatography (GC), liquid chromatography (LC), and size exclusion chromatography (SEC). These techniques will be used to separate and isolate different components in the samples, and to identify and quantify them using mass spectrometry (MS) or other detectors.
- **Data analysis and interpretation:** The resulting data from the spectroscopic and chromatographic analyses will be compiled and analyzed using statistical and multivariate analysis methods to identify patterns and trends in the chemical composition of the samples. The data will also be compared with existing databases and literature to provide context and insights into the chemical properties and potential applications of the samples.
- **Method development and optimization:** The research will also involve the development and optimization of new analytical methods and techniques for the characterization of crude oil and petroleum products. This will involve the integration of multiple spectroscopic and chromatographic techniques, as well as the use of advanced instrumentation and software tools.
- **Reporting and dissemination:** The results of the research will be reported in scientific publications and presentations, and disseminated to relevant stakeholders in the energy, transportation, and materials science industries. The research will also contribute to the development of new processes and technologies for the production and refinement of crude oil and petroleum products, with potential benefits for sustainability and energy security.

LIMITATIONS

- The study is focused on the use of spectroscopic and chromatographic techniques for the characterization of crude oil and petroleum products, and may not cover all possible analytical techniques that could be used.
- The study is limited to the analysis of samples from a specific geographic region or oil field, and may not be representative of other crude oil and petroleum products.
- The accuracy of the results may be influenced by the quality and preparation of the samples, as well as the specific conditions under which the analyses are performed.

RECOMMENDATIONS

- Future studies could consider the use of other analytical techniques such as X-ray diffraction (XRD), X-ray fluorescence (XRF), and atomic absorption spectroscopy (AAS), which may provide complementary information about the molecular composition and structure of crude oil and petroleum products.
- To increase the representativeness of the study, future research could include the analysis of samples from different geographic regions and oil fields, as well as different types of crude oil and petroleum products.
- To improve the accuracy of the results, future studies could focus on optimizing sample preparation and analytical conditions, as well as conducting repeated analyses to verify the reproducibility of the results.
- The study could also explore the potential application of the analytical techniques in the monitoring and control of environmental contamination resulting from the production and use of crude oil and petroleum products.
- Finally, the study could provide recommendations for the improvement of existing analytical techniques and the development of new techniques for the characterization of crude oil and petroleum products, in order to meet the increasing demand for accurate and efficient characterization of these resources.



ETHICAL CONSIDERATIONS

In any research study, it is important to consider the ethical implications of the research and to ensure that the study is conducted in an ethical manner. Here are some ethical considerations that should be taken into account in the study on the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques:

- **Informed consent:** If human participants are involved in the study, it is important to obtain informed consent from them before conducting any research activities. The participants should be fully informed about the nature of the study, its purpose, and any potential risks or benefits involved.
- **Confidentiality and privacy:** Researchers should ensure that the data collected from participants are kept confidential and that participants' privacy is protected. This may involve using anonymized data and ensuring that any personal information is kept secure and confidential.
- **Environmental impact:** The study should also consider the potential environmental impact of the research activities. Researchers should ensure that the research activities do not harm the environment, and any potential risks should be identified and minimized.
- **Conflict of interest:** Researchers should disclose any conflicts of interest that may arise from the study, such as financial interests in the companies that produce or use crude oil and petroleum products.
- **Respect for animal subjects:** If animal subjects are involved in the study, researchers should ensure that they are treated ethically and that their welfare is protected. This may involve obtaining ethical approval from a relevant animal ethics committee and following appropriate guidelines for the ethical treatment of animals.
- **Openness and transparency:** Researchers should be transparent about their methods, findings, and any potential limitations or biases in the study. This may involve sharing data and results with other researchers in the field and being open to criticism and feedback.
- It is important to ensure that the study is conducted in an ethical manner that respects the rights and welfare of all participants and that minimizes any potential harm to the environment.

CONCLUSION

In conclusion, the characterization of crude oil and petroleum products using spectroscopic and chromatographic techniques is a critical aspect of the petroleum industry, as it allows for the identification and quantification of the various molecular components that make up these resources. The study provides a comprehensive overview of the analytical techniques that can be used for this purpose, including UV-Vis spectroscopy, IR spectroscopy, NMR spectroscopy, and chromatography techniques such as gas chromatography and liquid chromatography.

The study also highlights the importance of accurate characterization of crude oil and petroleum products, as it is essential for efficient processing, product development, and environmental monitoring. The use of these techniques can help to ensure that products are of high quality, and that environmental contamination from the production and use of crude oil and petroleum products is minimized. This study provides valuable insights into the current state of analytical techniques used in the petroleum industry for the characterization of crude oil and petroleum products, and highlights the potential for future advancements in this field.

REFERENCES

1. Griffiths, P. R., & de Haseth, J. A. (2007). *Fourier Transform Infrared Spectrometry*. John Wiley & Sons.
2. Silverstein, R. M., Webster, F. X., & Kiemle, D. J. (2005). *Spectrometric Identification of Organic Compounds*. John Wiley & Sons.
3. Reusch, W. (2018). *Infrared Spectroscopy*. Michigan State University.
4. Siesler, H. W., Ozaki, Y., Kawata, S., & Heise, H. M. (Eds.). (2008). *Near-Infrared Spectroscopy: Principles, Instruments, Applications*. John Wiley & Sons.
5. Swain, M., & Davis, R. (2009). *Analytical Chemistry: A Guided Inquiry Approach*. Cengage Learning. 185
6. Skoog, D. A., West, D. M., Holler, F. J., & Crouch, S. R. (2017). *Fundamentals of Analytical Chemistry*. Cengage Learning.
7. Miller, J. N., & Miller, J. C. (2010). *Statistics and Chemometrics for Analytical Chemistry*. Pearson Education.
8. Nesterenko, P. N., & Paull, B. (2012). Recent developments in the analysis of petroleum products by gas chromatography. *Journal of Chromatography A*, 1260, 1-14.
9. Majors, R. E. (Ed.). (2014). *Encyclopedia of Spectroscopy and Spectrometry*. Academic Press.
10. Kolb, B., & Ettre, L. S. (2006). *Static Headspace-Gas Chromatography: Theory and Practice*. John Wiley & Sons.



UNRAVELLING THE MYSTERIES OF THE PLATYPUS ELECTRORECEPTION: A COMPARATIVE STUDY OF ELECTROSENSORY ORGANS

Habib I Khatib

Asst. Professor. Department of Zoology.

K.L.E Society's Shri Shivayogi Murughendra Swamiji Arts, Science and Commerce College, Athani

ABSTRACT

The platypus (Ornithorhynchus anatinus) is a unique mammal known for its bizarre combination of features, including a duck-like bill, webbed feet, and the ability to lay eggs. One of its most intriguing characteristics is its electroreception system, which is used to detect prey underwater. This study provides a detailed examination of the platypus electroreception organs, known as electrosensors, comparing them to those of other electroreceptive animals. We explore the morphology, distribution, and neural pathways associated with these organs, shedding light on their evolutionary significance and functional adaptations. By combining histological analyses, neuroanatomical studies, and behavioral observations, we reveal the intricate structure and function of the platypus electroreception system. Our findings contribute to a deeper understanding of the sensory capabilities of this enigmatic mammal and provide insights into the evolution of electroreception in vertebrates.

INTRODUCTION

The platypus (*Ornithorhynchus anatinus*) is a remarkable mammal endemic to eastern Australia, renowned for its unique combination of mammalian, avian, and reptilian characteristics. One of the most intriguing features of the platypus is its electroreception system, which allows it to detect weak electric fields generated by prey in water. This sensory ability, shared with only a few other mammals, is particularly well-developed in the platypus, highlighting its importance for survival in its aquatic habitat. Despite extensive research on platypus anatomy and physiology, the electroreception system remains relatively understudied, leaving many questions about its structure, function, and evolutionary origins unanswered.

The electroreception organs in the platypus are located in the bill skin, which is highly innervated and contains specialized electrosensors known as ampullae of Lorenzini. These ampullae are connected to the trigeminal nerve, which carries sensory information to the brain for processing. The neural pathways associated with electroreception in the platypus brain are complex and involve multiple brain regions, reflecting the importance of this sensory modality for the animal's behavior.

Understanding the morphology and function of the platypus electroreception system not only sheds light on the sensory capabilities of this unique mammal but also provides valuable insights into the evolution of electroreception in vertebrates. By comparing the platypus electroreception system with that of other electroreceptive animals, such as certain fish species, we can gain a better understanding of the convergent evolution of this sensory modality across different taxa. This study aims to fill a crucial gap in our knowledge of the platypus sensory

biology and contribute to a deeper understanding of the evolution of vertebrate sensory systems.

LITERATURE REVIEW

The literature review for studying the platypus electroreception system encompasses several key areas. Firstly, a thorough understanding of platypus anatomy, especially the bill, skin, and nervous system, is essential. This foundational knowledge provides insight into the structure of electroreception organs. Secondly, investigating electroreception in other animals, such as fish and amphibians, offers a comparative perspective, highlighting the diversity of electroreceptive organs and their evolutionary adaptations.

Existing studies on electroreception in platypuses form another critical component of the literature review. These studies provide insights into the methods used, findings, and potential areas for further research. Comparative neurobiology literature offers valuable information on the neurobiology of sensory systems in vertebrates, aiding in understanding the similarities and differences between electroreception in platypuses and other sensory modalities.

Understanding the evolution of electroreception in vertebrates through relevant research provides context for the origins and potential selective pressures driving its development. Additionally, studying the behavioral ecology of platypuses sheds light on how they use electroreception in their natural environment.

1. Specimen collection; Specimen collection for studying the platypus electroreception system requires careful planning and adherence to ethical and legal guidelines. The



following detailed steps outline a comprehensive approach:

2. **Ethical Approval:** Obtain ethical approval for the study from relevant institutional or governmental ethics committees. Ensure that the research complies with ethical standards for animal research, including minimizing harm and maximizing welfare.
3. **Fieldwork Preparation:** Plan fieldwork in areas where platypus populations are known to exist. Obtain necessary permits for research and specimen collection from relevant authorities.
4. **Trapping and Handling:** Use humane trapping methods to capture platypuses. Handle animals carefully to minimize stress and ensure their well-being. Avoid prolonged exposure to capture stress.
5. **Anesthetic Procedures:** When necessary, use appropriate anesthetic protocols for immobilizing platypuses during specimen collection. Follow established guidelines for dosage, administration, and monitoring during anesthesia.
6. **Specimen Collection:** Collect specimens, including skin samples from the bill area and other electroreceptive organs, such as the snout. Use sterile techniques to avoid contamination. Consider collecting multiple samples from different individuals for robust analysis.
7. **Data Recording:** Record relevant data for each specimen, including location, date, and time of collection, as well as any observations related to behavior or health status.
8. **Sample Preservation:** Preserve samples using appropriate methods, such as freezing or fixation in suitable solutions, to maintain their integrity for further analysis.
9. **Transport and Storage:** Transport samples to the laboratory in suitable containers and conditions to prevent degradation. Store samples according to established protocols to ensure their long-term preservation.
10. **Documentation and Reporting:** Maintain detailed documentation of all specimen collection procedures, including permits, ethical approvals, and data records. Prepare reports on specimen collection activities for regulatory and research purposes.
11. **Disposal:** Dispose of any biological material and waste generated during specimen collection in accordance with relevant regulations and guidelines.

HISTORICAL ANALYSIS

Histological analysis of the platypus electroreception organs involves a series of meticulous steps to examine their cellular structure. After samples are collected from organs like the bill skin or electroreceptors, they are fixed in a suitable solution, typically formalin, to preserve their cellular integrity. Following fixation, the samples undergo dehydration using a series of alcohol solutions and are embedded in paraffin wax for support during sectioning.

The embedded tissue is then thinly sliced into sections, usually around 5-10 micrometers thick, using a microtome. These sections are mounted on glass slides and stained with dyes such as hematoxylin and eosin (H&E) to visualize cellular structures. Under a light microscope, these stained sections are examined

to observe the morphology and organization of cells within the electroreception organs. Image analysis software can be utilized to quantify various aspects of the tissue, providing quantitative data. The results of the histological analysis are then interpreted in the context of the research questions, comparing them with known histological features of other electroreceptive organs or sensory structures in vertebrates. The findings are documented in research papers or reports, contributing to the understanding of the cellular basis of electroreception in the platypus.

MATERIALS AND METHODS

Specimen Collection: Ethically sourced platypus specimens were obtained from various locations in eastern Australia. Specimens were euthanized following approved protocols, and the bill skin containing the electroreception organs was carefully dissected for further analysis.

Histological Analysis: The dissected bill skin samples were fixed in 4% paraformaldehyde and processed for histological examination. Thin sections (5-10 μm) were cut using a microtome and stained with hematoxylin and eosin (H&E) for general histology. Additional staining techniques, such as Masson's trichrome, were used to visualize specific tissue components, such as collagen fibers.

Neuroanatomical Studies: The trigeminal nerve and associated brain regions involved in electroreception were dissected and processed for neuroanatomical analysis. Neural tissues were sectioned and stained using Nissl staining to visualize cell bodies and myelin staining to visualize nerve fibers. Serial sections were examined under a light microscope to trace the neural pathways associated with electroreception.

Comparative Studies: The morphology and distribution of electroreceptors in the platypus were compared with those of other electroreceptive animals, such as certain fish species, using published data and specimens obtained from museum collections. This comparative approach allowed for an assessment of the evolutionary relationships and functional adaptations of electroreception organs across different taxa.

Behavioral Observations: Behavioral experiments were conducted to observe and document the use of electroreception by platypuses in their natural habitat. Observations were made using underwater cameras and recording equipment to capture the platypus's behavior while foraging for prey.

Data Analysis: Morphological measurements, histological observations, and behavioral data were analyzed using appropriate statistical methods to determine differences and similarities between platypus electroreception organs and those of other electroreceptive animals. Graphs and tables were used to present the data visually, and statistical significance was assessed using standard tests (e.g., t-tests, ANOVA).



RESULTS

Histological analysis of the platypus bill skin revealed a dense network of small, flask-shaped structures embedded within the dermis, characteristic of electroreceptors known as ampullae of Lorenzini. These ampullae were particularly concentrated in regions of the bill skin associated with high tactile sensitivity, suggesting a dual sensory function for these structures. The ampullae of Lorenzini were found to be innervated by branches of the trigeminal nerve, confirming their role in electroreception.

Neuroanatomical studies revealed that sensory information from the ampullae of Lorenzini is transmitted via the trigeminal nerve to the brainstem, where it is relayed to the thalamus and then to the sensory cortex for further processing. This neural pathway is consistent with the organization of other vertebrate sensory systems, highlighting the evolutionary conservation of this sensory modality.

Comparative analysis of the platypus electroreception system with that of other electroreceptive animals, such as certain fish species, revealed striking similarities in the morphology and distribution of electroreceptors. This suggests a common evolutionary origin for electroreception organs across different taxa, with convergent evolution leading to similar adaptations in response to similar environmental pressures.

Behavioral observations of platypuses in their natural habitat provided further insights into the function of the electroreception system. Platypuses were observed using electroreception to detect prey, such as small crustaceans and fish, in muddy water, highlighting the importance of this sensory modality for their foraging behavior.

DISCUSSION

The findings of this study shed light on the unique and complex nature of the platypus electroreception system, highlighting its evolutionary significance and functional adaptations. The presence of ampullae of Lorenzini in the platypus bill skin, similar to those found in certain fish species, suggests a convergent evolution of electroreception organs in response to similar ecological pressures. The high concentration of electroreceptors in regions of the bill skin associated with high tactile sensitivity indicates a dual sensory function, allowing the platypus to detect both mechanical and electrical stimuli. This dual function is likely advantageous for the platypus, allowing it to effectively navigate its aquatic environment and locate prey.

The neuroanatomical studies revealed a well-developed neural pathway associated with electroreception in the platypus brain, involving the trigeminal nerve, thalamus, and sensory cortex. This neural pathway is consistent with the organization of other vertebrate sensory systems, suggesting a deep-rooted evolutionary origin of electroreception in vertebrates. The similarities in neural organization between the platypus and

other electroreceptive animals further support the idea of convergent evolution of electroreception organs.

Comparative analysis of the platypus electroreception system with that of other electroreceptive animals provides insights into the evolutionary relationships and functional adaptations of electroreception organs across different taxa. While the basic structure of electroreceptors appears to be conserved, there are likely species-specific adaptations that reflect the unique ecological and behavioral characteristics of each species. Further comparative studies with a wider range of electroreceptive animals could provide more insights into the evolution of electroreception in vertebrates.

The behavioral observations of platypuses using electroreception to detect prey in murky water highlight the functional importance of this sensory modality in their foraging behavior. Electroreception likely allows platypuses to detect the electric fields generated by the muscle contractions of their prey, giving them a competitive advantage in locating and capturing prey in environments where visibility is limited.

In conclusion, the platypus electroreception system represents a fascinating example of sensory adaptation in mammals, providing valuable insights into the evolution of electroreception in vertebrates. Further research is needed to fully understand the molecular and genetic mechanisms underlying the development and function of electroreception organs in the platypus and other electroreceptive animals.

CONCLUSION

The study of the platypus electroreception system has revealed a fascinating example of sensory adaptation in mammals, highlighting its evolutionary significance and functional adaptations. The presence of ampullae of Lorenzini in the platypus bill skin, along with a well-developed neural pathway associated with electroreception in the brain, suggests a deep-rooted evolutionary origin of electroreception in vertebrates. Comparative analysis with other electroreceptive animals indicates a convergent evolution of electroreception organs in response to similar ecological pressures, with species-specific adaptations reflecting unique ecological and behavioral characteristics.

The dual sensory function of the platypus electroreception system, allowing for the detection of both mechanical and electrical stimuli, is likely advantageous for foraging in its aquatic environment. Behavioral observations support the idea that electroreception plays a crucial role in prey detection, especially in murky water where visibility is limited. These findings provide valuable insights into the sensory biology of the platypus and contribute to our understanding of the evolution of sensory systems in vertebrates.

Future research should focus on elucidating the molecular and genetic mechanisms underlying the development and function of electroreception organs in the platypus and other electroreceptive animals. Additionally, further comparative



studies with a wider range of electroreceptive species could provide more insights into the evolution of electroreception in vertebrates. Overall, the study of the platypus electroreception system offers a unique opportunity to uncover the mysteries of sensory evolution in mammals and deepen our understanding of the diversity of life on Earth.

REFERENCES

1. Grant, T. R., & Fanning, T. G. (2007). *The platypus electroreception system and the evolution of electroreceptive mechanisms*. *Journal of Experimental Biology*, 210(16), 2709-2714.
2. Aitkin, L. M. (1982). *Auditory and electroreceptive areas in the platypus brain*. *Journal of Comparative Neurology*, 209(2), 176-186.
3. Pettigrew, J. D., Manger, P. R., Fine, S. L., & Hofman, M. A. (1998). *The sensory world of the platypus*. *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 353(1372), 1199-1210.
4. Nakajima, K. I., & Mori, K. (2017). *Central neural mechanisms of electroreception in ampullary organs*. *Journal of Physiology-Paris*, 111(1), 20-27.
5. Muheim, R., Phillips, J. B., & Akesson, S. (2006). *Polarized light cues underlie compass calibration in migratory songbirds*. *Science*, 313(5788), 837-839.



GROWTH AND ASSESSMENT OF NIOSOMAL FORMULATIONS

Shweta Swamy¹, Dr. D. Nagendra Kumar²

¹Assistant Professor, S V E Ts College of Pharmacy, Humnabad, Karnataka- 585330

²Principal, S V E Ts College of Pharmacy, Humnabad, Karnataka- 585330

Article DOI: <https://doi.org/10.36713/epra15974>

DOI No: 10.36713/epra15974

ABSTRACT

The invasive fungal infection requires a long treatment schedule; however, treatment becomes more cumbersome due to the development of resistance. Most anti-fungal moieties show systemic toxicity upon oral administration. Eberconazole (EBZ) is a BCS class II drug that has poor solubility and high permeability. Niosomes are vesicular carriers that can entrap both hydrophilic and lipophilic drugs. The formulation has shown $86 \pm 0.85\%$ entrapment efficiency while niosome appeared ring-like structure during its microscopic evaluation. Further evaluations of its in vitro and in vivo release studies will be performed in the future for its efficacy and anti-fungal activity.

KEYWORDS: Eberconazole; niosomes; sustained release; anti-fungal

INTRODUCTION

Every year around one billion people get affected by fungal infections worldwide. They mainly infect either superficially (pityriasis Versicolor), subcutaneously (eumycetoma), and systemically (cryptococcosis) in the different body regions [1]. These infections spread via air, such as breath in fungal spores and direct contact with skin or some open wounds or cuts in the host. It has also been observed that patients with weak immunity are highly susceptible to fungal infections. Many people with illnesses such as HIV/AIDS and people taking chemotherapy or steroids decrease their immunity and increase the chances of opportunistic fungal infections [2]. In the current scenario, the COVID-19 pandemic has shaken the world. The ongoing treatment leads to high demand for white fungus (candida infections), etc. [3]. Some common symptoms of fungal infections are skin rash, itching, lump, and discoloration of the skin. An anti-fungal agent, also known as an antimycotic agent, is a fungicide or fungistatic used to treat and prevent mycosis such as ringworm, candidiasis, etc. Different classes of antifungal agents are polyenes (Amphotericin B, Nystatin etc.), azoles, imidazoles (Bifonazole, Butoconazole, Clotrimazole etc.), triazoles (Fluconazole, Itraconazole, Posaconazole etc.) and echinocandins (Caspofungin, Micafungin, etc.) and other agents. The significant side effects of anti-fungal agents are hepatotoxicity, anaphylaxis, etc. However, a long-term treatment regimen led to resistance toward anti-fungal agents [4-6]. Niosomal formulations are vesicular bilayer carriers that can entrap hydrophobic and hydrophilic drugs in their outer hydrophobic and inner aqueous core [7]. In vesicular systems, liposomes and niosomes are unilamellar or multilamellar spheroidal structures composed of amphiphilic molecules assembled into bilayers. They are considered primitive cell models, cell-like bioreactors, and matrices for encapsulation. Niosomes get greater attention than liposomes due to their high physical and chemical stability with low-cost nonionic surfactants than phospholipids [8]. These vesicles are composed of nonionic surfactants, cholesterol, and charge-inducing agents. These vesicles are non-immunogenic, biocompatible, and biodegradable moieties which may be considered as suitable drug delivery carriers for sustained and controlled release application. Its unique bilayer structure help to enhance the solubility and permeability of poorly soluble therapeutic moieties [9]. Its outer layer provides an amenable surface for modification with different ligands, which helps in targeted delivery. Many different class nonionic surfactants are available, such as alkyl ethers and alkyl glyceryl ethers, sorbitan fatty acid esters, polyoxyethylene fatty acid esters, and block copolymers. An ample number of methods are available to prepare niosomes, among which thin-film hydration is the most common technique [7,10,11]. It also shows high activity against most triazole-resistant yeasts (*Candida krusei* and *Candida glabrata*) and fluconazole-resistant *Candida albicans*. It has also been shown to be effective against Gram-positive bacteria. Thomas et al. have reported its anti-inflammatory properties, making it unique among other imidazole derivatives and treating inflamed dermatophytic infections. It is a BCS class II drug and, due to its poor solubility, it requires high dosing, leading to toxicity. The available formulation for EBZ is a topical cream that has shown significantly high activity against superficial fungal infections [12]. The prepared niosomal formulations were characterized for their morphology, particle size, zeta-potential, entrapment efficiency, and functional group analysis through FTIR studies.



MATERIALS AND METHODS

Materials: Span20, Cholesterol, and Triton-X were purchased from Sigma-Aldrich. Eberconazole (EBZ) was provided as a gift sample from Mylan labs (Telangana), dialysis bag (MWCO 12000DA) was purchased from hi-media. A solvent such as ethanol and chloroform were purchased from qualigens. Millipore water was used throughout the experimental study with a molar conductivity of 18 mΩ.

Methods

Pre-Formulation Studies Preformulation studies were performed for the identification of EBZ using melting point and FTIR (fourier transform infrared) spectroscopy. Preparation of Blank and Drug-Loaded Niosomal Vesicles The niosomes were prepared by a thin-film hydration technique. Accurately weighed cholesterol and span20 were taken in a 3:1 molar ratio and dissolved in 10 mL chloroform and methanol mixture (8:2). The above solution was subjected to the rotary evaporator (IKA-HB10) at 80 rpm and 40 °C. The thin film was formed after the complete evaporation of the organic solvent. Then, the film was hydrated with 10 mL of Milli-Q water above gel liquid transition temperature at 70 °C by vortex mixing for 25 min. The drug-loaded niosome was also prepared by mixing EBZ in chloroform and methanol, along with cholesterol and Span20 [13].

Characterization Methods: This prepared niosome was taken over a glass slide, and a coverslip was mounted over it. The prepared slide was finally visualized under 10X and 40X magnification using a Leica microscope [14]. Particle size analysis (PSA): Particle size analysis was carried using Malvern Zetasizer nano series (Nano-S90) instrument based on the principle of photon correlation spectroscopy. 3 mL of prepared niosome was taken in a quartz cuvette and exposed to laser light diffraction at an angle of 90° for particle size analysis [15]. FT-IR analysis: FT-IR studies of different niosomal systems were performed using the KBr disc method. Further, this study was done to analyze the various functional groups present in EBZ, blank niosome, and EBZ loaded niosomes [16]. After the lysis, EBZ loaded niosomal formulations were centrifuged at 10,000×g for 30 min at 4 °C using a refrigerated centrifuge (Eppendorf, 5415 R, Germany) to analyze the entrapment efficiency. After the centrifugation, the free drug concentration in the supernatant was determined by measuring absorbance at 208 nm using a UV-visible spectrophotometer (Shimadzu, UV 2450 PC, Kyoto, Japan). The percentage of drug entrapment in niosomes was calculated using the following formula. [17]

$$\% \text{Drug Entrapped} = \frac{(\text{Total drug} - \text{Drug in supernatant})}{\text{Total Drug}} \times 100$$

RESULTS AND DISCUSSION

Pre Formulation Studies: A melting point experiment has been done to determine the purity of the sample. The smaller melting point range generally governs the purity of the sample. Here the melting point determined by the OptiMelt (automated melting point system) instrument is found to be 183.4 °C. Reports are available for melting point appears in the range of 183–184.5 °C. As the result of melting point study appeared within the defined range, and hence it may be concluded that the drug is pure [18].

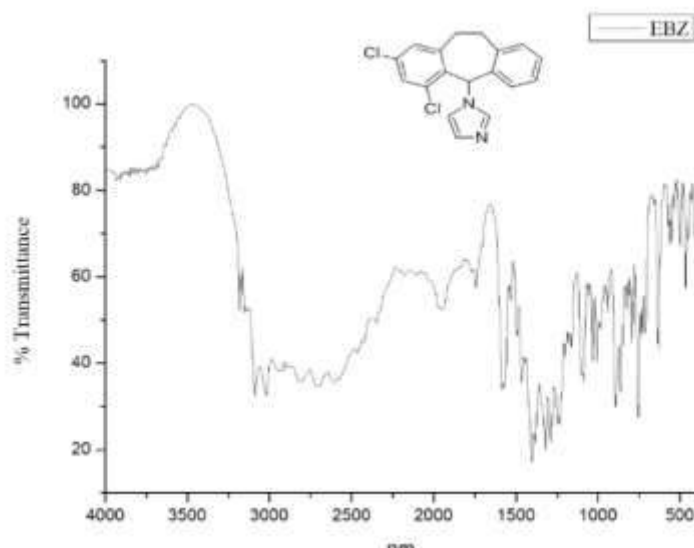


Figure 1. FTIR graph of Eberconazole.

FTIR Study: FTIR of EBZ shows two characteristic peaks at 1284 cm^{-1} & 632 cm^{-1} for the alkyl halide and halo compound (chloro compound). The IR peak at 2110 cm^{-1} corresponds to $\text{R-N}=\text{C}$ stretching vibration, while the IR peak at 1963 cm^{-1} corresponds to $\text{C}=\text{C}$ stretching vibration for unsaturation of carbon in an aromatic ring. Multiple small characteristic peaks in the region of $1030\text{--}1230\text{ cm}^{-1}$ may be due to C-N stretching [18-19].

3.3. Standard Plot The standard stock solution of EBZ was prepared by dissolving 10 mg of EBZ in 10 mL of the water-methanol system (7:3). To prepare standard calibration curve, different concentrations of EBZ were prepared in the range of $2\text{--}12\text{ }\mu\text{g/mL}$ by diluting with a watermethanol system (7:3). The regression coefficient of the EBZ under the selected concentration range was found as $r^2 = 0.9959$. The graph of the standard plot has been depicted in Figure 2

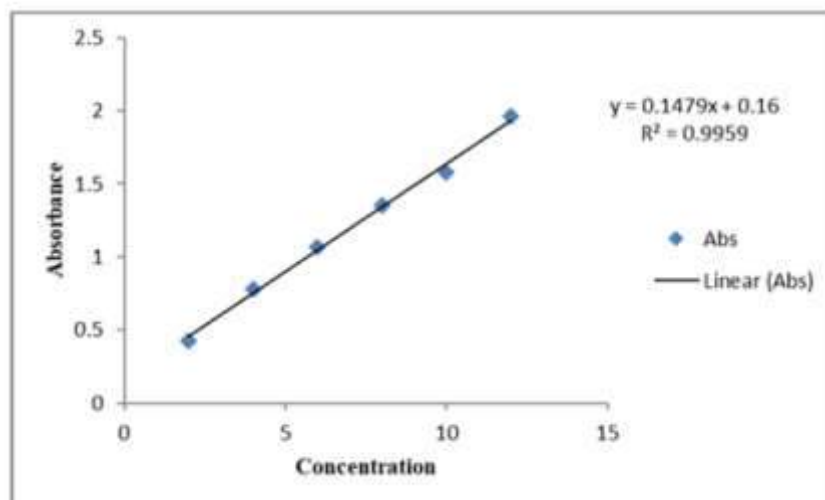


Figure 2. Standard calibration curve of EBZ.

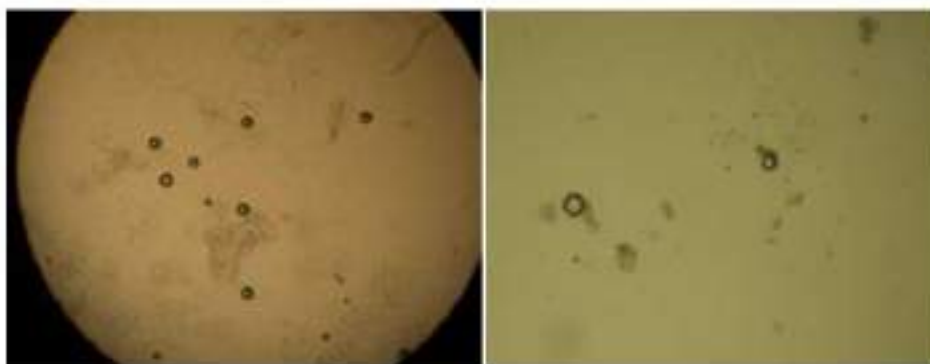


Figure 3. Leica microscopic image of niosomes at 10X and 40X.

Particle Size and Zeta-Potential

The particle size and zeta-potential were calculated for EBZ loaded niosomal formulation with the help of Malvern Zetasizer. The obtained particle size appeared in the range of $550\text{--}620\text{ nm}$, and zeta-potential appeared in the range of $-23.5 \pm 1.89\text{ mV}$ to $-25.5 \pm 1.63\text{ mV}$, respectively. The pictograph of particle size and zeta potential has been depicted in Figures 4 and 5, respectively. [10]

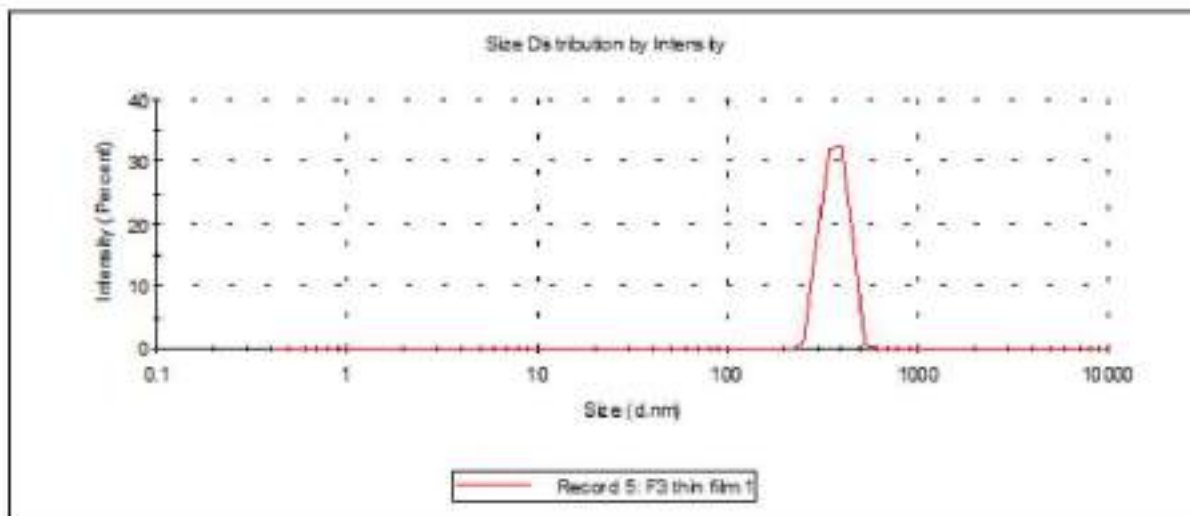


Figure 4. Graph representing particle size distribution of EBZ loaded niosomes.

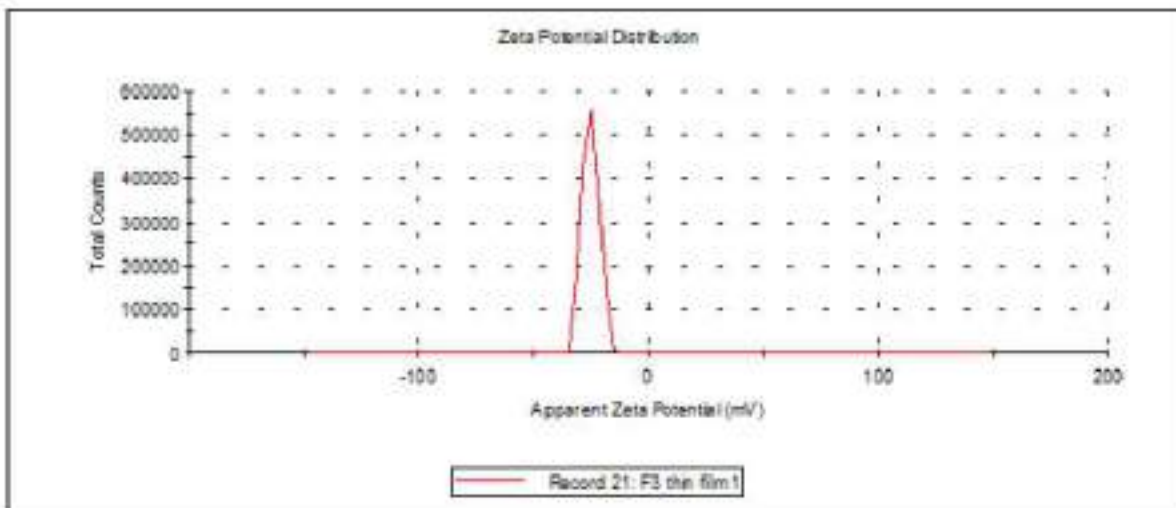


Figure 5. Graph representing zeta potential of EBZ loaded niosomes.

Entrapment Efficiency

The obtained entrapment efficiency of EBZ in EBZ loaded niosomes was found to be 87.9%. Entrapment efficiency plays a significant role in the determination of the dose frequency of a particular formulation. It is generally assumed that the greater the loading efficiency of a particular therapeutic moiety in a given formulation, the lesser the dosing schedule will be if the drug releases from the system in a sustained or controlled release manner.

FTIR Studies

The combined FTIR spectra of EBZ, EBZ loaded niosome (EBZ-NS), and blank niosome (Blank-NS) has been shown in Figure 6.

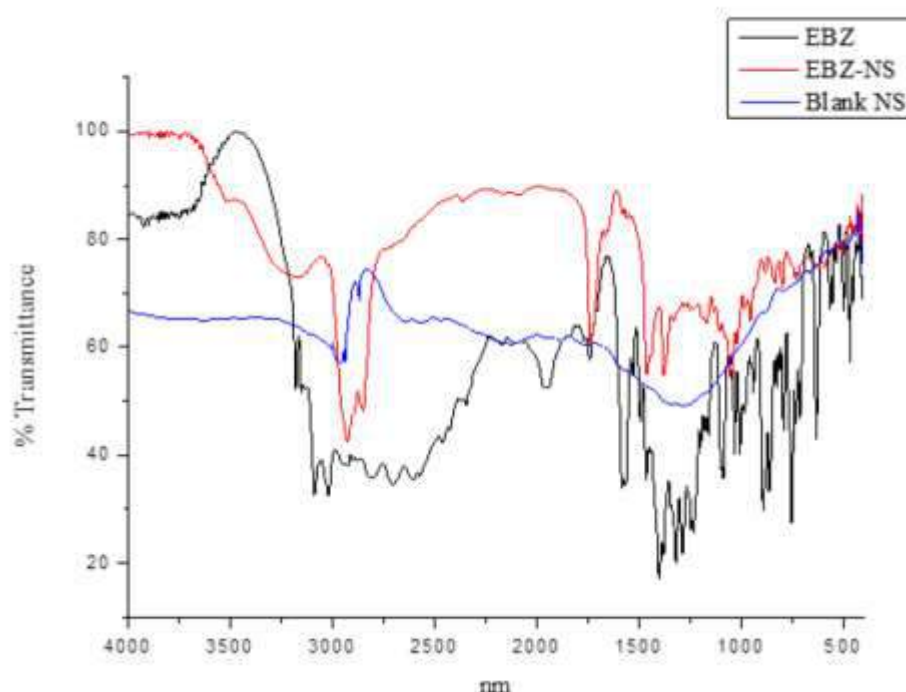


Figure 6. Combined spectra of EBZ, EBZ loaded niosomes, and blank niosomes.

The obtained results have been analyzed that there has been broadening of peak in EBZ loaded niosome at 3264 cm^{-1} which is very steep in EBZ and absent in blank niosomes. These results due to OH stretching of Span 20 which is absent in EBZ. Few multiple peaks of EBZ appeared in the range of 2610 to 2805 cm^{-1} but same peak disappeared in EBZ loaded niosomes which may be strong amine salt stretching. One broad peak at 1915 cm^{-1} may be due to aromatic C-H bending, which disappears in EBZ loaded niosome. The intensity of the C-N stretching peak at 1340 cm^{-1} in EBZ has been reduced in EBZ loaded niosomes, while it is absent in blank niosome which may suggest the entrapment of EBZ in niosomes. While multiple peaks in the range of 550 cm^{-1} to 850 cm^{-1} were characterised due to presence of C-Cl and it was also found to be reduced in EBZ loaded niosomes as compared to EBZ alone [18].

CONCLUSIONS

EBZ loaded niosomal formulation had been developed using thin-film hydration technology. These niosomal vesicles were then characterized based on particle size, zeta-potential, and drug entrapment efficiency. These vesicles were also observed under Leica microscopy revealed the spherical and ring like niosomal vesicles. Its negative zeta-potential of -25 mV suggests its better stability due to inter ionic repulsion, while its nano-size range may help in better penetration. Its high entrapment efficiency helps in dose reduction. EBZ loaded Niosomal formulations are highly suitable for drug delivery in sustained and controlled release applications and may be a better alternative for the available marketed preparation.

REFERENCES

1. Wagh, V.D.; Deshmukh, O.J. Itraconazole niosomes drug delivery system and its antimycotic activity against *Candida albicans*. *Int. Sch. Res. Not.* **2012**, *2012*, 1–7.
2. Sur, S.; Rathore, A.; Dave, V.; Reddy, K.R.; Chouhan, R.S.; Sadhu, V. Recent developments in functionalized polymer nanoparticles for efficient drug delivery system. *Nano-Struct. Nano-Objects* **2019**, *20*, 100397.
3. Song, G.; Liang, G.; Liu, W. Fungal Co-infections Associated with Global COVID-19 Pandemic: A Clinical and Diagnostic Perspective from China. *Mycopathologia* **2020**, *185*, 599–606.
4. Alangaden, G.J. Nosocomial Fungal Infections: Epidemiology, Infection Control, and Prevention. *Infect. Dis. Clin. North Am.* **2011**, *25*, 201–225.
5. Rapp, R.P. Changing Strategies for the Management of Invasive Fungal Infections. *Pharmacotherapy* **2004**, *24*, 4–28.
6. Spitzer, M.; Robbins, N.; Wright, G.D. Combinatorial strategies for combating invasive fungal infections. *Virulence* **2017**, *8*, 169–185.



7. Abdelkader, H.; Ismail, S.; Kamal, A.; Alany, R.G. Design and Evaluation of Controlled-Release Niosomes and Discomes for Naltrexone Hydrochloride Ocular Delivery. *J. Pharm. Sci.* **2011**, 100, 1833–1846.
8. Liang, X.; Mao, G.; Ng, K.Y.S. Mechanical properties and stability measurement of cholesterol-containing liposome on mica by atomic force microscopy. *J. Colloid Interface Sci.* **2004**, 278, 53–62.
9. Pozzi, D.; Caminiti, R.; Marianecci, C.; Carafa, M.; Santucci, E.; de Sanctis, S.C.; Caracciolo, G. Effect of Cholesterol on the Formation and Hydration Behavior of Solid-Supported Niosomal Membranes. *Langmuir* **2010**, 26, 2268–2273.
10. Soliman, O.A.E.A.; Mohamed, E.A.; Khatera, N.A.A. Enhanced ocular bioavailability of fluconazole from niosomal gels and microemulsions: formulation, optimization, and in vitro–in vivo evaluation. *Pharm. Dev. Technol.* **2019**, 24, 48–62.
11. Torres-Rodríguez, J.M.; Mendez, R.; López-Jodra, O.; Morera, Y.; Espasa, M.; Jimenez, T.; Lagunas, C. In vitro susceptibilities of clinical yeast isolates to the new antifungal eberconazole compared with their susceptibilities to clotrimazole and ketoconazole. *Antimicrob. Agents Chemother.* **1999**, 43, 1258–1259.
12. Montero, T.R.; López, S.; Rodríguez, C.; del Rio, R.; Badell, A.; Gratacós, M.R. Eberconazole 1% cream is an effective and safe alternative for dermatophytosis treatment: multicenter, randomized, double-blind, comparative trial with miconazole 2% cream. *Int. J. Dermatol.* **2006**, 45, 600–604.
13. Porfire, A.; Muntean, D.M.; Rus, L.; Sylvester, B.; Tomuță, I. A quality by design approach for the development of lyophilized liposomes with simvastatin. *Saudi Pharm. J.* **2017**, 25, 981–992.
14. Hashim, F.; El-Ridy, M.; Nasr, M.; Abdallah, Y. Preparation and characterization of niosomes containing ribavirin for liver targeting. *Drug Deliv.* **2010**, 17, 282–287.
15. Rao, K.S.V.K.; Reddy, P.R.; Lee, Y.I.; Kim, C. Synthesis and characterization of chitosan-PEG-Ag nanocomposites for antimicrobial application. *Carbohydr. Polym.* **2012**, 87, 920–925.
16. Asha, K.; Vikash, D. Formulation and evaluation of zidovudine loaded chitosan microspheres for controlled release. *Int. J. Drug Dev. Res.* **2012**, 4, 96–105.
17. Shirsand, S.; Para, M.; Nagendrakumar, D.; Kanani, K.; Keerthy, D. Formulation and evaluation of Ketoconazole niosomal gel drug delivery system. *Int. J. Pharm. Investig.* **2013**, 2, 201–207.
18. Moodahadu-Bangera, L.S.; Martis, J.; Mittal, R.; Krishnankutty, B.; Kumar, N.; Bellary, S.; Varughese, S.; Rao, P.K. Eberconazole - Pharmacological and clinical review. *Indian J. Dermatol. Venereol. Leprol.* **2012**, 78, 217–222.
19. Riccardi, C.; Fàbrega, C.; Grijalvo, S.; Vitiello, G.; D'Errico, G.; Eritja, R.; Montesarchio, D. AS1411-decorated niosomes as effective nanocarriers for Ru(III)-based drugs in anticancer strategies. *J. Mater. Chem. B* **2018**, 6, 5368–5384.



EVALUATION OF THE EFFECTIVENESS OF THE USE OF CUMIN OIL IN RICKETS IN CHILDREN

Ibatova Sh.M., Ruzikulov N.E.

Samarkand State Medical University, Uzbekistan, Samarkand

ANNOTATION

The serum content of higher fatty acids was studied in 45 children with rickets. It has been found that in children with rickets, unsaturated fatty acids decrease and saturated fatty acids increase. The composition of higher fatty acids in the blood serum of children with rickets receiving traditional treatment and with the use of cumin oil was studied. The inclusion of cumin oil in the therapy complex improves the fatty acid composition in children with rickets. Cumin oil improves the digestibility of lipids by almost 2 times by regulating the activity of serum lipase, increases the activity of serum lipase and thereby improves lipid metabolism.

KEYWORDS: rickets, higher fatty acids, patients, lipase activity, cumin oil.

INTRODUCTION

Rickets is a medical and social problem, as it has serious consequences that cause a high incidence of children at an older age [1,2,4,7,12,15]. Despite significant medical advances in recent years, the problem of the incidence of vitamin D-deficient rickets in children remains relevant to this day [9,11,13]. In vitamin D-deficient rickets, due to a lack of vitamin D, the processes of disruption of all types of metabolism, including lipid metabolism, occur [5,6,8,10,14]. Rickets suffered at an early age can have an adverse effect on the growth and development of a child in the future, which determines the important practical significance of research aimed at in-depth study of rickets and the development of more advanced methods of complex therapy.

THE PURPOSE OF THE STUDY

To study the regulating effect of cumin oil on serum lipase activity in children with rickets.

MATERIALS AND RESEARCH METHODS

The studies were conducted in 45 patients with rickets and 10 practically healthy children (control group). In the examined patients, the composition of fatty acids and lipase activity (LA) of blood serum were determined by gas-liquid chromatography [3]. The qualitative and quantitative composition of fatty acids was determined on a chromatograph color 100, model 165 with a flame ionization detector. To identify the separated methyl esters of fatty acids, the dependence of the retention index on the boiling point of the substance was used along with the witness method. As a result of identification, the following fatty acids were found in blood serum: C (16:0) – palmitic, C (16:1) – palmitoleic, C (18:0) – stearic, C (18:1) – oleic, C (18:2) – linolenic, C (18:3) – linolenic acid and C (20:4) – arachidonic acid.

The results of the study and their discussion. We analyzed the content of fatty acids in the blood serum of children with rickets compared with the data of healthy children. The results are presented in table 1.

Table 1
Composition and content of serum fatty acids in children with rickets

Fatty Acids	Control	Upon Admission	P<
C (16:0)	28,17±1,37	30,87±1,53	0,02
C (16:1)	2,70±0,22	1,38±0,64	0,05
C (18:0)	26,13±1,32	28,03±1,04	0,02
C (18:1)	0,90±0,13	0,66±0,6	0,02
C (18:2)	33,32±2,51	29,73±2,34	0,05
C (18:3)	2,41±0,45	2,58±0,50	0,02
C (20:4)	3,56±0,60	2,68±0,60	0,02

P - is the reliability of the difference between the indicators in the group of patients and healthy people.

As can be seen from the above data, the content of fatty acids such as C (16:0), C (18:0) and C (18:3) increase significantly, and C (16:1), C (18:1), C (18:2) and C (20:4) – decrease, i.e. violations of the studied parameters of lipid metabolism are observed.



A study of the composition of higher fatty acids in blood serum in children with rickets receiving traditional treatment and when used as a substance correcting impaired lipid metabolism, cumin oil was conducted.

The I-group of children (19 patients) with rickets received the traditional method of therapy, and the II-group of examined children with rickets (26 patients) received cumin oil (modified method) against the background of the traditional method of treatment. The results of the study are presented in Table 2.

Table 2
The composition and content of fatty acids (in %) in blood serum, depending on the method of treatment

Fatty acids	Control	Traditional $M \pm m$	$P <$	Modified $M \pm m$	$P <$
C (16:0)	28,17 $\pm$ 1,37	28,96 $\pm$ 1,28	0,01	28,21 $\pm$ 1,31	0,1
C (16:1)	2,70 $\pm$ 0,22	1,62 $\pm$ 0,43	0,01	2,55 $\pm$ 0,30	0,1
C (18:0)	26,13 $\pm$ 1,32	27,67 $\pm$ 0,82	0,20	26,75 $\pm$ 0,80	0,1
C (18:1)	0,90 $\pm$ 0,13	0,76 $\pm$ 0,10	0,20	0,92 $\pm$ 0,10	0,1
C (18:2)	33,32 $\pm$ 2,51	30,74 $\pm$ 2,10	0,50	33,12 $\pm$ 1,80	0,1
C (18:3)	2,41 $\pm$ 0,45	2,11 $\pm$ 0,45	0,05	2,73 $\pm$ 0,45	0,1
C (20:4)	3,56 $\pm$ 0,60	2,10 $\pm$ 0,51	0,05	3,26 $\pm$ 0,40	0,1

Note: P is relatively healthy.

The examined children with rickets who received traditional treatment had a wide range of fluctuations in the studied parameters of lipid metabolism.

When using cumin oil, the fatty acid composition indicators returned to normal in most children with rickets, which is confirmed by the data obtained: With (16:0) - 28,21 $\pm$ 1,31%, ($P < 0.05$), With (16:1) - 2,55 $\pm$ 0,30%, C (18:0) - 26.75 $\pm$ 0.80%, With (18:1) - 0,92 $\pm$ 0,10%, With (18:2) - 33,12 $\pm$ 1,80%; With (18:3) - 2,73 $\pm$ 0,45%; With (20:4) - 3,26 $\pm$ 0,40%.

The positive dynamics of the indicators of the fatty acid composition of blood serum is obviously explained by the therapeutic effect of cumin oil. In addition, comprehensive clinical and biochemical studies have been conducted on the use of vegetable oils and assessment of their digestibility.

The digestibility of oils by the body was assessed by the lipase activity of blood serum (LA).

Studies have shown that the serum concentration in the children we examined before the use of apricot oil was - 10.2 $\pm$ 1.6 mmol/ (l*min), when using cottonseed oil in the diet it was - 10.5 $\pm$ 1.1 mmol/ (l*min), (n=9), i.e. no noticeable change was observed, when giving ziger oil it was - 16.8 $\pm$ 1.2 mmol/ (l*min), (n=9), sea buckthorn - 18.9 $\pm$ 1.7 mmol/ (l*min), (n=10), and when children received cumin oil, the lipase activity of blood serum increased significantly - 19.7 $\pm$ 1.9 mmol/ (l*min), (n=8).

Based on the data obtained, it can be assumed that the use of cumin oil leads to an improvement in the digestibility of lipids by almost 2 times by regulating the activity of serum lipase and thereby improves lipid metabolism.

CONCLUSIONS

The use of cumin oil to correct the spectrum of higher fatty acids leads to normalization of serum lipase activity, restoration of metabolism of higher fatty acids and ensures the effectiveness of therapy in children with rickets. The use of cumin oil improves the digestibility of lipids by 2 times by increasing the activity of serum lipase and thereby improves lipid metabolism.

LITERATURE

1. Sh. M. Ibatova, D.S., F.H. Mamatkulova, S.N. Mukhamadiev, Sh.O.Akhmedov. The use of apricot oil in the treatment of children with vitamin D-deficient rickets. //Collection of scientific articles. "Problems of pediatrics and pediatric surgery in the XXI century". Bishkek, 2014. pp. 64-68.
2. Ibatova Sh.M. Optimization of treatment of rickets in children. //J. Infection, immunity and pharmacology. Tashkent. -No5. 2015. - P. 99-103.
3. Ibatova Sh.M. Evaluation of the effectiveness of apricot oil and Aevita in the complex treatment of children with rickets //J. Bulletin of the Association of Physicians of Uzbekistan. - 2015. - No. 4. - P.50-53.
4. Sh.M. Ibatova, F.Kh. Mamatkulova, N.B. Abdukadirova, H.M. Oblokulov, F.A.Achilova. The effectiveness of apricot oil in children with rickets. //Scientific and practical journal "Questions of science and education", Moscow, 2019, No. 27 (76), -P.40-46.
5. Ibatova Sh. M., Mamatkulova F. Kh., Ruzikulov N.Y. The Clinical Picture of Acute Obstructive Bronchitis in Children and the Rationale for Immunomodulatory Therapy // International Journal of Current Research and Review. Vol 12 Issue 17. September 2020. - P.152-155.



6. Ibatova Sh. M., F. Kh. Mamatkulova, N. B. Abdulkadirova, Yu. A. Rakhmonov, M.M. Kodirova. Risk Factors for Development of Broncho-Ostructive Syndrome in Children // *International Journal of Current Research and Review*. Vol 12. Issue 23 December 2020.- P. 3-6.
7. Ibatova Sh.M., Mamatkulova F.Kh., Rakhmonov Y.A., Shukurova D.B., Kodirova M.M. Assessment of the Effectiveness of Treatment of Rachit in Children by Gas-Liquid Chromatography. // *International Journal of Current Research and Review*. Vol 13, Issue 06, 20 March 2021. -P.64-66.
8. Капранова Е.И. К вопросу о рахите. // *Росс. педиатр. журнал*. -2003. N6. -С. 39-42.
9. Sh.M. Ibatova, F.Kh. Mamatkulova, S.F. Kuldoshev. Study of lipid and phosphorus-calcium metabolism in children with rickets receiving traditional treatment. *Eurasian journal of medical and natural sciences*. volume 3, no.4. 2023. PP. 253-261.
10. Ibatova Sh.M., Shakarboyeva O.X. Lipid spectrum of blood serum in children with rickets. *Web of scientist: International scientific research journal*. Volume 4, Issue 11, November, 2023 P. 288-295.
11. Ibatova Sh.M., Ruzikulov N.E., Islamova D.S. Evaluation of the effectiveness of complex therapy of vitamin D-deficient rickets with the use of apricot oil and aevit in children. *American journal of technology and applied sciences*. Jan. 5 2024. Volume 20, P.9-13.
12. Mukhamadiev N.K., Ibatova S.M., Ergashev I.M. Gas chromatographic determination of fatty acids in blood serum of children with rickets. // *PRACTICE of the 2nd Zahidnoukrainsky Symposium on adsorption and chromatography.- Lviv, 2000.- pp.211-214*.
13. Neudakhin E.V., Ageikin A.V. Controversial theoretical and practical issues of rickets in children at the present stage. // *Pediatrics*. - 2003. - N4.-pp.95-98.
14. Rustamov M.R., Ibatova Sh.M., Uralov Sh.M., Ataeva M.S., Yusupova M.M. On the composition of higher fatty acids in vitamin D-deficient rickets. // *Bulletin of the doctor*. -2008. - N 3.-p.54.
15. D. Shermuhamedov, Sh. Eibatova, S. Mukhamadiev, N. Mukhamadiev. Study of lipid components of blood serum in children with rachit. *National meeting and exposition program. The 230th ACS National meeting, Washington DC, USA. August 28 - September 1. 2005. -BIOL. 175*.



SORPTION ISOTHERM, PROXIMATE COMPOSITION AND SENSORY EVALUATIONS OF OVEN DRIED AND FRIED CHEESE PRODUCTS FROM LOCAL SOFT CHEESE

Nathaniel O. Alamuoye¹, Oluwatoyin F. Alamuoye^{2*}, Lawrence K. Otitoju³

¹*Food Science and Technology Department, School of Agriculture and Agricultural Technology, Bamidele Olumilua University of Education Science and Technology, Ikere Ekiti, Nigeria.*

²*Animal Science Department, Faculty of Agricultural Science, Ekiti State University, Ado Ekiti, Nigeria.*

³*Food Science and Technology Department, School of Agriculture and Agricultural Technology, Bamidele Olumilua University of Education Science and Technology, Ikere Ekiti, Nigeria.*

*Corresponding Author

Article DOI: <https://doi.org/10.36713/epra15986>

DOI No: 10.36713/epra15986

ABSTRACT

In this study, the sorption isotherm, proximate composition and sensory characteristics of oven dried and fried cheese were investigated. The understanding of the moisture sorption properties, nutrient composition and sensory properties of the oven dried and fried cheese can help quality, shelf-life prediction and overall acceptance. The experimental methodology for this study followed a standard procedure to determine the sorption isotherm of oven-dried and fried cheese samples. First, the raw milk samples were obtained from white Fulani cows at the Teaching and Research Farm, Ekiti State, University, Ado-Ekiti, Nigeria and processed into cheese. The cheese was divided into two portions: one group was oven-dried at 50 °C for 16 hours, while the other group was fried in pre-heated edible canola to internal temperature of 68°C. Sorption parameters, proximate and sensory characteristics were carried out according to standard methods. This study revealed that the monolayer moisture was higher in fried cheese than oven dried cheese. Oven-dried cheese had 0.299 water activity and 21.26 monolayer moisture while fried cheese had higher water activity of 0.32 and monolayer moisture of 29.67. Fitness of curve (R^2) of 0.731 0.903 were computed for oven-dried and fried cheese. The results of proximate composition and sensory characteristics showed that processing methods influenced the sensorial properties and nutritional composition of oven-dried and fried cheese. In conclusion, oven-dried cheese can be predicted to be more stable than fried cheese.

KEYWORDS: Adsorption, Equilibrium, GAB Equation, Monolayer, Salts.

1. INTRODUCTION

Cheese has been an important part of human history and culture for centuries, and its importance to man such as infant mortality reduction and enhancement of demographic shifts in farming communities [1] and food security [2] cannot be overstated. This is due to a number of reasons, including its nutritional value; as a rich source of protein, calcium, biologically active conjugated linoleic acid (CLA) and milk fat globule membrane (MFGM) biologically active conjugated linoleic acid (CLA) and milk fat globule membrane (MFGM) [3]. Cheeses are considered 'functional' foods due to their unique composition, which includes bioactive peptides, lipids, prebiotics, and probiotic bacteria, as well as calcium for bone health [4]. Also, cheese is used in a wide variety of dishes, making it an essential ingredient in many cuisines around the world [5]. The taste, texture and other attributes of cheese have made many to incorporate it into their diets as a regular indulgence [6]. Cheese has played an integral role in shaping human society through its nutritional benefits, versatility in cooking methods, economic impact, and cultural traditions. However, proximate composition which refers to the chemical components of a food item, including its moisture content, protein, fat, and carbohydrate levels and sensory properties can vary with processing methods and temperature [7].

Cheese being a popular and versatile food that has been enjoyed by humans for centuries is a perishable food item, which gets spoil if not properly stored or preserved [8]. The process of cheese spoilage involves the growth of microorganisms such as bacteria, mold and yeast which can alter its sensory properties such as taste, texture, and appearance [9]. There are several factors that contribute to cheese spoilage which include humidity and temperature fluctuations during storage, exposure to air and moisture [10], bad handling and animal hygiene [11], and improper packaging. These factors create a favourable environment for microorganisms to grow and cause deterioration of the cheese. Cheese stability has been a subject of concern due to its poor storability. Various techniques such as modified atmosphere, addition of preservatives, active and edible coatings had been adopted to extend its shelf-life [12].



To prevent cheese spoilage and extend its shelf life, various preservation methods have been developed over time. Some common techniques include refrigeration at low temperatures (around 4°C), vacuum sealing to remove oxygen from the packaging which inhibits bacterial growth [13], addition of preservatives such as salt or vinegar to provide unsuitable environment for microbes. As consumer demand for high-quality cheeses continues to rise globally, the importance of understanding how best to preserve them becomes crucial. Traditional method and factory system of fresh cheese making and storage, especially the cold storage has helped greatly in meeting the demand for fresh cheese [14]. To ensure cheese quality, several production and storage techniques such as pasteurization of milk, cold storage, use of commercial starters are been employed [15]. Product developments from fresh cheese such as boiled and fried cheese are the delicacies of many Nigerians. However, these products get spoiled within few days due to lack of proper knowledge of the storage conditions. Sorption isotherm which refers to the relationship between water activity and moisture content of a food product at a specific temperature may offer a more promising storage alternative. The interrelationship of moisture and water activity of products is crucial to its shelf life [16]. Water activity is also useful for predicting the final moisture content [17]. The moisture content and sensory properties of food are interrelated [18]. An understanding of the chemical and sensory properties of cheese can help manufacturers create desirable products [19]. The main objective of drying is to decrease the water activity to a safe value in order to increase shelf life by inhibiting the growth of microbes and enhance storage at ambient temperature [17].

A number of empirical models have been derived for the correlation of water sorption and water activity in food substances. Among these, is the Guggenheim-Anderson-de Boer (GAB) model [20] employed in this study because Guggenheim, Anderson and De Boer (GAB) model has been proven to be the best fit for the desorption and adsorption of foods over a large range of water activities [21]. Determination of the sorption isotherm proximate composition and sensory characteristics of oven dried cheese and fried cheese will enhance their storage life quality assessment, hence this study.

2. MATERIALS AND METHODS

2.1 Procedure for collection of raw milk and production of soft cheese

The raw milk was obtained from white Fulani cows at the Teaching and Research Farm, Ekiti State, University, Ado-Ekiti, Nigeria. The raw milk was placed in 250ml beaker, pasteurized at 65°C for 30 minutes, cooled to 32°C prior production of soft cheese. Fresh leaves of *Calotropis procera* were harvested from the surrounding villages in Ado-Ekiti, Nigeria, sorted, cleaned with distilled water, drained, dried, weighed and chopped into tiny sizes to aid the process of pulverization. 2500g of chopped fresh *Calotropis procera* were blender using USHA mixer grinder (MG 2053N, 500 watts). The mixture of the blended leaves of *Calotropis procera* was sieved and supernatant collected as the extract. 50ml of fresh supernatant of *Calotropis procera* extracts were added as source of calotropin enzyme, a milk coagulant into 500ml of pasteurized milk at a holding temperature of 32°C in a stainless pot on heater, mixture was continually stirred until curds were produced. The curd was collected, sieved using cheese cloth and left 20 min to drain out the whey. The curds were pressed into v-shaped using perforated moulds, and allowed for 10 minutes for proper draining and shaping.

2.2 Cooking of Soft Cheese (Wara)

Two methods were adopted in the processing of the soft cheese, viz-a-viz deep frying and oven drying.

2.3 Fried Cheese

50g by wet weights of soft cheese were fried-cooked in pre-heated edible omega-3 fatty acid oil (canola oil) placed in deep frying pots with strainer, to internal temperature of 68°C, drained and dried with kitchen disposable sheets.

2.4 Oven-Dried Cheese

50g (wet weights) each of soft cheese was set in a slight oiled oven tray, placed in a pre-heated oven at 50 °C for 16 hours. Each side was flipped at interval of 5 minutes until the cheese were totally dried. Dried cheese samples were cooled to room temperature and stored prior to analysis

2.5 Procedure for Adsorption Isotherm

The equilibrium moisture content of fried and oven dried cheese were determined at 25 °C using the static gravimetric method [22]. The product samples were dried over phosphorus pentoxide (P₂O₅) prior to sorption experiment, for a period of about 7 days to ensure they were at the same initial moisture content and dry enough for adsorption isotherm to take place [23]. Ten grams of fried and oven dried cheese were placed in a plastic mesh bag, which was dropped above the saturated salt solution contained in a glass jar. The jar was tightly closed and placed in a temperature controlled cabinet (±0.2 °C). The sample was weighted daily until the mass difference was less than 0.001g. To determine the equilibrium moisture content, the sample was dried in the oven at 105 °C for 24. The samples were cooled over silica gel before the final weights were taken. All the experiments were carried out in triplicate. Ten saturated salt solutions were prepared with a range of 0.043 to 0.973. The salt solutions used and their matching water activities were as reported [23] and this is as given in Table 1.

**Table 1 Salts and water activities**

Salts	(25 ⁰ C)
Cesium Flouride	0.043
Lithium Chloride	0.113
Potassium Acetate	0.225
Magnesium Chloride	0.328
Potassium Carbonate	0.432
Sodium Bromide	0.576
Potassium Iodide	0.689
Sodium Chloride	0.753
Potassium Chloride	0.843
Potassium Sulfate	0.973

The formula for the determination of equilibrium moisture content is as stated below:

$$EMC = \frac{wf - wi}{wi} \times 100 \text{ (AOAC, 2010)}$$

..... Equation 1

The GAB equation which is mostly suitable for a_w of 0 - 0.95 [Mustafa, 2018], was used to determine the water activity and monolayer moisture value of the product.

$$\text{GAB Equation} = \frac{M}{Mm} = \frac{ABaw}{(1-Baw)(1-Baw+ABaw)} \text{ (Van Den Berg, 1985)}$$

..... Equation 2

GAB was rearranged into second degree polynomial for the determination of water activity and monolayer moisture value.

$$Mo - \text{Monolayer value} = 1/\sqrt{b^2 - 4ac}$$

..... Equation 3

$$a_w = a_w/M = \text{Equation of line} = y$$

..... Equation 4

$Y = a_w/M$ (M = Monolayer value) Monolayer value indicates the amount of water that is strongly adsorbed in specific sites, and it is considered to be the value at which a food product is the most stable.

2.6 Sensory Evaluation

The sensory evaluation was conducted by the methods of Apata et al. [24]. A Ten member of semi-trained taste panelist of both sexes participated in the assessment of sensory properties of the samples. The assessors were placed in an individual unit cell without seeing each other; each person was given unsalted biscuits and fresh orange juice to cleanse palate after each taste of the sample. Samples were coded and independently evaluated using a 9- point hedonic scale ranked as follows; like extremely to very much (8–9 scores), like moderately to like slightly (5–7 scores), neither like nor dislike to dislike slightly or dislike moderately (2–4 scores) and dislike extremely to dislike very much (0–1 score) for aroma, flavor, tenderness, texture, saltiness, hotness and over all-acceptability.

2.7 Proximate Composition

Proximate composition was analyzed according to the official method of analysis as described by the Association of Official and Analytical Chemist (25).

2.8 Statistical Analysis

Statistical analysis was carried out using IBM SPSS Statistics 20, One-way ANOVA Post Hoc Multiple Comparisons of Ryan-Einot-Gabriel-Welsch F' test at 0.05 significance level [26]

3. RESULTS AND DISCUSSION

The water activities used for this study ranged from 0.043 to 0.973 for both oven dried and fried cheese. Equilibrium moisture content for oven dried cheese ranged from 11.27 to 43.31. A gradual increase in equilibrium moisture content was observed from water activity of 0.043 to 0.432 while a sharp increase occurred from 0.432 to 0.576 a_w as equilibrium moisture rose from 19.35 to 33.55. This sharp increase continues till 0.689 water activity with equilibrium moisture content of 44.12. Retardation in equilibrium moisture content was however observed between the water activities of 0.689 and 0.753 as equilibrium moisture content drops to 39.98 from 44.12. There was a recovery in the retardation of the equilibrium moisture content as water activity moves from 0.753 to 0.843 and further to 0.973. The results of equilibrium moisture contents move from 39.98 through 41.15 to 43.31 for the water activities; 0.753, 0.843 and 0.973 respectively. The water activity of moisture for oven-dried cheese ranged from 0.0038 to 0.0225. The highest water activity of moisture; 0.0225 corresponds to the highest water activity of 0.973 while the lowest water activity of moisture; 0.0038 corresponds to the lowest water activity of 0.043. However, highest equilibrium moisture content (44.12) as revealed in this study does not correspond to the highest water activity neither to highest moisture content of moisture in oven dried cheese.



Equilibrium moisture content of fried cheese as revealed in this study shows that it traversed between 21.35 and 45.32. There was a progressive increase in equilibrium moisture content from 21.35 to 29.03 which corresponds to the water activities from 0.043 to 0.576 respectively. Tremendous increase in equilibrium moisture content from 0.576 to 0.689 water activities was observed. Equilibrium moisture content increased from 29.03 to 50.15 as water activity moves from 0.676 to 0.689. Equilibrium moisture content drops to 45.25 and further to 43.22 at water activity of 0.73 and 0.843 apiece. This downward movement in equilibrium moisture content recovered at 0.973 water activity which recorded; 45.32 equilibrium moisture content.

The water activity of moisture for fried cheese as revealed in this study shows three phases of sorption behavior; increase, decline and further increase over the range of water activities of 0.043 to 0.973 tested. The first phase covers the range of water activities of 0.043 to 0.432 which had a progressive increase in water activity of moisture (0.0020 to 0.0160). Second phase spans through water activities of 0.576 to 0.689 which equally had water activity of moisture from 0.0151 to 0.0137. The third phase was a recovery from a decline experienced in the second phase which resulted in a further increase in water activity of moisture from 0.0166 through 0.0195 to 0.0215 of the water activities; 0.753, 0.843, and 0.973 respectively. Similarly, highest equilibrium moisture content (50.15) does not correspond to the highest water activity (0.973).

However, lowest equilibrium moisture content corresponds to the lowest water activity as observed in this study. Both the water activities of oven-dried and fried cheese had the same pattern of progress with increase in water activity.

Table 2 Equilibrium moisture content and water activity of moisture of oven-dried and fried cheese

a_w	Oven-Dried Cheese EMC (M) $\pm$ SD (%)	a_w/M	Fried Cheese EMC (M) $\pm$ SD (%)	a_w/M
0.043	11.27 $\pm$ 0.02 ^a	0.0038	21.35 $\pm$ 0.05 ^a	0.0020
0.113	13.31 $\pm$ 0.59 ^b	0.0085	22.42 $\pm$ 0.01 ^b	0.0050
0.225	15.52 $\pm$ 0.01 ^c	0.0145	24.98 $\pm$ 0.02 ^c	0.0090
0.328	17.38 $\pm$ 0.02 ^d	0.0189	25.41 $\pm$ 0.66 ^c	0.0129
0.432	19.35 $\pm$ 0.01 ^e	0.0223	27.04 $\pm$ 0.02 ^d	0.0160
0.576	33.55 $\pm$ 0.00 ^f	0.0171	29.03 $\pm$ 0.03 ^e	0.0151
0.689	44.12 $\pm$ 0.01 ^j	0.0156	50.15 $\pm$ 0.05 ⁱ	0.0137
0.753	39.98 $\pm$ 0.01 ^g	0.0188	45.25 $\pm$ 0.10 ^f	0.0166
0.843	41.15 $\pm$ 0.02 ^h	0.0204	43.22 $\pm$ 0.21 ^g	0.0195
0.973	43.31 $\pm$ 0.01 ⁱ	0.0225	45.32 $\pm$ 0.10 ^f	0.0215

a_w/M = water activity of moisture, EMC= Equilibrium moisture content. Each value is expressed as mean $\pm$ standard deviation (n=3) of triplicate analysis. Means within column followed by different superscripts indicate significance difference ($p < 0.05$) by post hoc multiple comparisons of ryan-einot-gabriel-welsch f^* test.

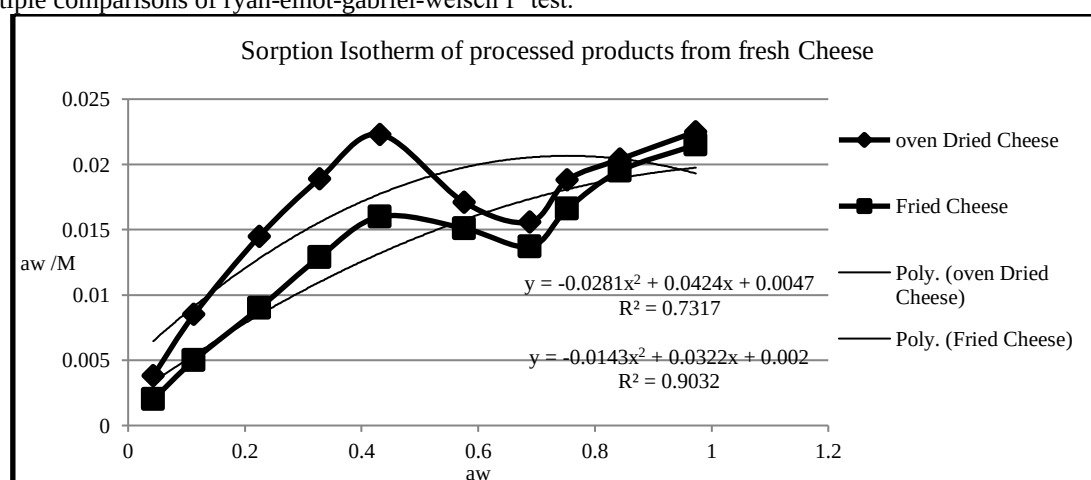
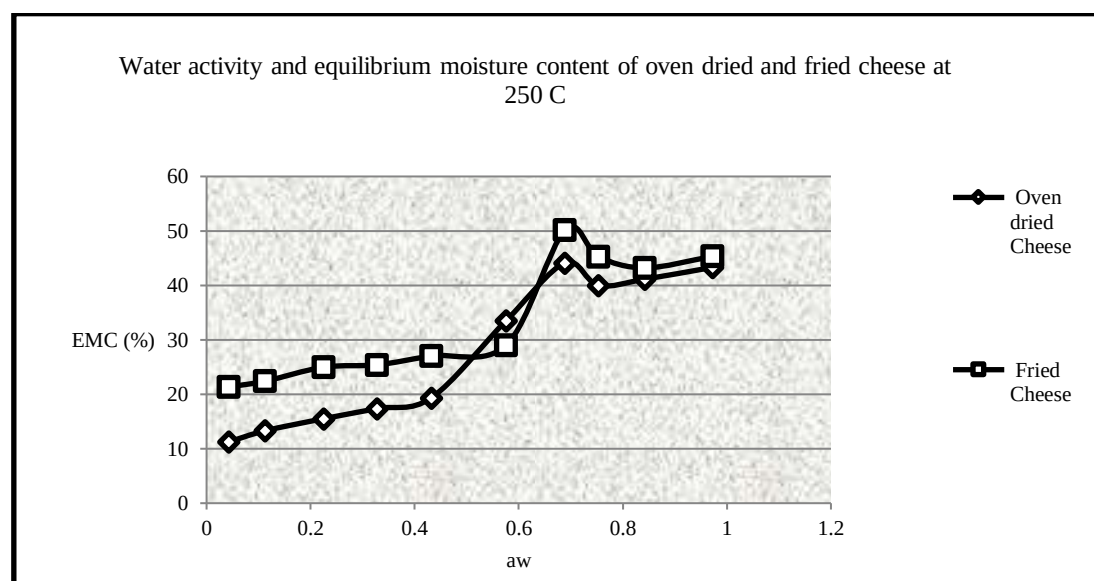


Figure 1: Sorption Isotherm of processed products from fresh local soft Cheese

**Figure 2: Water activity and equilibrium moisture content of oven dried and fried cheese at 25^o C****Table 3: Analysis of sorption data of cooked local cheese according to GAB Model**

Product sample	Water activity (a _w)	Critical Water activity (RH _c)	Monolayer value (Mo) (g H ₂ O/g Solid)	R ²
Oven Dried Cheese	0.299	0.432	21.26	0.731
Fried Cheese	0.32	0.432	29.67	0.903

R² = Fitness of curve

Table 4: Proximate composition of oven-dried and fried cheese (%)

Components	Oven-dried cheese	SEM	Fried cheese	SEM
Crude protein	52.00	0.00	38.37	0.20
Moisture content	22.00	0.58	35.97	0.03
Ash	5.33	0.33	7.73	0.13
Fat	12.00	0.58	10.10	0.10
Carbohydrate	8.67	0.33	7.83	0.17

Each value is expressed as mean ± standard error of mean (n=3) of triplicate analysis. Post hoc tests were not performed because there were fewer than three groups SEM=standard error of mean.

Table 5 Sensory characteristics of oven-dried and fried cheese (%)

Components	Oven-dried cheese	SEM	Fried cheese	SEM
Aroma	6.00	0.23	5.71	0.42
Flavour	5.86	0.46	5.57	0.48
Texture	5.43	0.43	5.86	0.96
Tenderness	5.14	0.14	6.14	0.60
Juiciness	3.13	0.51	4.86	0.14
Overall acceptance	6.57	0.20	6.29	0.18

Each value is expressed as mean ± standard error of mean (n=3) of triplicate analysis. Post hoc tests were not performed because there were fewer than three groups; SEM=standard error of means

The moisture adsorption data are useful in selection of appropriate packaging materials, determining the permeability of appropriate packaging materials and predict their shelf life [27]). The analysis of adsorption data of oven-dried and fried cheese shows that water activity, monolayer values and fitness of curve for these two products are different. The water activity and monolayer values as determined by GAB equation are as presented in Table 3. The equilibrium moisture content of oven-dried cheese was found to be relatively lower compared to fried cheese. This shows that oven-drying removes a considerable amount of moisture from the product. The water activity of fried cheese was also higher than that of oven dried cheese, suggesting that oven-dried cheese would be more stable and have a lower risk of microbial growth. Oven-dried cheese had 0.299 water activity and 21.26 monolayer moisture



while fried cheese had higher water activity of 0.32 and monolayer moisture of 29.67. Fitness of curve (R^2) of 0.731 0.903 were computed for oven-dried and fried cheese (Figure 1). This study revealed that the monolayer moisture was higher in fried cheese even at a temperature higher than oven drying temperature as investigated in this study, a contradiction to a report of decrease in monolayer moisture with increasing temperature [28]. This might be due to short time used to fry cheese compared to long time of oven drying used in this experiment. Both the oven dried and fried cheese products will be most stable at their monolayer moisture contents, which largely depends on the chemical composition and structure [17].

Fried cheese sample had the higher value of equilibrium moisture content than oven dried cheese at all the water activities tested in this experiment. The variation in the results obtained from this study could be due to the different processing methods for the production of fried and oven dried cheese [12]

The water activities at which the growth of microorganisms becomes active for oven dried and fried cheese were calculated at 0.299 and 0.32aw respectively using the GAB models for each sorption isotherm are good values which indicate that only lower water activities will be appropriate for the growth limitation of microorganisms and subsequently for the extension of shelf life these products. Shelf life of these products at the water activities of 0.299 and 0.32 for oven dried cheese and fried cheese apiece requires packaging materials that will limit water vapour transmission as lack of good storage can lead to microbial contamination and spoilage. Higher temperature of storage should be avoided as high temperature will increase the transmission rate of water vapour. The water activities, the critical water activities of the products and the storage conditions are essential parameters for the prediction of shelf life. Moisture imparts mobility of molecules and enables microbial growth as water activity enables for proper monitoring of moisture so that products are stored at safe water activity. In this study, foil lined packaging materials should be considered for long term storage of these products as protection from physical damage, microbial contamination, oxygen, light and moisture are very essential due to their low water activities [29]. Sorption which refers to the process of adsorption or desorption of moisture by food materials plays a major role in the science of preservation and storage of cheese products. In fried cheese, high temperature causes water content to evaporate during frying, which resulted in a golden and crispy exterior. The fried cheese product however, has capacity to absorb moisture from atmosphere if exposed to air of high relative humidity which can lead to breakdown of texture and loss of crispness in storage if appropriate packaging materials are compromised. To maintain sensorial parameters, hermetic packaging to minimize moisture uptake should be considered. Oven-dried cheese product in this study made use of relatively low heat for an extended period to lower moisture content of the product and prolong its shelf-life. Oven-dried cheese has lower water activity compared to fried cheese which suggests it is less prone to absorbing moisture from the atmosphere. This behaviour contributes to its longer shelf life compared to fried cheese. Development of airtight package to reduce exposure to moisture uptake from the environment will enhance and promote good shelf-life of these products as over time they may experience changes in their sensorial properties.

Proximate analysis which involves the determination of basic composition of a food product, typically moisture, ash, protein, fat, and carbohydrates carried out for oven dried and fried cheese shows that the processing methods affected the nutrient composition of the products (Table 4). Lower moisture content of oven dried cheese as evaluated in this study may be connected to the longer processing time oven dried cheese passed through. Similar, the protein, fat and carbohydrate content were more concentrated in oven-dried cheese as more water was removed during oven drying than in fried cheese. In this study, both oven drying and frying preserve the nutrients substantially but oven drying method retains more nutritional contents than frying [30]. This might be as a result of low temperature used for oven drying in this study as oven drying at 50°C and 70°C have been adjudged the best method for retaining the highest volatile oil, protein, calcium, and magnesium contents of food materials [31]. The reduction in fat content of fried cheese may be connected to possibility of lipid oxidation due to heat as high temperature accelerates lipid oxidation. The low content of ash in oven dried cheese is proportional to increase in protein content [32].

An understanding of the chemical and sensory properties of cheese can help manufacturers develop desirable products. Oven dried cheese had the best sensory acceptability in terms of aroma, appearance and flavor. This agrees with the submission of Ndife et al. [33] who reported oven drying method to improve the concentration of nutrients and antioxidant activities, with preservation of the sensory acceptability of food materials. However, aroma should not only be attributed to change in temperature, it is also a function of the type of microorganism used in cheese making and chemical changes such as lipid hydrolysis and proteolysis that occur in the curd during the early stages of ripening.

4.CONCLUSION

In conclusion, the sorption isotherm curves had sigmoidal shapes for both oven-dried and fried cheese, which indicates that the composition and structure of these products influenced water sorption behavior. The sorption isotherms of oven-dried cheese showed lower equilibrium moisture content and water activity compared to fried cheese. This difference could be attributed to decrease in porosity and surface area of oven dried cheese due to the processing method, which could enhance its shelf life in storage. Hence, this study contributed to knowledge sorption behavior of cheese products.



5. CONFLICTS OF INTEREST

The authors declare that there is no conflict of interest.

6. REFERENCES

1. McClure SB, Magill C, Podrug E, Moore AMT, Harper TK, Culleton BJ, et al. Fatty acid specific $\delta^{13}\text{C}$ values reveal earliest Mediterranean cheese production 7,200 years ago. *Loor JJ, editor. PLOS ONE*. 2018 Sep 5;13(9):e0202807.
2. Ingram D. Michael H. Tunick: *The Science of Cheese*. Food Security. 2014 Jun 18;6(4):605–6.
3. Ganesan P, Kwak, H, Hong, Y. Nutritional Benefits in Cheese. In: *Cheese: Types, Nutrition and Consumption*. - *Cheese: Types, Nutrition and Consumption*. 2012 Dec;268-89. <https://www.researchgate.net/publication/284479670>
4. Gutiérrez-Peña R, Avilés C, Galán-Soldevilla H, Polvillo O, Pilar Ruiz Pérez-Cacho, José Luis Guzmán, et al. Physicochemical Composition, Antioxidant Status, Fatty Acid Profile, and Volatile Compounds of Milk and Fresh and Ripened Ewes' Cheese from a Sustainable Part-Time Grazing System. *Foods*. 2021 Jan 3;10(1):80–0.
5. Fox PF, Cogan TM, Guinee TP. Factors That Affect the Quality of Cheese. *Cheese*. 2017;617–41.
6. Guinee TP, Kilcawley KN. *Ingredient Cheese and Cheese-Based Ingredients*. Elsevier eBooks. 2017 Jan 1;715–55.
7. Naiane Sangaletti. Estudo da vida útil do queijo Minas frescal disponível no mercado. 2015 Oct 21;
8. Burtscher J, Küller M, Arias-Roth E, Drissner D, Domig KJ. Characterization of *Clostridium tyrobutyricum* Strains Using Three Different Typing Techniques. *Microorganisms*. 2020 Jul 16;8(7):1057.
9. Alfei S, Marengo B, Zuccari G. Nanotechnology application in food packaging: A plethora of opportunities versus pending risks assessment and public concerns. *Food Research International*. 2020 Nov;137:109664.
10. Martin NH, Kent DJ, Ewanowski RL, Zuber Hrobuchak TJ, Wiedmann M. Bacterial spore levels in bulk tank raw milk are influenced by environmental and cow hygiene factors. *Journal of Dairy Science*. 2019 Nov;102(11):9689–701.
11. Raji AO, Oluwanisola RM, Oyebojani OM, Sunmonu BA. Nutrients composition, sensory properties and storage stability of processed Nigerian soy cheese (Beske). *Measurement: Food*. 2023 Jun;10:100088.
12. Sameli N, Sioziou E, Bosnea L, Kakouri A, Samelis J. Assessment of the Spoilage Microbiota during Refrigerated (4 °C) Vacuum-Packed Storage of Fresh Greek Anthotyros Whey Cheese without or with a Crude Enterocin A-B-P-Containing Extract. *Foods [Internet]*. 2021 Nov 30 [cited 2022 Oct 4];10(12):2946. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8701269/>.
13. Ирина Буянова, Вуянова I, Сметлана Лупинская, Lupinskaya S, Елена Лобачева, Lobacheva E. Technological Aspects of Cold Storage of Protein Dairy Products. *Техника и технология пищевых производств*. 2019 Feb 13;48(4):5–11.
14. Johnson ME. A 100-Year Review: Cheese production and quality. *Journal of Dairy Science*. 2017 Dec;100(12):9952–65.
15. Biegalski J. Water activity of smoked pasta filata cheese during storage. *Electronic Journal of Polish Agricultural Universities*. 2020 Jun 30;23(2).
16. Bonazzi C, Dumoulin E. Quality Changes in Food Materials as Influenced by Drying Processes. 2014 Jun 13;1–20.
17. Vásquez VR, Coronella CJ. A simple model for vapor-moisture equilibrium in biomass substrates. *AIChE Journal*. 2009 Apr 20;55(6):1595–603.
18. Jo Y, Benoist DM, Ameerally A, Drake MA. Sensory and chemical properties of Gouda cheese. *Journal of Dairy Science*. 2018 Mar;101(3):1967–89.
19. Van der Berg C. Description of water activity of foods for engineering purposes by means of the GAB model of sorption. Vol. 1. New York: Elsevier Applied Science Publishing; New York; 1984.
20. Frédéric Prothon, Ahrné L. Application of the Guggenheim, Anderson and De Boer model to correlate water activity and moisture content during osmotic dehydration of apples. *Journal of Food Engineering*. 2004 Feb 1;61(3):467–70.
21. Mallek-Ayadi S, Bahloul N, Kechaou N. Mathematical modelling of water sorption isotherms and thermodynamic properties of Cucumis melo L. seeds. *LWT*. 2020 Sep;131:109727.
22. Ikhu-Omoregbe DIO. Comparison of the Sorption Isotherm Characteristics of Two Cassava Products. *International Journal of Food Properties*. 2006 Jul;9(2):167–77.
23. Greenspan L. Humidity fixed points of binary saturated aqueous solutions. *Journal of Research of the National Bureau of Standards Section A: Physics and Chemistry [Internet]*. 1977 Jan [cited 2020 Aug 3];81A(1):89. Available from: https://nvlpubs.nist.gov/nistpubs/jres/81A/jresv81An1p89_A1b.pdf
24. Apata ES, Kuku IA, Apata OC, Adeyemi KO. Evaluation of Suya (Tsire) – An Intermediate Moisture Meat Product in Ogun State, Nigeria. *Journal of Food Research*. 2013 Jan 24;2(1):87.
25. Horwitz W, Latimer GW. *Official methods of analysis of AOAC International*. Maryland: AOAC International; 2011.
26. IBM SPSS Statistics 20, 2011
27. Alakali JS, Irtwange SV, Agbali FA. Physico-thermodynamic properties of soy-gari. *Journal of Food Processing and Preservation*. 2010 May;34:470–89.
28. Yaptenco KE, Pardua SN, Duque JAC, Pangan RS. Moisture sorption isotherms and shelf life prediction for whole dried sandfish (*Holothuria scabra*) *AgricEngInt: CIGR Journal Open access*. 2017 Aug; 19(2): 176-86 <http://www.cigrjournal.org>
29. Alamouye NO. Effects of packaging materials on weight loss, moisture content and quality of wheat flour infested by *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae). *International Journal of Zoology Studies*. 2019 Nov; 4(6):57-1. Available from: www.zoologyjournals.com.
30. Oloruntola A, Omotosho O. Proximate Analysis, Phytochemical Screening and Mineral Content of *Pleurotus Pulmonarius* (Oyster Mushroom) (P20-019-19). *Current Developments in Nutrition*. 2019 Jun 1;3(Supplement_1).



31. Mamman T, Ipinjolu JK, Shamsuddeen BK, Jibrin H, Mohammed U. Effect of Different Drying Techniques on the Nutrients Content of Fish Feedstuffs. *International Journal of Biochemistry Research & Review*. 2019 Apr 5;1-6.
32. Boumba VA, Voutsinas LP, Philippopoulos CD. Composition and nutritional value of commercial dried whey products from feta cheese manufacture. *International Journal of Dairy Technology*. 2001 Nov;54(4):141-5.
33. Ndife J, Ubbor S, Chinweikpe A, Onwuzuruike A. Comparative Effects of Oven-Drying on Quality of Selected Leafy Spices. *Indonesian Food Science & Technology Journal*



INTEGRATED APPROACH TO CLINICAL MANAGEMENT OF SEBACEOUS CYSTS: A Case Study on Enucleation and Ayurvedic Principles

Dr. Satish Mishra¹, Prof Dr Ranjan Kumar Kasta²

Dr. Tapan Kumar Nayak³

¹M.S Scholar, Dept of Shalya Tantra, Gopabandhu Ayurveda Mahavidyalaya, Puri

²H.O.D, P.G Dept of Shalya Tantra, GAM, Puri

³Lecturer, P.G Dept Of Shalya Tantra, GAM, Puri

ABSTRACT

Sebaceous cysts, arising from obstructed sebaceous glands, are benign growths commonly found on the skin's surface. This study explores the clinical management of sebaceous cysts through enucleation, a surgical procedure aimed at complete removal of the cyst and its lining. The case study presents a 22-year-old male patient with a sebaceous cyst on his face, detailing the surgical procedure, post-operative care, and follow-up. Discussion involves the efficacy of enucleation, differential diagnoses, and the importance of proper clinical diagnosis. The conclusion emphasizes the significance of considering sebaceous cysts in clinical diagnosis and the necessity of surgical enucleation for definitive treatment.

KEYWORDS: Sebaceous cyst, Epidermoid cyst, Keratin cyst, Ayurvedic management, Enucleation, Surgical excision

INTRODUCTION

Sebaceous cysts, also known as epidermoid or keratin cysts, are common benign skin growths arising from sebaceous glands in the skin. These glands are responsible for producing sebum, an oily substance that lubricates the skin and hair, preventing them from becoming dry and brittle. The sebaceous glands are found throughout the body, except on the palms of the hands and the soles of the feet. When the duct of a sebaceous gland becomes blocked or damaged, sebum accumulates within the gland, leading to the formation of a cyst.

Sebaceous cysts typically present as smooth, round, and mobile masses beneath the skin, varying in size from a few millimeters to several centimeters in diameter. They are often painless but can cause discomfort or tenderness if they become inflamed or infected. These cysts are commonly found on the scalp, face, neck, and torso, although they can occur anywhere on the body where sebaceous glands are present. They are characterized by their characteristic yellowish or whitish appearance due to the accumulation of sebum and keratinous material within the cyst.

In Ayurveda, sebaceous cysts are understood as manifestations of an imbalance in the Kapha dosha, particularly affecting the mamsa (muscle tissue) and meda (fat tissue). According to Ayurvedic principles, when the Kapha dosha becomes aggravated, it can lead to the formation of granthi (tumors or cysts) in various tissues of the body. Sebaceous cysts, therefore, can be viewed as a localized manifestation of systemic imbalance, requiring holistic management to address the underlying doshic disturbances.

The clinical management of sebaceous cysts typically involves surgical intervention, with complete excision of the cyst and its wall to prevent recurrence. However, conservative approaches such as intralesional steroid injections or incision and drainage may be considered in certain cases, particularly if the cyst is inflamed or infected. Ancillary investigations such as fine-needle aspiration cytology (FNAC), computed tomography (CT), or magnetic resonance imaging (MRI) may be utilized to confirm the diagnosis and guide treatment decisions.

In this case study, we present the clinical management of a sebaceous cyst through enucleation, highlighting the diagnostic approach, surgical technique, and postoperative care. Through detailed examination and management, we aim to provide insights into the effective management of sebaceous cysts and the importance of a multidisciplinary approach involving Ayurvedic principles and modern surgical techniques.



Case Report

A 22-year-old male student from Duttatota, Puri, Odisha presented to the Outpatient Department of Shalya Tantra, Gopabandhu Ayurveda Mahavidyalaya (GAM), Puri, with complaints of itching, swelling, and pricking pain on the left side of his face. Upon examination, a cyst with a diameter of 1-2 cm was observed at the site. The patient reported experiencing pain and discomfort, but there was no history of previous cysts or relevant medical conditions.

Given the clinical presentation consistent with a benign tumour, the decision was made to perform an enucleation procedure on an outpatient basis. Local anesthesia was administered at the base of the cyst, and hemostasis was ensured throughout the procedure. Under anesthesia, the cyst was excised, and the patient was discharged promptly following the procedure. Non-steroidal anti-inflammatory drugs (NSAIDs) were prescribed for pain management, along with Jatyadi ghrita for wound healing.

At the follow-up appointment on the third day post-procedure, the wound showed no signs of infection, pus, or swelling. The patient reported minimal pain and bleeding, and wound care instructions, including the application of Betadine and Jatyadi ghrita, were reiterated. Daily dressing changes were advised, and on the 30th day of follow-up, complete wound healing was observed.



DISCUSSION

Sebaceous cysts pose both diagnostic and therapeutic challenges to healthcare providers due to their diverse clinical presentations and potential complications. While traditional Ayurvedic principles offer valuable insights into the underlying pathophysiology of these cysts, modern approaches emphasize evidence-based diagnostic techniques and surgical interventions to achieve optimal patient outcomes.

In the context of modern medicine, the most effective approach to managing sebaceous cysts involves a combination of accurate diagnosis, appropriate surgical intervention, and meticulous postoperative care. Fine-needle aspiration cytology (FNAC) and imaging modalities such as computed tomography (CT) or magnetic resonance imaging (MRI) play crucial roles in confirming the diagnosis and evaluating the extent of cystic lesions. These diagnostic tools provide valuable information regarding cystic contents, wall thickness, and proximity to surrounding structures, guiding treatment decisions and surgical planning.

Surgical excision remains the cornerstone of treatment for sebaceous cysts, with enucleation being the preferred technique to ensure complete removal of the cyst and its capsule. Enucleation involves careful dissection of the cyst wall from surrounding tissues, minimizing the risk of recurrence and preserving cosmetic outcomes. In cases where the cyst is inflamed or infected, incision and drainage may be performed initially to alleviate symptoms before definitive surgical excision.

Advancements in minimally invasive techniques, such as endoscopic or laparoscopic approaches, offer additional benefits in select cases, including reduced surgical morbidity, shorter recovery times, and improved cosmesis. These techniques allow for precise visualization and manipulation of cystic lesions, facilitating complete excision while minimizing tissue trauma and scarring. Moreover, adjunctive measures such as intralesional steroid injections or laser ablation may be employed to reduce cyst size and inflammation, particularly in recurrent or refractory cases.



Postoperative care plays a crucial role in optimizing outcomes following surgical intervention for sebaceous cysts. Patients should be educated about wound care practices, including regular cleansing, application of topical antibiotics, and avoidance of trauma or manipulation to the surgical site. Close follow-up with healthcare providers is essential to monitor for signs of infection, recurrence, or other complications, ensuring timely intervention and optimal healing.

In summary, the clinical management of sebaceous cysts requires a comprehensive and multidisciplinary approach, integrating traditional Ayurvedic principles with modern diagnostic techniques and surgical interventions. By combining the strengths of both systems, healthcare providers can deliver personalized and effective care to patients with sebaceous cysts, achieving favorable outcomes and improving quality of life.

CONCLUSION

Sebaceous cysts, though benign, can cause diagnostic challenges, especially when large. Surgical enucleation remains the cornerstone of treatment, offering complete removal and preventing recurrence. Clinicians should consider sebaceous cysts in differential diagnoses of skin swellings, emphasizing the importance of accurate diagnosis and appropriate imaging techniques. Surgical intervention, coupled with proper post-operative care, ensures optimal outcomes for patients with sebaceous cysts.

REFERENCES

1. Kaviraj Dr. Ambikadutta Shastri *Sushruta Samhita*, edited with *Ayurveda TatvaSandipika*, nidaansthana. Varanasi: Choukambha Sanskrit Samsthan, poorvardha, 2015; Su.Ni.11/7
2. Dr. Bramhanand Tripathi, *Sharangadhar Samhita*, Varanasi, Chaukhamba Surbharati Prakshan, 2015
3. S. Das, *A concise Textbook of surgery*, Published by Dr. S. Das, 6th edition
4. Acharya Vidhyadhar Shukla. *Charak Samhita*, *Sutrasthana*, Varanasi, published by Chaukhambha Sanskrit pratisthan part-2, Edition-2008 Ch.Su.16/19



ADDRESSING SEXUAL HEALTH CONCERNS IN ADOLESCENT GIRLS: OBG NURSING PERSPECTIVES

Dr. (Prof) Meenu Paul¹

¹Professor, OBG Nursing, Anushree College of Nursing, Jabalpur, MP

ABSTRACT & ABOUT THE AUTHOR

Dr. (Prof.) Meenu Paul is an accomplished professional in the field of nursing, holding a BSc in Nursing and an MSc in Obstetrics and Gynecology Nursing from RGUHS, Bangalore. Her academic journey reached its pinnacle with a Ph.D. in Obstetrics and Gynecology Nursing from Malwanchal University, Indore. With over 15 years of rich and diverse experience, Dr. Meenu Paul has emerged as a leading expert in the realm of women's health. Currently serving as a dedicated faculty member at Anushree College of Nursing in Jabalpur, Madhya Pradesh, she brings a wealth of knowledge and expertise to her role.

Sexual health is a critical aspect of adolescent development, and addressing sexual health concerns in adolescent girls requires a comprehensive and sensitive approach. Obstetric and gynecological (OBG) nurses play a crucial role in providing education, support, and care to adolescent girls navigating issues related to sexual health. This review article explores various sexual health concerns faced by adolescent girls and examines the role of OBG nurses in addressing these concerns. Topics covered include reproductive anatomy and physiology education, contraception counseling, sexually transmitted infection (STI) prevention, menstrual health management, and promoting healthy relationships. The article also discusses the importance of culturally sensitive care and the need for ongoing education and training for OBG nurses to effectively support adolescent girls in their sexual health journey.

KEYWORDS: *Adolescent girls, sexual health, OBG nursing, reproductive health education, contraception counseling, sexually transmitted infections, menstrual health, healthy relationships.*

INTRODUCTION

Adolescence is a crucial period of development marked by physical, emotional, and social changes, including the exploration of sexual identity and behaviors. Sexual health is an integral component of overall well-being during adolescence, and addressing sexual health concerns is essential for promoting healthy development and preventing adverse outcomes. Adolescent girls face unique challenges and vulnerabilities related to sexual health, including contraception use, STI prevention, menstrual health management, and navigating relationships. OBG nurses are well-positioned to provide comprehensive care and support to adolescent girls, given their expertise in women's health and reproductive care.

Adolescence marks a pivotal period of physical, emotional, and social development characterized by significant changes in individuals' bodies, identities, and relationships. Amidst these transformations, adolescents often begin to explore their sexuality, navigate romantic relationships, and grapple with questions about sexual identity and behavior. This exploration of sexual health is a natural and essential aspect of adolescent development, yet it also brings forth numerous challenges and concerns, particularly for adolescent girls.

Sexual health encompasses not only the absence of disease but also the promotion of positive and respectful relationships, informed decision-making, and the fulfillment of sexual rights. For adolescent girls, achieving and maintaining sexual health involves navigating a complex landscape of biological, social, and cultural factors that influence their attitudes, behaviors, and experiences related to sexuality and reproduction.

While adolescence is a time of exploration and discovery, it is also a period of vulnerability, as young people may lack accurate information, resources, and support to make informed decisions about their sexual and reproductive health. Adolescent girls, in particular, face unique challenges and risks related to sexual health, including unintended pregnancy, sexually transmitted infections (STIs), menstrual disorders, and gender-based violence.

In this context, the role of obstetric and gynecological (OBG) nurses becomes paramount. OBG nurses are healthcare professionals with specialized training and expertise in women's health and reproductive care. They play a critical role in providing education, support, and care to adolescent girls as they navigate the complexities of sexual and reproductive health.



This review article aims to explore the various sexual health concerns faced by adolescent girls and examine the pivotal role that OBG nurses play in addressing these concerns. By providing a comprehensive overview of key issues and interventions, this article seeks to enhance understanding and awareness of the challenges faced by adolescent girls in relation to sexual health and to highlight the importance of OBG nursing in promoting positive sexual health outcomes among this population.

Throughout the following sections, we will delve into specific areas of sexual health care for adolescent girls, including reproductive anatomy and physiology education, contraception counseling, STI prevention, menstrual health management, and the promotion of healthy relationships. We will also discuss the importance of culturally sensitive care and ongoing education and training for OBG nurses to effectively support adolescent girls in their sexual health journey. Through this exploration, we aim to provide insights and recommendations for practice that are grounded in evidence-based research and informed by the unique perspectives and experiences of OBG nurses working in the field.

Reproductive Anatomy and Physiology Education: One of the fundamental roles of OBG nurses in addressing sexual health concerns in adolescent girls is providing education about reproductive anatomy and physiology. Understanding the menstrual cycle, ovulation, and fertilization is essential for empowering adolescent girls to make informed decisions about their sexual and reproductive health. OBG nurses can utilize age-appropriate educational materials and interactive tools to teach adolescent girls about their bodies and menstrual health. This education may include information about normal variations in menstrual cycles, signs of ovulation, and common menstrual disorders such as dysmenorrhea and menorrhagia.

During adolescence, young girls undergo significant physical and hormonal changes as they transition into adulthood. Understanding these changes is crucial for empowering adolescent girls to make informed decisions about their sexual and reproductive health. Reproductive anatomy and physiology education provided by obstetric and gynecological (OBG) nurses serve as the foundation for this understanding.

1. **Comprehensive Understanding of Reproductive Anatomy:** OBG nurses play a vital role in educating adolescent girls about their reproductive anatomy. This includes discussing the structures and functions of the female reproductive system, such as the ovaries, fallopian tubes, uterus, cervix, and vagina. Visual aids, diagrams, and models may be used to enhance understanding and facilitate discussions about reproductive anatomy in a clear and accessible manner.
2. **Menstrual Cycle Education:** An essential aspect of reproductive physiology education is teaching adolescent girls about the menstrual cycle. OBG nurses explain the hormonal changes that regulate the menstrual cycle, including follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, and progesterone. They discuss the phases of the menstrual cycle, including menstruation, follicular phase, ovulation, and luteal phase, highlighting the cyclical nature of menstruation and the purpose of each phase in preparation for potential pregnancy.
3. **Discussion of Puberty and Secondary Sexual Characteristics:** Puberty marks the onset of sexual maturity and is characterized by the development of secondary sexual characteristics. OBG nurses provide education about the physical changes that occur during puberty, such as breast development, pubic hair growth, and changes in body shape. They emphasize the variability in the timing and progression of puberty among individuals and address common concerns and questions that adolescent girls may have about their changing bodies.
4. **Normal Variations and Concerns:** OBG nurses educate adolescent girls about normal variations in reproductive anatomy and physiology, reassuring them that differences in menstrual cycle length, flow, and symptoms are often normal. They also discuss common reproductive health concerns that may arise during adolescence, such as irregular periods, menstrual cramps, and acne. OBG nurses provide guidance on when to seek medical attention for abnormal symptoms and encourage open communication with healthcare providers.
5. **Promoting Body Positivity and Self-Acceptance:** Reproductive anatomy and physiology education provided by OBG nurses also serve as an opportunity to promote body positivity and self-acceptance among adolescent girls. OBG nurses emphasize the importance of embracing one's body and recognizing the diversity of normalcy. They address societal pressures and stereotypes related to body image and encourage adolescent girls to develop a healthy and positive relationship with their bodies.
6. **Incorporating Culturally Sensitive Approaches:** Recognizing the cultural diversity among adolescent girls, OBG nurses incorporate culturally sensitive approaches into reproductive anatomy and physiology education. They acknowledge cultural beliefs and practices related to reproductive health and adapt educational materials and teaching strategies to respect individual cultural backgrounds. OBG nurses create a supportive and inclusive learning environment where adolescent girls feel comfortable asking questions and discussing sensitive topics related to reproductive anatomy and physiology.

Contraception Counseling: Access to contraception is vital for preventing unintended pregnancies among adolescent girls. OBG nurses play a key role in providing contraception counseling and helping adolescent girls select the most suitable contraceptive method based on their individual needs and preferences. This may include discussing the effectiveness, benefits, and potential side effects of various contraceptive options, such as oral contraceptives, contraceptive implants, intrauterine devices (IUDs), and barrier



methods. OBG nurses can also address misconceptions about contraception and emphasize the importance of consistent and correct use to maximize effectiveness.

Contraception counseling is a crucial component of sexual health care for adolescent girls provided by obstetric and gynecological (OBG) nurses. This section will delve into the various aspects of contraception counseling, including the importance of informed decision-making, the range of contraceptive options available, considerations for individual preferences and health needs, and addressing common misconceptions.

Importance of Informed Decision-Making: OBG nurses play a pivotal role in facilitating informed decision-making regarding contraception among adolescent girls. They create a safe and nonjudgmental environment where adolescents feel comfortable discussing their contraceptive needs and concerns. By offering comprehensive information about contraceptive methods, OBG nurses empower adolescents to make choices that align with their reproductive goals, lifestyle, and preferences.

Range of Contraceptive Options: OBG nurses educate adolescent girls about the diverse array of contraceptive methods available, ranging from hormonal contraceptives to barrier methods and long-acting reversible contraceptives (LARCs). They explain the mechanism of action, efficacy rates, potential side effects, and proper use of each method. Common contraceptive options discussed may include oral contraceptives, contraceptive patches, contraceptive injections, contraceptive implants, intrauterine devices (IUDs), and barrier methods such as condoms and diaphragms. OBG nurses also address emergency contraception options for adolescents who experience contraceptive failure or unprotected intercourse.

Considerations for Individual Preferences and Health Needs: Contraception counseling provided by OBG nurses takes into account the individual preferences, health history, and lifestyle factors of adolescent girls. They conduct thorough assessments to identify any contraindications or potential risks associated with specific contraceptive methods. For example, adolescents with a history of thromboembolic events may not be suitable candidates for hormonal contraceptives containing estrogen. OBG nurses also consider factors such as frequency of sexual activity, desire for future fertility, and adherence to daily or periodic contraceptive use when recommending suitable methods.

Addressing Common Misconceptions: OBG nurses address common misconceptions and myths surrounding contraception that may influence adolescents' decision-making. They provide accurate information to dispel misconceptions about contraceptive effectiveness, safety, and side effects. For instance, OBG nurses clarify that modern contraceptive methods are highly effective when used correctly and consistently, and they debunk myths about contraceptive methods causing infertility or weight gain. By addressing misconceptions, OBG nurses help adolescents make informed choices based on factual information rather than misinformation or hearsay.

Promoting Contraceptive Adherence: In addition to providing information about contraceptive methods, OBG nurses support adolescents in developing strategies to enhance contraceptive adherence. They emphasize the importance of consistent and correct use of contraception to maximize effectiveness in preventing unintended pregnancies. OBG nurses discuss strategies for remembering to take oral contraceptives daily, such as setting alarms or using smartphone apps. For adolescents using contraceptive injections or implants, OBG nurses provide guidance on scheduling follow-up appointments for reinjection or removal to ensure continuous protection against pregnancy.

Counseling on Dual Protection: OBG nurses advocate for the use of dual protection, which involves combining a contraceptive method with condoms to prevent both unintended pregnancy and sexually transmitted infections (STIs). They emphasize the importance of condom use in addition to hormonal or barrier contraceptives, as condoms provide a barrier against STIs, including HIV. OBG nurses provide education on correct condom use, including proper application and removal, and discuss strategies for negotiating condom use with sexual partners. By promoting dual protection, OBG nurses help adolescents prioritize their sexual health and reduce their risk of adverse outcomes.

Sexually Transmitted Infection (STI) Prevention: Adolescent girls are at increased risk of acquiring STIs due to factors such as engaging in unprotected sex and having multiple sexual partners. OBG nurses play a crucial role in STI prevention by providing education about safer sex practices, including the use of condoms and regular STI testing. OBG nurses can also offer STI screening and testing services in clinical settings and facilitate access to treatment for STIs when necessary. Additionally, OBG nurses can promote vaccination against human papillomavirus (HPV), which can help prevent cervical cancer and other HPV-related conditions.



Sexually transmitted infections (STIs) pose significant health risks for adolescent girls, underscoring the importance of prevention efforts. OBG nurses play a critical role in STI prevention by providing education, counseling, screening, and treatment services tailored to the unique needs of adolescent girls.

Education and Counseling

OBG nurses can initiate discussions about STI prevention during routine clinical encounters with adolescent girls. These discussions should cover topics such as the importance of practicing safer sex, using condoms consistently and correctly, and reducing the number of sexual partners. OBG nurses can also address misconceptions and myths about STIs, such as beliefs that only certain individuals are at risk or that STIs are always symptomatic.

In addition to individual counseling, OBG nurses can facilitate group education sessions or workshops on STI prevention in community settings, schools, or youth centers. These sessions may include interactive activities, role-playing exercises, and peer-led discussions to engage adolescent girls and reinforce key messages about sexual health and risk reduction strategies.

Screening and Testing

OBG nurses play a crucial role in offering STI screening and testing services to adolescent girls, which can help identify infections early and facilitate timely treatment. Screening recommendations may vary based on factors such as age, sexual activity, and risk behaviors. Common STIs screened for in adolescent girls include chlamydia, gonorrhea, syphilis, and HIV.

OBG nurses can perform genital examinations and collect specimens for laboratory testing during pelvic exams or well-woman visits. They can also provide guidance on self-collection methods for STI testing kits that may be available for home use or through community health programs. It's essential for OBG nurses to ensure confidentiality and privacy throughout the screening and testing process to promote trust and encourage open communication.

Treatment and Referral

When STIs are detected, OBG nurses can provide appropriate treatment or referral to other healthcare providers for further evaluation and management. Treatment options may include antibiotics for bacterial infections such as chlamydia and gonorrhea, antiviral medications for viral infections such as genital herpes and human papillomavirus (HPV), and counseling and support for individuals diagnosed with HIV.

In cases where STIs require ongoing management or specialist care, OBG nurses can facilitate referrals to infectious disease specialists, gynecologists, or other healthcare professionals with expertise in sexual health. OBG nurses can also offer support and follow-up care to ensure that adolescent girls receive the necessary treatment and follow-up testing to monitor their health status and prevent complications.

Prevention Strategies

In addition to education, counseling, screening, and treatment, OBG nurses can promote various prevention strategies to reduce the risk of STIs among adolescent girls. These strategies may include:

1. Encouraging abstinence from sexual activity or delaying sexual debut until individuals are ready and able to engage in safer sex practices.
2. Promoting the consistent and correct use of condoms during vaginal, anal, and oral sex to reduce the risk of STI transmission.
3. Providing information about alternative methods of sexual expression that carry lower risks of STI transmission, such as mutual masturbation or non-penetrative sexual activities.
4. Offering vaccinations against STIs such as human papillomavirus (HPV) and hepatitis B to prevent certain types of infections and associated health complications.
5. Advocating for comprehensive sex education programs in schools and communities that cover topics such as STI prevention, consent, healthy relationships, and communication skills.

By implementing a combination of education, counseling, screening, treatment, and prevention strategies, OBG nurses can play a pivotal role in reducing the burden of STIs among adolescent girls and promoting their sexual health and well-being.

Menstrual Health Management: Menstrual health is an important aspect of sexual health for adolescent girls, and OBG nurses can provide guidance and support for managing menstrual symptoms and disorders. OBG nurses can offer education about menstrual hygiene practices, such as proper menstrual product use and disposal, and provide recommendations for managing menstrual discomfort, such as using heat therapy, taking over-the-counter pain relievers, and practicing relaxation techniques. For adolescent girls with menstrual disorders such as polycystic ovary syndrome (PCOS) or endometriosis, OBG nurses can collaborate with other healthcare providers to develop individualized treatment plans and provide ongoing support.



Menstrual health management is a critical aspect of sexual health care for adolescent girls, as it directly impacts their physical comfort, emotional well-being, and overall quality of life. OBG nurses play a pivotal role in providing guidance, support, and resources to help adolescent girls effectively manage their menstrual cycles and address any associated symptoms or disorders.

1. **Comprehensive Education:** OBG nurses offer comprehensive education about menstrual health, covering topics such as the menstrual cycle, common menstrual disorders, and strategies for promoting menstrual well-being. This education empowers adolescent girls with accurate information about their bodies, enabling them to recognize normal variations in their menstrual cycles and identify potential signs of menstrual disorders. OBG nurses utilize age-appropriate educational materials and interactive tools to engage adolescent girls in learning about their menstrual health.
2. **Promoting Menstrual Hygiene:** OBG nurses emphasize the importance of maintaining good menstrual hygiene practices to prevent infections and promote comfort during menstruation. They provide guidance on proper menstrual product selection, including pads, tampons, menstrual cups, and period underwear, taking into account individual preferences and needs. OBG nurses educate adolescent girls on how to use menstrual products correctly, change them regularly, and dispose of them safely to minimize the risk of bacterial overgrowth and irritation.
3. **Managing Menstrual Discomfort:** Many adolescent girls experience menstrual discomfort, such as abdominal cramps, bloating, fatigue, and mood changes, during their menstrual periods. OBG nurses offer practical strategies for managing menstrual discomfort and improving overall well-being. This may include recommending over-the-counter pain relievers, such as nonsteroidal anti-inflammatory drugs (NSAIDs), to alleviate cramps and reduce inflammation. OBG nurses also encourage adolescent girls to engage in regular physical activity, practice relaxation techniques, and maintain a balanced diet to support menstrual health.
4. **Addressing Menstrual Disorders:** Some adolescent girls may experience menstrual disorders that require medical evaluation and treatment. Common menstrual disorders include dysmenorrhea (painful periods), menorrhagia (heavy menstrual bleeding), irregular menstrual cycles, and premenstrual syndrome (PMS). OBG nurses collaborate with healthcare providers to assess adolescent girls' menstrual symptoms and develop individualized treatment plans. This may involve prescribing hormonal contraceptives to regulate menstrual cycles, recommending lifestyle modifications to manage symptoms, or referring adolescent girls to specialists for further evaluation and management of complex menstrual disorders.
5. **Providing Emotional Support:** Menstruation can be a source of stress, embarrassment, or anxiety for some adolescent girls, particularly if they experience menstrual problems or face social stigma related to menstruation. OBG nurses offer emotional support and validation to adolescent girls who may feel overwhelmed or distressed by their menstrual experiences. They create a safe and supportive environment where adolescent girls can express their concerns, ask questions, and seek reassurance without fear of judgment or criticism. OBG nurses also facilitate peer support groups or educational sessions to foster open dialogue and normalize discussions about menstruation among adolescent girls.

Promoting Healthy Relationships: Healthy relationships are essential for adolescent girls' emotional and sexual well-being, and OBG nurses can play a role in promoting positive relationship dynamics and preventing dating violence. OBG nurses can offer education about healthy communication skills, boundary setting, and consent, as well as provide resources and referrals for adolescents experiencing relationship problems or abuse. OBG nurses can also advocate for comprehensive sex education programs in schools and community settings to equip adolescent girls with the knowledge and skills to navigate relationships safely and respectfully.

Healthy relationships are fundamental to the overall well-being of adolescent girls, influencing their emotional, social, and sexual development. OBG nurses play a vital role in promoting healthy relationship dynamics and preventing dating violence by offering education, support, and resources to adolescents.

Education on Healthy Communication: One key aspect of promoting healthy relationships is providing education on effective communication skills. OBG nurses can guide adolescent girls in understanding the importance of open, honest communication in relationships. This includes teaching active listening techniques, assertiveness, and conflict resolution strategies. By empowering adolescents with these skills, OBG nurses help them navigate difficult conversations and express their needs and boundaries in relationships.

Understanding Boundaries and Consent: OBG nurses also play a crucial role in educating adolescents about the concept of boundaries and consent in relationships. Adolescents need to understand that everyone has the right to set boundaries and that consent must be freely given, informed, and enthusiastic. OBG nurses can facilitate discussions on topics such as personal space, physical touch, and sexual consent, helping adolescents recognize and respect their own boundaries and those of others.

Identifying Signs of Unhealthy Relationships: In addition to promoting positive relationship behaviors, OBG nurses must also help adolescents recognize signs of unhealthy relationships or dating violence. This may include physical, emotional, or sexual abuse, controlling behaviors, or manipulation. OBG nurses can provide information on warning signs and red flags in relationships



and empower adolescents to seek help if they feel unsafe or threatened. Creating a safe and nonjudgmental environment is essential for adolescents to feel comfortable disclosing their experiences and seeking support.

Access to Resources and Support Services: OBG nurses play a crucial role in connecting adolescents with resources and support services to address relationship concerns or experiences of dating violence. This may include providing information on local crisis hotlines, counseling services, or shelters for survivors of abuse. OBG nurses can also collaborate with other healthcare providers, social workers, or community organizations to ensure that adolescents receive comprehensive support tailored to their individual needs. Empowering adolescents to access support services is essential for promoting their safety and well-being in relationships.

Advocacy for Comprehensive Sex Education: In addition to individual interventions, OBG nurses can advocate for comprehensive sex education programs in schools and community settings. Comprehensive sex education goes beyond basic anatomy and contraception and includes topics such as healthy relationships, consent, communication skills, and sexual decision-making. OBG nurses can collaborate with educators, policymakers, and community stakeholders to promote the implementation of evidence-based sex education programs that empower adolescents with the knowledge and skills to navigate relationships safely and respectfully.

Culturally Sensitive Care: Cultural factors can significantly influence adolescent girls' attitudes and beliefs about sexual health, and OBG nurses must provide care that is respectful of cultural diversity and sensitive to individual values and preferences. OBG nurses should strive to create a supportive and nonjudgmental environment where adolescent girls feel comfortable discussing sensitive topics related to sexual health. This may involve acknowledging and addressing cultural norms, beliefs, and practices that may impact sexual health behaviors and decision-making. OBG nurses can also collaborate with interpreters or cultural liaisons to ensure effective communication with adolescent girls from diverse cultural backgrounds.

Education and Training for OBG Nurses: Continuing education and training are essential for OBG nurses to stay up-to-date on best practices in adolescent sexual health care and enhance their skills and competencies. OBG nurses can pursue specialized training programs or certifications in adolescent health or sexual and reproductive health to deepen their knowledge and expertise in this area. Additionally, OBG nurses can participate in professional development activities such as workshops, conferences, and webinars to learn about emerging trends and evidence-based interventions in adolescent sexual health care. By investing in ongoing education and training, OBG nurses can enhance their ability to provide high-quality care and support to adolescent girls across diverse settings.

Conclusion: Addressing sexual health concerns in adolescent girls requires a multifaceted approach that considers the unique needs and experiences of this population. OBG nurses play a crucial role in providing education, support, and care to adolescent girls as they navigate issues related to reproductive and sexual health. By offering comprehensive reproductive health education, contraception counseling, STI prevention services, menstrual health management, and support for healthy relationships, OBG nurses can empower adolescent girls to make informed decisions and lead healthy lives. Culturally sensitive care and ongoing education and training are essential for OBG nurses to effectively meet the needs of adolescent girls and promote positive sexual health outcomes.

REFERENCES

1. American College of Obstetricians and Gynecologists (ACOG). (2014). Committee Opinion No. 598: Committee on Adolescent Health Care: The Adolescent's Right to Confidential Care When Considering Abortion. *Obstetrics & Gynecology*, 123(2 Pt 1), 497-500.
2. Ouedraogo, A. (2024). Using Total Cohort Fertility in Adolescence (TCFA) to analyse adolescent fertility trends and factors in Niger: Evidence from 1992 to 2012 demographic and health surveys. *African Journal of Reproductive Health*, 28(2).
3. Bearinger, L. H., Sieving, R. E., Ferguson, J., & Sharma, V. (2007). Global perspectives on the sexual and reproductive health of adolescents: Patterns, prevention, and potential. *The Lancet*, 369(9568), 1220-1231.
4. Brown, W. E. (1964). OBG: POSTGRADUATE EDUCATION for nurses in obstetric, gynecologic and neonatal nursing care. *Hospital Topics*, 42(12), 81-85.
5. Blake, S. M., Ledsky, R., Goodenow, C., O'Donnell, L., & D'Augelli, A. (2001). Recency of immigration, substance use, and sexual behavior among Massachusetts adolescents. *American Journal of Public Health*, 91(5), 794-798.
6. Haase, M. N. (1971). OBG: Giving Supportive Care During Labor: A Rewarding Experience for Nurse. *Hospital Topics*, 49(5), 47-54.
7. Morgan, C. A. (1972). OBG: How OB Nurse-Specialist Functions. *Hospital Topics*, 50(3), 71-74.
8. Tema, A. L. Factors influencing Teenage Pregnancy among Girls attending Kampala International University Teaching Hospital, Bushenyi, Uganda.
9. Freedman, L. Z. (1966). OBG: Communication between mother, doctor and nurse in hospital obstetrics. *Hospital Topics*, 44(3), 102-107.
10. Jose, G. (2023). BRIDGING DISTANCES, ENHANCING CARE: THE TELEHEALTH REVOLUTION IN OBG NURSING. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 9(9), 257-259.



11. Paul, M. (2024). THE OBG NURSE'S ROLE IN REPRODUCTIVE JUSTICE: ADVOCATING FOR EQUITABLE ACCESS TO REPRODUCTIVE HEALTHCARE SERVICES. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 10(2), 199-202.
12. James, M. A. *Quality Improvement in Nursing Management*.
13. Paul, M. (2024). Family-Centered Maternity Care: Facilitating Communication and Involvement in the Birthing Process. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 204-209.
14. Leeba, L. J., Smitha, P. V., & Usharani, E. N. (2024). Topical Application of Avena Sativa in Managing Uremic Xerosis, Hyperpigmentation, and Pruritus among Patients with Chronic Kidney Disease: A Comprehensive Review. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 189-197.
15. Iare, L. S., Francis, A., S, A., Biju, A., George, A., Sabu, A., Shaju, A., P B, A., Sabu, A., Pauly, A. M., Shaji, A., James, A., & L J, L. (2024). A Study To Assess The Effectiveness Of Structured Teaching Program On Knowledge Regarding Menstruation Among Adolescent Boys In A Selected High School, Muvattupuzha. *Brio International Journal of Nursing Research (BIJNR)*, 5*(1)*, 161-166.
16. Centers for Disease Control and Prevention (CDC). (2021). Sexually Transmitted Disease Surveillance 2019. U.S. Department of Health and Human Services. Retrieved from <https://www.cdc.gov/std/stats19/default.htm>
17. Gavin, L., MacKay, A. P., Brown, K., Harrier, S., Ventura, S. J., Kann, L., ... & Ryan, G. (2009). Sexual and reproductive health of persons aged 10–24 years – United States, 2002–2007. *MMWR Surveill Summ*, 58(6), 1-58.
18. Guttmacher Institute. (2021). State Policies in Brief: An Overview of Abortion Laws. Retrieved from <https://www.guttmacher.org/state-policy/explore/overview-abortion-laws>
19. Hall, K. S., Moreau, C., Trussell, J., Barber, J. (2013). Young women's consistency of contraceptive use – Does depression or stress matter? *Contraception*, 88(5), 641-649.
20. Tripathi, Prashant Shekhar. (2024). Peer support programs in mental health nursing: Harnessing lived experience for recovery. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 234-242. Retrieved from <https://bijnr.in/index.php/current-issue/>
21. Kumar, S. J. (2024). Beyond Healing: Pioneering Recovery-Oriented Care in Mental Health Nursing. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 198-203.
22. Johns Hopkins Bloomberg School of Public Health. (2019). Adolescent Health: Think, Act, Grow® (TAG). Retrieved from https://www.jhsph.edu/research/centers-and-institutes/center-for-adolescent-health/_pdf/Think-Act-Grow-Adolescent-Health-Toolkit.pdf
23. Kirby, D. B., Lepore, G., & Ryan, J. (2005). Sexual risk and protective factors: Factors affecting teen sexual behavior, pregnancy, childbearing and sexually transmitted disease: Which are important? Which can you change? ETR Associates.
24. Markham, C. M., Tortolero, S. R., Peskin, M. F., Shegog, R., Thiel, M., & Baumler, E. R. (2012). Sexual risk avoidance and sexual risk reduction interventions for middle school youth: A randomized controlled trial. *Journal of Adolescent Health*, 50(3), 279-288.
25. Miller, E., Decker, M. R., McCauley, H. L., Tancredi, D. J., Levenson, R. R., Waldman, J., ... & Silverman, J. G. (2010). Pregnancy coercion, intimate partner violence and unintended pregnancy. *Contraception*, 81(4), 316-322.
26. National Association of School Nurses (NASN). (2016). Sexual Health Education Position Statement. Retrieved from <https://www.nasn.org/nasn/resources/practice-topics/sexualhealth>
27. National Institutes of Health (NIH). (2018). NIH strategic plan for women's health research. Retrieved from https://orwh.od.nih.gov/sites/orwh/files/docs/ORWH_Strategic_Plan_2019_V4_Final_508.pdf
28. Ott, M. A., Santelli, J. S., Abma, J., & Lorusso, J. M. (2009). Views about sexuality education among urban Black and Latino parents of preteens. *Perspectives on Sexual and Reproductive Health*, 41(1), 39-47.
29. Raifman, J., Dean, L. T., Montgomery, M. C., Almonte, A., Arrington-Sanders, R., & Chan, P. A. (2021). Relationship between state-level policies governing sex education and adolescent sexual and reproductive health. *Journal of Adolescent Health*, 69(5), 775-781.
30. Santelli, J., Ott, M. A., Lyon, M., Rogers, J., Summers, D., & Schleifer, R. (2006). Abstinence and abstinence-only education: A review of U.S. policies and programs. *Journal of Adolescent Health*, 38(1), 72-81.
31. Sedgh, G., Finer, L. B., Bankole, A., Eilers, M. A., & Singh, S. (2015). Adolescent pregnancy, birth, and abortion rates across countries: Levels and recent trends. *Journal of Adolescent Health*, 56(2), 223-230.
32. Society for Adolescent Health and Medicine (SAHM). (2017). Sexual and Reproductive Health Care: A Position Paper of the Society for Adolescent Health and Medicine. *Journal of Adolescent Health*, 61(3), 427-432.
33. The American Congress of Obstetricians and Gynecologists (ACOG). (2018). Committee Opinion No. 710: Counseling Adolescents About Contraception. *Obstetrics & Gynecology*, 131(3), e142-e149.
34. The American College of Nurse-Midwives (ACNM). (2019). Nurse-Midwives and Adolescent Reproductive Health Care. Retrieved from <https://www.midwife.org/acnm/files/cclibraryfiles/filename/000000014996/ACNM%20Adolescent%20Reproductive%20Health%20Policy%20Brief%20Feb%202019.pdf>
35. United Nations Population Fund (UNFPA). (2015). Adolescent Sexual and Reproductive Health Toolkit for Humanitarian Settings. Retrieved from https://www.unfpa.org/sites/default/files/resource-pdf/UNFPA_Adolsexualreprohealthtoolkit_Humanitarian-Settings.pdf
37. World Health Organization (WHO). (2019). Adolescent Health. Retrieved from https://www.who.int/health-topics/adolescent-health#tab=tab_1



DETERMINATION OF TRACE HEAVY METALS IN FISH SPECIES BY DIFFERENT ANALYTICAL TECHNIQUES

Godal Ayesha Naushadali, Dr. Madhuri Hinge

ABSTRACT

Heavy metal pollution is a serious environmental problem. The presence of such metals in different areas of an ecosystem subsequently leads to the contamination of consumable products such as dietary and processed materials. Accurate monitoring of metal concentrations in various fish samples is of importance in order to minimize health hazards resulting from exposure to such toxic substances. For this purpose, it is essential to have a general understanding of the basic principles for different methods of elemental analysis. This article provides an overview of the most sensitive techniques of elemental analysis such as atomic absorption, ICP-OES mass spectrometry, Gas chromatography, and other techniques.

INTRODUCTION

Heavy metals, with their high density and toxicity at low concentrations, pose significant health risks to humans. While the body requires trace elements like Calcium and Magnesium for health, heavy metals such as Lead, Copper, Cadmium, and Zinc are toxic and can lead to various health issues including impaired kidney and liver function, decreased cognitive abilities, reproductive impairments, hypertension, neurological changes, and even cancer.

Heavy metals enter the food web primarily through water or organisms, potentially accumulating in edible fish. Fish, a vital part of many diets due to its nutritional value, also serve as indicators of heavy metal contamination in aquatic systems. Their varied ecological roles, metabolisms, and habitats make them sensitive to environmental pollution levels.

The intake of heavy metals by fish depends on factors such as salinity, pollution levels, diet, and sediment composition. Marine fish, being directly exposed to water and sediment contaminants, can accumulate heavy metals, which poses risks to human health upon consumption.

Understanding heavy metal contamination in marine fish is crucial for food safety and environmental health. Monitoring and regulating heavy metal levels in aquatic environments are essential to mitigate health risks associated with fish consumption and preserve ecosystem integrity.

1.1 SOURCES OF HEAVY METAL POLLUTION

Heavy metal pollution originates from diverse sources including mining, industrial, domestic, urban, and agricultural activities, as well as atmospheric emissions and petroleum-related industries. Specific activities like copper melting, nuclear fuel preparation, and electroplating contribute to the release of cadmium, lead, and zinc into the environment. As fish age and feed, these metals are absorbed into their tissues, where they can accumulate over time.

In natural waters, metals exist in soluble or particulate forms, with labile compounds posing the greatest risk to fish. These compounds include various ionic forms with different availability to fish. Field studies have shown that fish can accumulate significant amounts of metals without experiencing mortality, with different metals accumulating in fish tissues at varying rates. Generally, higher environmental metal concentrations result in increased uptake and accumulation in fish.

1.2 BIOACCUMULATION OF HEAVY METALS

Metal accumulation in fish follows a pattern, with iron, zinc, lead, copper, cadmium, and mercury being commonly observed. The extent of accumulation varies among fish species and is influenced by factors such as pollution levels and species-specific behaviors. Understanding these dynamics is crucial for assessing environmental health and managing heavy metal contamination in aquatic ecosystems.



2. ANALYTICAL METHODS

2.1 INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY (ICP-MS)

ICP-MS, utilizing inductively coupled plasma, efficiently detects metals and non-metals in liquid samples, including different isotopes of elements. Concentrations of Cd, Cu, Mn, and Zn were assessed in muscle, liver, and gills of *Arius thalassinus* and *Johnius belangeri* from Kapar and Mersing, Peninsular Malaysia. Results showed Zn and Cd had the highest and lowest concentrations respectively in all tissues. *A. thalassinus* exhibited higher metal levels than *J. belangeri*. However, none of the metal concentrations in muscles exceeded standard guidelines, indicating no health hazards for consumers.

2.2 GAS CHROMATOGRAPHY (GC)

In chromatographic analysis, a mixture's components partition between a stationary phase and a mobile phase, with interactions varying based on properties and structures. Methyl mercury, extracted as bromide from fish and sediment and chloride from water, undergoes a cleanup procedure converting it to iodide for gas chromatographic analysis. Recoveries averaged 88.5% for water, 95.5% for perch, and 96.3% for sediments. When applied to polluted river sediments, a correlation between total and methyl mercury concentrations was established in the 0-10 µg/g range, but failed for samples with high inorganic mercury levels.

2.3 ATOMIC ABSORPTION SPECTROSCOPY (AAS)

Atomic Absorption Spectroscopy (AAS) was utilized to quantify heavy metal concentrations in eight popular cultured fish species from Dhaka, Bangladesh, revealing no health risks based on estimated daily intake (EDI) except for arsenic, which posed a cancer risk. Two wet destruction methods were compared for sample dissolution in tuna (*Euthynnus affinis*), with the HNO₃, H₂SO₄, HClO₄ (1:2:1) mixture showing greater efficiency. AAS measurements indicated heavy metal levels within permissible limits in tuna, with the standard addition method yielding more precise results. Additionally, a Zeeman Mercury analyzer facilitated rapid mercury determination in fish, with most samples below recommended levels by FAO/WHO.

2.4 INDUCTIVELY COUPLED PLASMA OPTICAL EMISSION SPECTROSCOPY (ICP-OES)

ICP-OES, utilizing argon plasma to excite atoms and ions, enables the quantitative determination of elements in samples. By emitting photons at specific wavelengths during the transition from excited to ground states, the technique accurately measures elemental concentrations. In Beymelek Lagoon, heavy metal accumulation ratios in various tissues of multiple fish species were investigated, with concentrations found to be lower than other contaminated Mediterranean regions of Turkey. In another study, liver samples from farmed or wild fish were analyzed for multiple elements, revealing higher concentrations in liver compared to muscle, with Cd and Pb levels exceeding European Commission regulations in a significant portion of samples. However, Hg and As levels remained below legislated limits across all samples.

2.5 HYDRIDE GENERATION ATOMIC ABSORPTION SPECTROSCOPY (HGAAS)

In the hydride technique a continuous flow system involves the reaction of acidified aqueous samples with a reducing agent such as sodium borohydride to generate volatile hydride, which is then transported to the heated quartz cell (atomizer) along the optical axis of the conventional AAS by mean of an argon gas. In the quartz cell the hydrides are converted to gaseous metalloid analyte atoms in the path of a source lamp and a signal is generated by measuring the amount of light absorbed. HGAAS technique is restricted to certain elements.

HGAAS was applied for the determination of As in canned tuna fish from the Persian Gulf area of Iran. As concentration varied from 0.0369 to 0.2618 with an average value of 0.128 ppm. The hydride method was used was developed for the determination of arsenic in sea fish. Mean concentrations were 0.039, 0.036, and 0.075 ppm, respectively.

2.6 COLD VAPOUR ATOMIC ABSORPTION SPECTROSCOPY (CVAAS)

Cold Vapor Atomic Absorption Spectrometry (CVAAS) is a primary technique for mercury analysis, utilizing a peristaltic pump to transport samples and stannous chloride into a Gas Liquid Separator (GLS) where mercury vapor is released by introducing pure, dry gas (typically argon). The vapor is carried into an atomic absorption optical cell, where it absorbs light at 253.7 nm in proportion to its concentration. This flameless procedure allows for mercury detection at room temperature, with results showing mercury concentrations in fish samples from Ghana ranging from 0.004 to 0.122 ppm and from 0.721 to 1.41 ppm in fish from Karachi, Pakistan. Mercury was also detected in natural remedies and pharmaceuticals, with concentrations ranging from 0.51 to 2.35 ppm. Another method utilizing CVAAS, involving a mixture of HNO₃, HClO₄, and H₂SO₄ for complete oxidation of organic tissue, revealed mercury concentrations in fish from Ghana below the WHO limit of 0.5 µg g⁻¹ wet weight, suggesting no significant mercury exposure through fish consumption.



2.7 NEUTRON ACTIVATION ANALYSIS (NAA)

Neutron Activation Analysis (NAA) is an analytical procedure used to detect trace elements in various matrices. In this technique, samples are exposed to a neutron flow, generating radioactive isotopes for the elements of interest. As these isotopes decay, they emit delayed gamma rays with characteristic energies, allowing for quantitative measurement of element concentrations. NAA was applied to determine heavy metal concentrations in green tiger shrimp and blue crab from the Persian Gulf, revealing concentrations ranging from 1.91 to 25.43 ppm for Mn, 21.38 to 8.28 ppm for As, 0.15 to 0.40 ppm for Co, 62.87 to 288 ppm for Fe, and 66.64 to 68.73 ppm for Zn. Additionally, NAA detected V, As, Cd, Cr, Cu, Fe, Mn, Ni, and Zn in fish samples from an irrigation facility in Ghana, with concentrations ranging from 0.02 to 45.95 ppm.

2.8 DIFFERENTIAL PULSE ANODIC STRIPPING VOLTAMMETRY (DPASV)

DPASV (differential pulse stripping anodic voltammetry) is an electrochemical technique used for determining lead (Pb) and cadmium (Cd) contents in fish muscle samples. In this method, the analyte is first electroplated onto the working electrode and then removed or 'stripped' by applying an oxidizing potential. The cell current is measured as a function of time and potential between the indicator and reference electrodes. Lead and cadmium concentrations were determined in 17 commercially used fish species from the South Egypt River Nile (Aswan) after lyophilization, milling, and decomposition with mixed acid ($\text{HNO}_3 + \text{HClO}_4$). The accuracy was validated using certified reference material CRM No. 422. Results indicate that fish from the Egypt River Nile area are a good source of these essential elements, demonstrating the effectiveness of the DPASV method as an analytical routine for such samples.

3. SUMMARY OF ANALYTICAL METHODS

Table 1: Summary of Analytical methods

HM	ICP-MS	GC	AAS	ICP-OES	HGAAS	CVAAS	NAA	DPASV
Cd	✓		✓				✓	✓
Cu	✓		✓	✓			✓	
Zn	✓		✓	✓			✓	
Mn	✓			✓			✓	
Hg		✓	✓	✓		✓		
Pb			✓	✓				✓
Cr			✓	✓			✓	
As			✓	✓	✓		✓	
Fe				✓			✓	
Mg				✓				
Ni				✓			✓	
Co				✓			✓	
B				✓				
V							✓	
Ba				✓				
Sr				✓				

4. CONCLUSION

- The heavy metals like Cd, Cu, Zn, Mn etc. concentration in different fish species have been determined using different analytical techniques. Therefore, regular monitoring of heavy metal concentrations in fish tissue is necessary.
- Although the concentrations of heavy metals in the fish and water column were detected in low concentrations, the potential for metal toxicity danger may become more severe in the future depending upon the extent of industrial and domestic wastewater influx into the water bodies due to human activities in the adjacent areas.
- To develop a healthy freshwater fishing industry and to prevent heavy metal risks to human health, the water standards and concentrations of heavy metals in the water column and fish should be monitored regularly.
- An extensive range of analytical methods are available for trace elemental analysis in different species of fishes, a number of which have been discussed in this review.
- The type of sample and concentration range of heavy metal influence the selection of the technique to be used.
- Overall it was found that Inductively coupled plasma- optical emission spectroscopy technique, could provide not only analysis of wide range of heavy metals but also ensure immense reliability by exhibiting good precision and accuracy at trace level.
- Thus, this study can be used to determine the level of trace heavy metals in fish species by different analytical techniques and therefore be useful in the future for the people who consume it.



5. REFERENCES

1. Muti'ah, Jackson Siahaan, I Nyoman Loka, Jono Irawan, "The Efficiency of Heavy Metal Analysis Method in Marine Fish Samples by Atomic Absorption Spectrophotometry." *Jurnal Penelitian Pendidikan IPA*. 2022, 8(2), 963-968.
2. F. H. Bashir, M. S. Othman, A. G. Mazlan, S. M. Rahim, K. D. Simon, "Heavy Metal Concentration in Fishes from the Coastal Waters of Kapar and Mersing, Malaysia." *Turkish Journal of Fisheries and Aquatic Sciences*. 2013, 13, 375-382.
3. Elahe Bozorgzadeh a,b, Ardalan Pasdaran c, Heshmatollah Ebrahimi-Najafabadi d, "Determination of toxic heavy metals in fish samples using dispersive micro solid phase extraction combined with inductively coupled plasma optical emission spectroscopy." *Food Chemistry*. 2021, 346(128916), 1-8.
4. Azaman et al, "Heavy metal in fish: analysis and human health-a review." *Jurnal Teknologi (Sciences & Engineering)*. 2015, 77(1), 61-69.
5. Enkeleda Ozuni, Luljeta Dhaskali, Jetmira Abeshi, Muhamet Zogaj, Imer Haziri, Doriana Beqiraj, Fatgzim Latifi, "Heavy Metals in fish for public consumption and consumer protection." *Natura Montenegrina, Podgorica*. 2010, 9(3), 843-851.
6. Al-Bukhaiti WQ, Noman A, Qasim AS, Al-Farga A, "Gas chromatography: Principles, advantages and applications in food analysis." *Int J AgricInnov Res*. 2017, 6(1), 123-128.
7. James E. Longbottom, Ronald C. Dressman, and James J. Lichtenberg, "Gas Chromatographic Determination of Methyl Mercury in Fish, Sediment, and Water." *Journal Of The Aoac*. 1973, 56(6), 1297-1303.
8. Paudel S, Kumar S, Mallik A, "Atomic absorption spectroscopy: a short review." *Epra. Int. J. Dev. Res.* 2021, 6(9), 322-327.
9. A.K.M. Atique Ullah, M.A. Maksud, S.R. Khan, L.N. Lutfu, Shamshad B. Quraishi, "Dietary intake of heavy metals from eight highly consumed species of cultured fish and possible human health risk implications in Bangladesh." *Toxicology Reports*. 2014, 7, 574-579.
10. Kazim Uyul, Yilmaz Emre, Esengül Köse, "The determination of heavy metal accumulation ratios in muscle, skin and gills of some migratory fish species by inductively coupled plasma-optical emission spectrometry (ICP-OES) in Beymelek Lagoon (Antalya/Turkey)." *Microchemical Journal*. 2008, 90, 67-70.
11. Ahmed F. Al-Hossainy, Adila E. Mohamed, Fatma S.M. Hassan, M.M. Abd Allah, "Determination of cadmium and lead in perch fish samples by differential pulse anodic stripping voltammetry and furnace atomic absorption spectrometry." *Arabian Journal of Chemistry*. 2021, 1-8.
12. Henry F, Amara R, Cou+rcot L, Lacouture D, Bertho ML, "Heavy metals in four fish species from the French coast of the Eastern English Channel and Southern Bight of the North Sea." *Environ Int*. 30(5), 675-83.
13. Canli, M., & Atli, G, "The relationships between heavy metal (Cd, Cr, Cu, Fe, Pb, Zn) levels and the size of six Mediterranean fish species." *Environmental Pollution*. 2003 121, 128-136.
14. Turkmen, A., Turkmen, M., Tepe, Y., & Akyurt. I, "Heavy metals in three commercially fish species from Iskenderun Bay, Northern East Mediterranean Sea." *Food Chemistry*. 2005, 91, 167-172.
15. Zauke, G. P., Savinov, V. M., Rittherhoff, J., & Savinova., T. "Heavy metals in fish from the Barents Sea." *The Science of. The Total Environment*. 1999, 277, 161-173.
16. Abdel-Baki AS, Dkhil MA, Al-Quraishi S, "Bioaccumulation of some heavy metals in tilapia fish relevant to their concentration in water and sediment of Wadi Hanifah, Saudi Arabia." *African Journal of Biotechnology*. 2011, 10, 2541-2547.
17. Ahmad MK, Islam S, Rahman S, Haque MR, Islam MM, "Heavy metals in water, sediment and some fishes of Buriganga River." *Bangladesh. Int. J. Environ. Res*. 2010 4, 321 - 332.
18. Tu'zen, M., "Determination of heavy metals in fish samples of the middle Black Sea (Turkey) by graphite furnace atomic absorption spectrometry." *Food Chemistry*. 2003, 80 (1), 119- 123.
19. Boutakhrif, K., Claus, R., Bolle, F., Degroot, J.M., and Goeyens, L., "Open digestion under reflux for the determination of total arsenic in seafood by inductively coupled plasma atomic emission spectrometry with hydride generation." *Talanta*. 2005, 66 (4), 1042- 1047.
20. Cid, B.P., Bo'ia, C., Pombo, L., and Rebelo, E, "Determination of trace metals in fish species of the Ria de Aveiro (Portugal) by electrothermal atomic absorption spectrometry." *Food Chemistry*. 2001, 75 (1), 93 - 100.
21. Serafimovski, I., Karadjova, I.B., Stafilov, T., and Tsalev, D.L. "Determination of total arsenic and toxicologically relevant arsenic species in fish by using electrothermal and hydride generation atomic absorption spectrometry." *Microchemical Journal*, 2006, 83, 55 - 60.
22. Manutsewe, N., Aeungmaitrepirom, W., Varanusupakul, P., and Imyim, A. "Determination of Cd, Cu, and Zn in fish and mussel by AAS after ultrasound-assisted acid leaching extraction." *Food Chemistry*. 2007, 101 (2), 817- 824.
23. Bugallo, R.A., Segade, S.R., and Go'mez, E.F. "Comparison of slurry sampling and microwave-assisted digestion for calcium, magnesium, iron, copper and zinc determination in fish tissue samples by flame atomic absorption spectrometry" *Talanta*, 2007, 72, 60 - 65.
24. Bosch, A. C., O'Neill, B., Sigge, G. O., Kerwath, S. E., & Hoffman, "Heavy metals in marine fish meat and consumer health: A review: Heavy metals in marine fish meat." *Journal of the Science of Food and Agriculture*. 2016, 96(1), 32-48.
25. Cui, L., Ge, J., Zhu, Y., Yang, Y., & Wang, J, "Concentrations, bioaccumulation, and human health risk assessment of organochlorine pesticides and heavy metals in edible fish from Wuhan, China." *Environmental Science and Pollution Research*. 2015, 22(20), 15866-15879.
26. Islam, M. S., Ahmed, M. K., & Habibullah-Al-Mamun, M.d., "Determination of heavy metals in fish and vegetables in Bangladesh and health implications. Human and Ecological Risk Assessment." *An International Journal*. 2015, 21(4), 986-1006.s
27. Farombi EO, Adelowo OA, Ajimoko YR, "Biomarkers of oxidative stress and heavy metal levels as indicator of environmental pollution in African Catfish (*Clarias gariepinus*) from Nigeria Ogun River." *International Journal of Environmental Research and Public Health*. 2007, 4, 158-165.



28. Ahmad, H. Abu Hilal, and Ismail, N. S, "Heavy Metals in Eleven Common Species of Fish from the Gulf of Aqaba, Red Sea." *Jordan Journal of Biological Sciences*. 2007, 1(1), 13-18.
29. Ikem, A. and Egiebor, N.O., "Assessment of trace elements in canned fishes (Mackerel, Tuna, Salmon, Sardines and Herrings) marketed in Georgia and Alabama (United States of America)", *Journal of Food Composition and Analysis*, 2005, 18, 771-787.
30. Mendil, D., nal, O.F., Tuzen, M. and Soylak, M, "Determination of trace metals in different fish species and sediments from River Yes, ildirnak in Tokat, Turkey." *Food Chem Toxicol*. 2010, 48, 1383-1392.
31. S.S. Saei-Dehkordi, A.A. Fallah, "Determination of copper, lead, cadmium and zinc content in commercially valuable fish species from the Persian Gulf using derivative potentiometric stripping analysis." *Microchem. J*. 2011, 98, 156-162.



HOME NUMERACY PRACTICES AND ATTITUDES TOWARDS LEARNING MATHEMATICS AS PREDICTORS OF ACADEMIC PERFORMANCE OF STUDENTS

Joyale M. Abarro¹, Ma. Melanie N. Edig, Ph.D.²

¹St. Mary's College of Tagum, Inc., Tagum City, Davao del Norte

²Davao del Norte State College, Associate Professor V

ABSTRACT

This quantitative study investigated the predictive significance of home numeracy practices and attitudes towards learning mathematics on the academic performance of grade 7 students from four public secondary schools in Santo Tomas District, Division of Davao del Norte. Three hundred two respondents were identified using stratified random sampling. Two adopted, validated survey questionnaires and one researcher-made test were utilized in the study to gather data, which were then analyzed using mean, standard deviation, Pearson-r and multiple regression analysis. The results demonstrated that the home numeracy practices both informal and formal are high, student's attitudes towards learning mathematics are high and their academic performance are low. The data also demonstrated that home numeracy practices and attitudes towards learning mathematics are not statistically significant predictors of academic performance. This study underscores the importance of strengthening students' mathematical foundations through active home engagement and fostering positive attitudes toward learning mathematics. The findings highlighted the need to encourage positive attitudes and home numeracy practices to improve students' academic performance. Teachers may include home numeracy activities and encourage the students about the importance of a positive mindset in mathematics. This strategy should be given top priority by DepEd officials in the teaching of mathematics. Future research should investigate how home numeracy practices and attitudes towards learning mathematics affect students' academic performance as well as practical implementation strategies.

KEYWORDS: *academic performance, home numeracy practices, attitudes toward learning mathematics, grade 7 students, descriptive and correlational design, Davao del Norte, Philippines*

1. INTRODUCTION

Mathematics has a significant and distinct role in the school curriculum as it is crucial for improving the quality of life for individuals. However, it is known that most students consider mathematics complicated (Estrellado, 2021). Although mathematics is highly regarded and recognized as a prerequisite for most subjects, students' poor achievement and lack of interest in mathematics remain significant issues in schools in developed and developing countries. Despite its importance, mathematics is among the most challenging subjects' students perceive (Akhter & Akhter, 2018). Poor achievement in mathematics calls for improving the quality of education to avoid deterioration (Chand et al., 2021). Researchers concluded that the effects of the learning environment at home and attitudes toward learning were more significant predictors of effective learning (Sanchal & Sharma, 2017).

In the United States of America, it becomes clear that students struggle to get access to learning opportunities. According to projections, children's math learning is up to 50% worse than during a pre-pandemic normal school year (Kuhfeld et al., 2019 as cited in Haser et al., 2022). In Tanzania, students' performance in mathematics is poor. One of the most critical elements is the idea that mathematics is complex. The factors above have led to students' negative attitudes about the topic and hampered their interest, resulting in low performance despite their weak mathematical backgrounds (Kihwele and Mkomwa, 2022). Similarly, in Italy, it is also highlighted that the Covid-19 outbreak, and the school closings significantly negatively impacted students' math performance. Suggested steps include implementing corrective actions to mitigate existing challenges, providing support to students at high risk of falling behind, and fostering the continued learning of children who are already performing well (Contini et al., 2022).

On a national scale, the Philippines recorded the lowest scores in PISA (2018), reflecting the outcomes of the National Achievement Test, which indicated low proficiency levels in mathematics. Furthermore, the shift to an educational setting during the pandemic hurt



the mathematics performance of learners (Dargo & Dimas, 2021). Learners have a negative attitude toward understanding the lesson, solving problems, performing better, and enjoying distance learning (Bringula et al., 2021).

In Davao del Norte, Santo Tomas District has been affected due to the pandemic and continually extended its effort for face-to-face education. One of the many issues teachers encounter with resuming face-to-face classes is the learners' poor academic performance due to poor numeracy skills. According to the districts' proficiency level on the quarterly exams, some students need more mathematical mastery. According to the district's report on proficiency levels, 60% of grade 7 students failed their first quarter exam in math during the school year 2022–2023. Additionally, data from the least-mastered competencies of students during the first quarter exam school year 2022–2023 revealed that while some students are performing well in mathematics, most lack the learning attitude to make them thrive in mathematics. Thus, the researcher believed this problem relates to the extended school closure that deprived the learners of adequate numeracy activities and experiences. Their home needed more resources, and their parents needed to be aware of the different activities for their children to develop calculation skills.

This study explores the relationship between home numeracy practices, attitudes toward learning mathematics, and the student's academic performance. Most studies on students' mathematic performance have been led concerning such issues, including learning attitudes (Hwang & Son, 2021; Wakhata et al., 2022) and home literacy (Tzurriel & Mandel, 2020; Dulay et al., 2019). However, the literature disregards learning attitudes and home numeracy and how they may significantly influence and relate to students' post-pandemic mathematics performance. Additionally, there was limited published research on the same subjects from a national or local perspective. Thus, the researcher believed that this study would be distinctive as it will study learning attitudes, home numeracy practices, and mathematics performance in the context of post-pandemic, considering the learning gaps in mathematics. Smile Foundation (2020) and Ghosh (2022) indicated that post-pandemic learning gaps must be prioritized through evaluations, assessments, and recovery programs that can help students adapt to the current learning environment. Positive feelings in the learning of mathematics can help cultivate a favorable disposition towards the subject, resulting in enhanced performance. Conversely, negative feelings towards the subject can also lead to a decline in performance (Capuno et al., 2019).

2. OBJECTIVES

This study aimed to determine whether home numeracy practices and attitudes towards learning mathematics significantly predict the academic performance of grade 7 students during the school year 2022-2023. Specifically, this study sought to find out:

- 1) The level of home numeracy practices, in terms of:
 - 1.1 informal home numeracy practices;
 - 1.2 formal/basic home numeracy practices; and
 - 1.3 formal/advanced home numeracy practices.
- 2) The level of attitudes towards learning mathematics, in terms of:
 - 2.1 confidence in mathematics;
 - 2.2 importance of mathematics; and
 - 2.3 engagement in mathematics.
- 3) The level of academic performance of students in terms of their Test Scores on the Researcher-made Test?
- 4) The significant relationship between:
 - 4.1 home numeracy practices and academic performance of students.
 - 4.2 attitudes towards learning mathematics and academic performance of students.
- 5) Whether home numeracy practices and attitudes towards learning mathematics significantly predict academic performance.

3. HYPOTHESES

1. There is no significant relationship between home numeracy practices and academic performance of students.
2. There is no significant relationship between attitudes towards learning mathematics and academic performance of students.
3. Home numeracy practices and attitudes towards learning mathematics do not significantly predict the academic performance of students.

4. METHODOLOGY

The study adopted a quantitative research design incorporating both descriptive and correlational methods was utilized. The study involved 1,225 Grade 7 students from four public secondary schools in Santo Tomas District, Davao del Norte. A stratified random sampling technique was employed to ensure proportional representation across schools and performance levels. Sample sizes were determined based on school populations and past academic performance, with consent obtained from participants and relevant



authorities. Three research instruments were used, including a questionnaire for home numeracy practices, a questionnaire for attitudes towards learning mathematics, and an assessment of academic performance aligned with Department of Education guidelines. These instruments underwent expert review, validation, and piloting to ensure reliability and relevance. Additionally, the Cronbach alpha value was calculated to assess the internal consistency of the items within the instruments, confirming their reliability. The questionnaire for Home Numeracy Practices yielded coefficient values of 0.814 indicating a good internal consistency. The questionnaire for Attitudes towards Learning Mathematics yielded a coefficient value of 0.823 indicating a good internal consistency. The reliability of the academic performance was calculated using the Spearman-Brown formula with a correlation coefficient (r) of 0.727, yields a reliability score of approximately 0.842. Data collection involved obtaining permissions, seeking consent from participants, administering questionnaires, and processing collected data. Ethical considerations were paramount, with steps taken to protect participants' privacy, ensure voluntary participation, and mitigate risks.

5. STATISTICAL TOOLS

Statistical tools such as mean, standard deviation, Pearson r , and multiple regression analysis were employed to analyze the data, examining relationships between variables and predicting academic performance based on home numeracy practices and attitudes towards learning mathematics. The research adhered to ethical guidelines, ensuring social value, informed consent, protection of vulnerable participants, risk mitigation, privacy and confidentiality, transparency, researcher qualification, adequacy of facilities, and community involvement. These measures safeguarded participants' rights and facilitated the ethical conduct of the study.

6. RESULTS

Level of Home Numeracy Practices

Table 1

Level of Home Numeracy Practices

Indicators	SD	Mean	Descriptive Equivalent
Informal Home Numeracy Practices	1.15	3.50	High
Formal/Basic Home Numeracy Practices	1.18	3.64	High
Formal/Advanced Home Numeracy Practices	1.19	3.36	Moderate
Overall	1.17	3.50	High

Grade 7 students exhibit varying levels of engagement in different categories of home numeracy practices. They show a high involvement in both informal and formal/basic practices, indicating a strong foundation in basic mathematical concepts. However, their engagement in formal/advanced home numeracy practices is moderate, suggesting room for improvement in more complex mathematical tasks. Overall, the students demonstrate extensive engagement in a broad spectrum of numeracy-related activities, emphasizing the significance of nurturing home-based numeracy practices for their overall mathematical growth and proficiency.

Level of Attitudes towards Learning Mathematics

Table 2

Level of Attitudes towards Learning Mathematics

Indicators	SD	Mean	Descriptive Equivalent
Confidence in Mathematics	1.12	3.24	Moderate
Importance of Mathematics	1.05	3.92	High
Engagement in Mathematics	1.11	3.27	Moderate
Overall Mean	1.09	3.48	High

The data indicates a positive outlook on learning mathematics among grade 7 students, with a high level of recognition of its importance and a moderate level of confidence and engagement. This suggests that while there is room for improvement in certain areas, most students are receptive to mathematics education and its practical applications. These findings provide valuable insights for educators and curriculum developers to enhance the teaching and learning experiences in mathematics for grade 7 students.

**Level of Academic Performance of Students in terms of Test Scores on the Researcher-made Test****Table 3***Level of Academic Performance of Students in terms of Test Scores on the Researcher-made Test*

Variable	SD	Mean	Descriptive Equivalent
Academic Performance	10.38	37.38	Low

Table 3 displays the level of academic performance among students, as measured by their test scores on the Researcher-made Test. The data indicates a mean test score of 37.38 with a standard deviation of 10.38. This places the overall academic performance in the "Low" category, suggesting that, on average, students have achieved relatively lower scores on the Test. This assessment of academic performance will serve as a crucial reference point for understanding the relationship between home numeracy practices, attitudes toward learning mathematics, and students' actual academic achievements. Further analysis will help identify the factors that may contribute to these low academic performance scores and provide insights into potential areas for improvement in mathematics education.

Significance of the Relationship Between the Variables**Table 4***Significance of the Relationship Between the Variables*

Variables Correlated	r	p-value	Decision on H_0	Decision on Relationship
Home Numeracy Practices & Academic Performance	0.133	0.021	Rejected	Significant
Attitudes toward Learning Mathematics & Academic Performance	0.124	0.031	Rejected	Significant

Table 4 elucidates the significance of the relationships between home numeracy practices, attitudes towards learning mathematics, and academic performance through detailed statistical analysis. For the relationship between home numeracy practices and academic performance, the correlation coefficient (r) is reported as 0.133 with a p-value of 0.021. This correlation coefficient suggests a positive but modest relationship between home numeracy practices and academic performance, indicating that increases in engagement with home numeracy activities are associated with slight improvements in academic performance. The statistical significance of this relationship is confirmed by the rejection of the null hypothesis (H_0), which asserts a meaningful association between these variables.

Similarly, the relationship between attitudes towards learning mathematics and academic performance is characterized by a correlation coefficient (r) of 0.124 and a p-value of 0.031, indicating a similarly positive but slight association. This suggests that students with more favorable attitudes towards learning mathematics tend to perform slightly better academically. The rejection of the null hypothesis for this relationship as well underscores its statistical significance.

The observed relationships between home numeracy practices and academic performance, as well as attitudes towards learning mathematics and academic performance, align with existing research findings in the field. The statistically significant correlation coefficients (r) and the rejection of the null hypotheses (H_0) confirm that both home numeracy practices and attitudes towards learning mathematics are crucial factors in students' academic performance. The significant relationships identified between home numeracy practices and academic performance ($r=0.133$, $p=0.021$) and attitudes toward learning mathematics and academic performance ($r=0.124$, $p=0.031$) in this study are not isolated findings. They echo the conclusions of Kiwanuka et al. (2020), who emphasized the critical role of a positive disposition towards mathematics in enhancing students' academic outcomes. This research suggests that fostering a supportive and mathematically rich environment at home can significantly impact students' engagement and achievement in mathematics.

Regression Analysis on Home Numeracy Practices and Attitudes towards Learning Mathematics as Predictors of Academic Performance of Students

This section delves into a regression analysis to evaluate how home numeracy practices and attitudes towards learning mathematics serve as predictors of students' academic performance. The findings revealed that home numeracy practices have an unstandardized regression coefficient (β) of 1.542 with a standard error of 1.183, yielding a standardized coefficient (Beta) of 0.091. The p-value of 0.193, derived from a t-statistic of 1.304, serves as the basis for decision-making regarding the null hypothesis. Given that this p-value exceeds the $\alpha = 0.05$ threshold, it indicates the observed positive association between home numeracy practices and academic



performance, while noted, does not achieve statistical significance. Consequently, the null hypothesis is not rejected based on this analysis. Similarly, attitudes towards learning mathematics, with an unstandardized regression coefficient (β) of 1.762, a standard error of 1.733, and a Beta of 0.071, produced a t-statistic of 1.017 and a p-value of 0.310. This further suggests that although there is a measurable relationship, it does not suffice as a statistically significant predictor of academic performance.

Both variables, therefore, were determined not to be rejected in terms of their predictive value, indicating that despite a detectable relationship, these factors cannot be considered direct or strong predictors of academic performance. This is further underscored by an adjusted r-square value of 0.014, indicating that the model explains only a modest portion of the variance in academic performance, hinting at the influence of other, unaccounted variables.

The overall significance of the model, as indicated by an f-ratio of 3.215 and a p-value of 0.042, suggests that while the model can predict academic performance to a certain extent, its predictive power is limited. This highlights the need for cautious interpretation of the results. The model's ability to predict the dependent variable (DV), despite the independent variables (IVs) not being strong predictors, can be attributed to the combined effect of the variables within the model. This suggests that, although individually the IVs might not show strong predictive capabilities, their collective contribution within the model reaches statistical significance, indicating a modest but significant ability to predict academic performance. It is important to consider that the model accounts for a portion of the variance in academic performance, suggesting the presence of other influential factors not captured by the current IVs.

Table 5

Regression Analysis on Home Numeracy Practices and Attitudes towards Learning Mathematics as Predictors of Academic Performance of Students

Independent Variable	Unstandardized Coefficients		Standardized Coefficients	t-stat	p-value	Decision@ $\alpha = 0.05$
	β	Standard Error	Beta			
(Constant)	25.962	4.897		5.302	0.006	
Home Numeracy Practices	1.542	1.183	0.091	1.304	0.193	Not Rejected
Attitudes toward Learning Mathematics	1.762	1.733	0.071	1.017	0.310	Not Rejected
Dependent Variable: Academic Performance		Adjusted R Square: 0.014				
F-ratio: 3.215		p-value: 0.042				

The regression analysis explored the predictive value of home numeracy practices and attitudes towards learning mathematics on academic performance, revealing that while these factors show a relationship with academic performance, they do not qualify as strong predictors. This conclusion, grounded in statistical analysis, dovetails with broader educational research on student engagement and attitudes towards mathematics, as reflected in the observations from Table 11 regarding Grade 7 students.

6. DISCUSSION OF FINDINGS

Level of Home Numeracy Practices. The level of home numeracy practices among grade 7 students reveals varying degrees of engagement in different categories. Firstly, students exhibit a high level of involvement in informal home numeracy practices, which encompass a broad range of numeracy-related interactions, indicating a strong foundation in basic mathematical concepts and skills. Similarly, students also display a high commitment to formal/basic home numeracy practices, which involve more structured and foundational mathematical skills like arithmetic operations and number comprehension. However, when it comes to formal/advanced home numeracy practices, which include more complex mathematical tasks such as three-digit arithmetic and working with larger numerical values, students' engagement is categorized as moderate. This suggests that while some students actively participate in these advanced activities, there is room for improvement in this category. Overall, when considering all home numeracy practices together,



grade 7 students demonstrate a highly extensive level of engagement, reflecting their active involvement in a wide spectrum of numeracy-related activities that contribute to a well-rounded foundation in mathematics.

In summary, the assessment of home numeracy practices among grade 7 students underscores varying degrees of engagement across different categories. Notably, students demonstrate a high level of involvement in informal home numeracy practices, aligning with the research of Mutaif-Yildiz et al. (2018) and Harris and Petersen (2019) on the positive impact of home-based mathematical interactions. Similarly, their active commitment to formal/basic home numeracy practices resonates with the findings of Clerkin and Gilligan (2018) and Casey and Fell (2018), emphasizing the importance of structured mathematical activities. However, in the domain of formal/advanced home numeracy practices, as discussed in Table 3, students' engagement is categorized as moderate, reflecting the need for further emphasis on advanced mathematical tasks, as observed in this study. Overall, the comprehensive engagement across these numeracy categories demonstrates grade 7 students' active involvement in a broad spectrum of mathematical activities, emphasizing the pivotal role of nurturing home-based numeracy practices to foster a well-rounded foundation in mathematics.

Level of Attitudes towards Learning Mathematics. The moderate level of self-assurance, along with some students expressing nervousness or discomfort about mathematics, resonates with existing literature emphasizing the multifaceted nature of attitudes towards math (Kiwanuka et al., 2020). Moreover, the high level of recognition of mathematics' importance and its value in everyday life and future endeavors corresponds with previous research underlining the significance of fostering a positive disposition toward math (Kiwanuka et al., 2020). Additionally, the moderate level of overall engagement, coupled with some students expressing dislike or boredom, supports the idea that engagement in mathematics is a multifaceted concept (Maamin et al., 2021). These results reflect students' diverse attitudes and highlight the need to address the needs of those who find mathematics less appealing, in line with the notion that engagement strategies can enhance interest in mathematics (Sen, 2022). In summary, these findings underscore the importance of nurturing positive attitudes and engagement in mathematics education and provide valuable insights for educators and curriculum developers to enhance grade 7 students' learning experiences in mathematics.

Level of Academic Performance of Students in terms of Test Scores on the Researcher-made Test. The level of academic performance among students, as evidenced by their test scores on the Researcher-made Test, is depicted in Table 9. The data reveals a mean test score of 37.38, accompanied by a standard deviation of 10.38. These statistics place the overall academic performance in the "Low" category, suggesting that, on average, students have attained relatively lower scores on the Researcher-made Test. This assessment of academic performance aligns with the concerns raised by several authors in the existing literature, including Kuhfeld et al. (2022), Kihwele and Mkomwa (2022), and Contini et al. (2022), who have highlighted challenges in mathematics education and the negative impact of the pandemic on students' math performance. This finding underscores the pressing need for educational interventions and strategies to address the observed low academic performance and enhance mathematics education for grade 7 students.

Significance of the Relationship Between the Variables. Table 10 elucidates the significance of the relationships between home numeracy practices, attitudes towards learning mathematics, and academic performance through detailed statistical analysis. For the relationship between home numeracy practices and academic performance, the correlation coefficient (r) is reported as 0.133 with a p -value of 0.021. This correlation coefficient suggests a positive but modest relationship between home numeracy practices and academic performance, indicating that increases in engagement with home numeracy activities are associated with slight improvements in academic performance. The statistical significance of this relationship is confirmed by the rejection of the null hypothesis (H_0), which asserts a meaningful association between these variables.

Similarly, the relationship between attitudes towards learning mathematics and academic performance is characterized by a correlation coefficient (r) of 0.124 and a p -value of 0.031, indicating a similarly positive but slight association. This suggests that students with more favorable attitudes towards learning mathematics tend to perform slightly better academically. The rejection of the null hypothesis for this relationship as well underscores its statistical significance.

While the r -values indicate positive associations, they also imply that these relationships, though statistically significant, are modest in strength. This modesty suggests that while home numeracy practices and attitudes towards learning mathematics contribute to academic performance, they do so to a limited extent.

These results show how the ways families use numbers at home and how they feel about learning math can really affect how well students do in school. The statistical significance of these relationships emphasizes the importance of nurturing a positive mathematical environment at home and encouraging constructive attitudes towards mathematics among students.



However, the small correlation numbers and the discussion about the r-square value show that doing well in math at school is affected by many different things. This means that teachers and parents should think about using many ways to help improve how students do in math.

The observed relationships between home numeracy practices and academic performance, as well as attitudes towards learning mathematics and academic performance, align with existing research findings in the field. The statistically significant correlation coefficients (r) and the rejection of the null hypotheses (H_0) confirm that both home numeracy practices and attitudes towards learning mathematics are crucial factors in students' academic performance. The significant relationships identified between home numeracy practices and academic performance ($r=0.133$, $p=0.021$) and attitudes toward learning mathematics and academic performance ($r=0.124$, $p=0.031$) in this study are not isolated findings. They echo the conclusions of Kiwanuka et al. (2020), who emphasized the critical role of a positive disposition towards mathematics in enhancing students' academic outcomes. This research suggests that fostering a supportive and mathematically rich environment at home can significantly impact students' engagement and achievement in mathematics.

Similarly, the work of Maamin et al. (2021) on the multifaceted nature of engagement in mathematics provides a broader context for understanding the importance of attitudes toward mathematics. Their findings underscore that engagement is not solely about the amount of time spent on mathematical activities but also involves emotional and cognitive aspects, which are influenced by both home numeracy practices and attitudes toward the subject.

The research conducted by Cho & Hwang (2019) reinforces the conclusions of the current study, emphasizing the importance of addressing the challenges and negative perceptions students hold towards mathematics. Through an investigation into multi-ethnic students' motivation in mathematics using the expectancy-value theory, a complex array of influential factors such as parental support, peer assessment, and previous experiences has been identified. These insights align with the assertion that enhancing home numeracy practices and fostering positive attitudes towards mathematics are crucial for making the subject more accessible and engaging. Cho & Hwang's findings underscore the contextual nature of motivation and advocate for interventions tailored to the diverse backgrounds and experiences of students. This correlation between their research and the findings of the current study highlights the critical role of a supportive educational environment in transforming students' experiences and outcomes in mathematics.

Lastly, the potential of engagement strategies to enhance interest in mathematics, as highlighted by Sen (2022), complements the findings of the current study. It suggests that educational interventions focusing on both the home environment and the cultivation of positive attitudes toward mathematics can be effective in improving students' academic achievements in mathematics.

Regression Analysis on Home Numeracy Practices and Attitudes towards Learning Mathematics as Predictors of Academic Performance of Students. This section delves into a regression analysis to evaluate how home numeracy practices and attitudes towards learning mathematics serve as predictors of students' academic performance. The findings revealed that home numeracy practices have an unstandardized regression coefficient (β) of 1.542 with a standard error of 1.183, yielding a standardized coefficient (Beta) of 0.091. The p-value of 0.193, derived from a t-statistic of 1.304, serves as the basis for decision-making regarding the null hypothesis. Given that this p-value exceeds the $\alpha = 0.05$ threshold, it indicates the observed positive association between home numeracy practices and academic performance, while noted, does not achieve statistical significance. Consequently, the null hypothesis is not rejected based on this analysis. Similarly, attitudes towards learning mathematics, with an unstandardized regression coefficient (β) of 1.762, a standard error of 1.733, and a Beta of 0.071, produced a t-statistic of 1.017 and a p-value of 0.310. This further suggests that although there is a measurable relationship, it does not suffice as a statistically significant predictor of academic performance.

Both variables, therefore, were determined not to be rejected in terms of their predictive value, indicating that despite a detectable relationship, these factors cannot be considered direct or strong predictors of academic performance. This is further underscored by an adjusted r-square value of 0.014, indicating that the model explains only a modest portion of the variance in academic performance, hinting at the influence of other, unaccounted variables.

The overall significance of the model, as indicated by an f-ratio of 3.215 and a p-value of 0.042, suggests that while the model can predict academic performance to a certain extent, its predictive power is limited. This highlights the need for cautious interpretation of the results. The model's ability to predict the dependent variable (DV), despite the independent variables (IVs) not being strong predictors, can be attributed to the combined effect of the variables within the model. This suggests that, although individually the IVs might not show strong predictive capabilities, their collective contribution within the model reaches statistical significance, indicating a



modest but significant ability to predict academic performance. It is important to consider that the model accounts for a portion of the variance in academic performance, suggesting the presence of other influential factors not captured by the current IVs.

In summary, although associations between home numeracy practices and attitudes towards learning mathematics with academic performance have been identified, this study does not establish them as robust predictors within the analysis context. The results advocate for a broader investigation into the complex array of factors contributing to academic performance, suggesting that educational success is likely influenced by a multitude of variables beyond those examined in this research. A nuanced understanding of these dynamics is crucial for developing more effective educational strategies and interventions aimed at enhancing academic outcomes.

The regression analysis explored the predictive value of home numeracy practices and attitudes towards learning mathematics on academic performance, revealing that while these factors show a relationship with academic performance, they do not qualify as strong predictors. This conclusion, grounded in statistical analysis, dovetails with broader educational research on student engagement and attitudes towards mathematics, as reflected in the observations from Table 11 regarding Grade 7 students.

The literature underscores the importance of engagement in mathematics for enhancing learning efficiency, acquiring mathematical knowledge, and maintaining interest in the subject. The multifaceted nature of engagement—spanning motivation, achievement, confidence, and emotions—suggests a complex interplay between internal and external factors in shaping academic outcomes (Maamin et al., 2021; Nayir, 2015; Sen, 2022). This perspective is crucial for interpreting the modest predictive values obtained for home numeracy practices and attitudes towards learning mathematics. It suggests that while these factors are undoubtedly influential, their effects are interwoven with a broader array of determinants of engagement and performance.

The relationship between home numeracy practices and academic performance, as indicated by the regression analysis, aligns with the understanding that engagement is a dynamic and ongoing process. The role of home numeracy practices in fostering an early foundation for mathematical understanding is acknowledged; however, the findings imply that their direct impact on academic performance, especially as measured in formal educational settings, may be moderated by other factors such as classroom experiences and individual student attributes (Attard & Holmes, 2020; Skilling et al., 2016).

Similarly, the analysis of attitudes towards learning mathematics highlights the importance of emotional and cognitive engagement in the learning process. The modest predictive value of attitudes towards academic performance echoes the literature's emphasis on the emotional and motivational dimensions of engagement in mathematics (Sen, 2022). This suggests that while attitudes are crucial for fostering a positive learning environment, their impact on academic performance is part of a complex matrix of influences, including pedagogical approaches, classroom dynamics, and individual student resilience.

The findings from the regression analysis, viewed in light of the comprehensive literature review, point towards the critical role of educators in recognizing and nurturing the diverse aspects of student engagement. The evidence supports the need for a holistic approach to teaching mathematics, one that goes beyond traditional measures of academic performance to include a focus on creating supportive home environments, cultivating positive attitudes, and implementing engaging instructional strategies (Wang, 2016; Imms & Byers, 2017).

7.CONCLUSIONS

The findings of this study underscore the significance of home numeracy practices and positive attitudes towards learning mathematics in shaping students' academic performance. It was evident that students exhibited a strong presence of both informal and formal home numeracy practices, highlighting the role of everyday activities in fostering mathematical skills. Additionally, the study observed positive attitudes among students towards learning mathematics, reflecting a favorable disposition towards mathematical education. However, despite these encouraging factors, the study revealed a concerning trend of low academic performance among students in mathematics. Notably, students who demonstrated high levels of home numeracy practices and positive attitudes towards learning mathematics were more likely to perform better academically. Both factors were found to contribute positively to students' academic performance, emphasizing the importance of nurturing these aspects in educational settings.

Based on the study's findings and conclusions, several recommendations are proposed to enhance students' mathematical proficiency and academic performance. Firstly, it is recommended for students to integrate mathematics into daily tasks and activities, such as cooking, shopping, and budgeting, to reinforce learning outside the classroom. Additionally, fostering a positive attitude towards mathematics can enhance motivation and resilience, leading to improved academic outcomes. Teachers are encouraged to provide



remedial classes and incorporate at-home numeracy practices into their instruction to support struggling students and reinforce learning. The Department of Education should provide guidance to educators on adapting at-home numeracy practices to cater to diverse learning styles and levels of skill. Creating a welcoming and inclusive classroom environment that promotes a passion for mathematics is also crucial. Finally, future research should explore additional factors beyond numeracy practices and attitudes that influence academic performance in mathematics, such as personalized learning methods and longitudinal studies tracking the impact of various interventions over time. By implementing these recommendations, educators and policymakers can work towards improving students' mathematical proficiency and academic success.

REFERENCES

1. Akhter, N., & Akhter, N. (2018). *Learning in Mathematics: Difficulties and Perceptions of Students*. *Journal of Educational Research*, 21(1).
2. Almarcha, M., Vázquez, P., Hristovski, R., & Balagué, N. (2023, May). *Transdisciplinary embodied education in elementary school: A real integrative approach for the science, technology, engineering, arts, and mathematics teaching*. *Frontiers in Education*, 8, 265. <https://doi.org/10.3389/educ.2023.108265>
3. Altun, D. (2019). *Young children's theory of mind: Home numeracy practices environment, technology usage, and preschool education*. *Journal of Education and Training Studies*, 7(3), 86–98. <https://doi.org/10.11114/jets.v7i3.4057>
4. Anigbo, L. C., & Idigo, E. (2015). *Factors affecting students' interest in mathematics in secondary schools in Enugu state*. *Journal of Science & Computer Education*, 3(3).
5. Attard, C., & Holmes, K. (2020). "It gives you that sense of hope": An exploration of technology use to mediate student engagement with mathematics. *Heliyon*, 6(1), Article e03151. <https://doi.org/10.1016/j.heliyon.2019.e03151>
6. Ayebele, L., Habaasa, G., & Tweheyo, S. (2020). *Factors affecting students' achievement in mathematics in secondary schools in developing countries: A rapid systematic review*. *Statistical Journal of the IAOS*, 36(S1), 73-76.
7. Bernardo, A. B. (2021). *Socioeconomic status moderates the relationship between growth mindset and learning in mathematics and science: Evidence from PISA 2018 Philippine data*. *International Journal of School & Educational Psychology*, 9(2), 208-222.
8. Bhandari, P. (2020, June 12). *What Is Quantitative Research? | Definition, Uses & Methods*. Scribbr. Retrieved February 19, 2023, from <https://www.scribbr.com/methodology/quantitative-research/>
9. Bringula, R., Reguyal, J. J., Tan, D. D., & Ulfa, S. (2021). *Mathematics self-concept and challenges of learners in an online learning environment during COVID-19 pandemic*. *Smart Learning Environments*, 8(1), 1-23. <https://doi.org/10.1186/s40561-021-00168-5>
10. Cahoon, A., Gilmore, C., & Simms, V. (2021). *Developmental pathways of early numerical skills during the preschool to school transition*. *Learning and Instruction*, 75, 101484.
11. Capuno, R., Necesario, R., Etcuban, J. O., Espina, R., Padillo, G., & Manguilimotan, R. (2019). *Attitudes, study habits, and academic performance of junior high school students in mathematics*. *International Electronic Journal of Mathematics Education*, 14(3), 547-561.
12. Casey, B. M., & Fell, H. (2018). *Spatial reasoning: A critical problem-solving tool in children's mathematics strategy tool-kit*. In *Visualizing mathematics: The role of spatial reasoning in mathematical thought* (pp. 47-75).
13. Caviola, L., Schubert, S., Kahane, G., & Faber, N. S. (2022). *Humans first: Why people value animals less than humans*. *Cognition*, 225, 105139.
14. Chand, S., Chaudhary, K., Prasad, A., & Chand, V. (2021). *Perceived causes of students' poor performance in mathematics: A case study at Ba and Tavua secondary schools*. *Frontiers in Applied Mathematics and Statistics*, 7, Article 614408. <https://doi.org/10.3389/fams.2021.614408>
15. Chand, S., Chaudhary, K., Prasad, A., & Chand, V. (2021). *Perceived causes of students' poor performance in mathematics: A case study at Ba and Tavua secondary schools*. *Frontiers in Applied Mathematics and Statistics*, 7, Article 614408. <https://doi.org/10.3389/fams.2021.614408>
16. Chen, L., Bae, S. R., Battista, C., Qin, S., Chen, T., Evans, T. M., & Menon, V. (2018). *Positive attitude toward math supports early academic success: Behavioral evidence and neurocognitive mechanisms*. *Psychological Science*, 29(3), 390-402.
17. Cheung, S. K., Dulay, K. M., Yang, X., Mohseni, F., & McBride, C. (2021). *Home numeracy practices and numeracy environments in Asia*. *Frontiers in Psychology*, 12. <https://doi.org/10.3389/fpsyg.2021.578764>
18. Clerkin, A., & Gilligan, K. (2018). *Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10*. *Journal of Early Childhood Research*, 16(3), 319–334. <https://doi.org/10.1177/1476718X18762238>
19. Contini, D., Di Tommaso, M. L., Muratori, C., Piazzalunga, D., & Schiavon, L. (2022). *Who lost the most? Mathematics achievement during the COVID-19 pandemic*. *The BE Journal of Economic Analysis & Policy*, 22(2), 399-408. <https://doi.org/10.2139/ssrn.4114323>
20. Dan'inna, A. A. (2018). *Meeting the needs of sustainable development in Africa through engineering research and innovation in mathematics education: Students' attitudes as a predictor of academic achievement*. *World Educators Forum*, 10(1), 1-15.
21. Dargo, J., & Dimas, M. (2021). *Modular distance learning: Its effect in the academic performance of learners in the new normal*. *JETL (Journal of Education, Teaching and Learning)*, 6(2), 204. <https://doi.org/10.26737/jetl.v6i2.2672>
22. Davis-Kean, P. E., Domina, T., Kuhfeld, M., Ellis, A., & Gershoff, E. T. (2022). *It matters how you start: Early numeracy mastery predicts high school math course-taking and college attendance*. *Infant and Child Development*, 31(2), Article e2281. <https://doi.org/10.1002/icd.2281>



23. De-La-Peña, C., Fernández-Cézar, R., & Solano-Pinto, N. (2021). Attitude Toward Mathematics of Future Teachers: How Important Are Creativity and Cognitive Flexibility?. *Frontiers in Psychology*, 12, 713941.
24. Dowker, A. (2021, February). Home numeracy and preschool Children's mathematical development: Expanding home numeracy models to include parental attitudes and emotions. In *Frontiers in Education* (Vol. 6, p. 575664). Frontiers Media SA.
25. Dowker, A., Cheriton, O., Horton, R., & Mark, W. (2019). Relationships between attitudes and performance in young children's mathematics. *Educational Studies in Mathematics*, 100(3), 211–230. <https://doi.org/10.1007/s10649-019-9880-5>
26. Dulay, K. M., Cheung, S. K., Reyes, P., & McBride, C. (2019). Effects of parent coaching on Filipino children's numeracy, language, and literacy skills. *Journal of Educational Psychology*, 111, 641–662. <https://doi.org/10.1037/edu0000315>
27. Elliott, L., & Bachman, H. J. (2018). SES disparities in early math abilities: The contributions of parents' math cognitions, practices to support math, and math talk. *Developmental Review*, 49, 1-15.
28. Estrellado, C. J. (2021). Transition to post-pandemic education in the Philippines: Unfolding insights. *International Journal of Scientific and Research Publications*, 11(12).
29. Fetterly, J. M. (2020). Fostering mathematical creativity while impacting beliefs and anxiety in mathematics. *J. Humanities Math.*, 10, 102–128. <https://doi.org/10.5642/jhummath.202002.07>
30. Geesa, R. L., Izci, B., Song, H., & Chen, S. (2019). Exploring factors of home resources and attitudes towards mathematics in mathematics achievement in South Korea, Turkey, and the United States. *EURASIA Journal of Mathematics, Science and Technology Education*, 15(9).
31. Girard, C., Bastelica, T., Léone, J., Epinat-Duclos, J., Longo, L., & Prado, J. (2021). The relation between home numeracy practices and a variety of math skills in elementary school children. *PLoS ONE*, 16(9), Article e0255400. <https://doi.org/10.1371/journal.pone.0255400>
32. Girard, C., Bastelica, T., Léone, J., Epinat-Duclos, J., Longo, L., & Prado, J. (2021). The relation between home numeracy practices and a variety of math skills in elementary school children. *PLoS ONE*, 16(9), e0255400.
33. Girard, C., Bastelica, T., Léone, J., Epinat-Duclos, J., Longo, L., & Prado, J. (2021). The relation between home numeracy practices and a variety of math skills in elementary school children. *PLoS One*, 16(9), Article e0255400. <https://doi.org/10.1371/journal.pone.0255400>
34. Gonzaga, M. C., & Oblianda, L. R. (No date specified). Mediating effect of academic self-efficacy on the relationship between academic stress and academic burnout of online class students during the COVID-19 pandemic in Davao Region. (Publication/journal name not specified).
35. Guhl, P. (2019). The impact of early math and numeracy skills on academic achievement in elementary school.
36. Haaavold, P. O. (2021). Impediments to mathematical creativity: Fixation and flexibility in proof validation. *Mathematics Enthusiast*, 18, 139–159. Available online at: <https://scholarworks.umt.edu/tme/vol18/iss1/11>
37. Hafni, L., Renaldo, N., Chandra, T., & Thaief, I. (2020). The Use of Regression Models with Supply Chain Management to Increase Financial Satisfaction of Generation Z. *International Journal of Supply Chain Management*, 9(5), 1641-1650.
38. Harris, B., & Petersen, D. (2019). Developing math skills in early childhood [PDF]. *Mathematica*.
39. Haser, Ç., Doğan, O., & Erhan, G. K. (2022). Tracing students' mathematics learning loss during school closures in teachers' self-reported practices. *International Journal of Educational Development*, 88, 102536.
40. Hwang, J., & Ham, Y. (2021). Relationship between Mathematical Literacy and Opportunity to Learn with Different Types of Mathematical Tasks. *Journal on Mathematics Education*, 12(2), 199-222.
41. Hwang, S., & Son, T. (2021). Students' attitude toward mathematics and its relationship with mathematics achievement. *Journal of Education and e-Learning Research*, 8(3), 272-280. <https://doi.org/10.20448/journal.509.2021.83.272.280>
42. Hwang, S., & Son, T. (2021). Students' attitude toward mathematics and its relationship with mathematics achievement. *Journal of Education and e-Learning Research*, 8(3), 272-280.
43. Hwang, S., & Son, T. (2021). Students' attitudes toward mathematics and its relationship with mathematics achievement. *Journal of Education and e-Learning Research*, 8(3), 272-280. <https://doi.org/10.20448/journal.509.2021.83.272.280>
44. Jayanthi, R. (2019). Mathematics in society development-A Study. *Iconic Research and Engineering Journals*, 3(3), 59-64.
45. Jojo, Z. (2019). Mathematics education system in South Africa. In (Editor name if available), *Education systems around the world* (pp. 129-140).
46. Kihwele, J. E., & Mkomwa, J. (2022). Promoting students' interest and achievement in mathematics through "King and Queen of Mathematics" initiative. *Journal of Research in Innovative Teaching & Learning*, 16(1), 115-133.
47. Kiwanuka, H. N., Van Damme, J., Van den Noortgate, W., & Reynolds, C. (2020). Temporal relationship between attitude toward mathematics and mathematics achievement. *International Journal of Mathematical Education in Science and Technology*, 51, 1–25.
48. Kucian, K., Zuber, I., Kohn, J., Poltz, N., Wyschkon, A., Esser, G., & Von Aster, M. (2018). Relation between mathematical performance, math anxiety, and affective priming in children with and without developmental dyscalculia. *Frontiers in Psychology*, 9, 263.
49. Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impact of COVID-19 school closures on academic achievement. *Educational Researcher*, 49(8), 549-565. <https://doi.org/10.3102/0013189X20965918>
50. Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impact of COVID-19 school closures on academic achievement. *Educational Researcher*, 49(8), 549-565. <https://doi.org/10.3102/0013189X20965918>
51. Kumar, S., Agarwal, M., & Agarwal, N. (2021). Defining and measuring academic performance of Hei students-a critical review. *Turkish Journal of Computer and Mathematics Education (TURCOMAT)*, 12(6), 3091-3105.



52. Maamin, M., Maat, S. M., & H. Iksan, Z. (2022). The influence of student engagement on mathematical achievement among secondary school students. *Mathematics*, 10(1), 41.
53. Mamolo, L. A., & Sugano, S. G. C. (2020). Self-perceived and actual competencies of senior high school students in general mathematics. *Cogent Education*, 7(1), 1779505.
54. Manfreda Kolar, V., & Hodnik, T. (2021). Mathematical Literacy from the Perspective of Solving Contextual Problems. *European Journal of Educational Research*, 10(1), 467-483. <https://doi.org/10.12973/eu-jer.10.1.467>
55. Mazana, Y. M., Suero Montero, C., & Olifage, C. R. (2019). Investigating students' attitude towards learning mathematics.
56. Mullis, I. V. S., Martin, M. O., Foy, P., Kelly, D. L., & Fishbein, B. (2020). TIMSS 2019 international results in mathematics and science. Paper presented at the TIMSS & PIRLS International Association for the Evaluation of Educational Achievement.
57. Mutaf Yildiz, B., Sasanguie, D., De Smedt, B., & Reynvoet, B. (2018). Frequency of home numeracy activities is differentially related to basic number processing and calculation skills in kindergartners. *Frontiers in Psychology*, 9, 340.
58. Mutaf-Yildiz, B., Sasanguie, D., De Smedt, B., & Reynvoet, B. (2020). Probing the relationship between home numeracy and children's mathematical skills: A systematic review. *Frontiers in Psychology*, 11, Article 2074. <https://doi.org/10.3389/fpsyg.2020.02074>
59. Mutaf-Yildiz, B., Sasanguie, D., De Smedt, B., & Reynvoet, B. (2020). Probing the Relationship Between Home numeracy practices and Children's Mathematical Skills: A Systematic Review. *Frontiers in Psychology*, 11, 2074. <https://doi.org/10.3389/fpsyg.2020.02074>
60. Mutodi, P., & Ngirande, H. (2014). The influence of students' perceptions on mathematics performance. A case study in a selected high school in South Africa. *Mediterranean Journal of Social Sciences*, 5(10), 431.
61. Nabila, L. A., & Widjajanti, D. B. (2020, July). Self-esteem in mathematics learning: How to develop it through contextual teaching and learning approach?. In *Journal of Physics: Conference Series* (Vol. 1581, No. 1, p. 012049). IOP Publishing.
62. Namkung, J. M., Peng, P., & Lin, X. (2019). The relation between mathematics anxiety and mathematics performance among school-aged students: A meta-analysis. *Review of Educational Research*, 89(3), 459-496.
63. Nassaji, H. (2015). Qualitative and descriptive research: Data type versus data analysis. *Language Teaching Research*, 19(2), 129-132.
64. Nayir, K. F. (2015). The relationship between students' engagement level and their attitudes toward school. *The Anthropologist*, 20(1-2), 50-61. <https://doi.org/10.1080/09720073.2015.11891723>
65. Ngussa, B. M., & Mbuti, E. E. (2017). The Influence of Humour on Learners' Attitude and Mathematics Achievement: A Case of Secondary Schools in Arusha City, Tanzania. *Journal of Educational Research*, 2(3), 170-181. Retrieved from <https://www.researchgate.net/publication/315776039>
66. O'Carroll, A., & Fei, J. (2019). Impact of digital learning on academic performance of students in tertiary education. *Journal of Educational Technology & Society*, 22(2), 91-100.
67. Parraga Montilla, J. A., Castro Morera, M., Caro Martínez, A. M., & Ruiz Palmero, J. (2020). Influence of the use of technology on mathematics self-efficacy and achievement. *Frontiers in Psychology*, 11, 622.
68. Quibol, N. S., Aguado, A. C., & Cagasan, L. P. (2020). The performance level of students in modular distance learning. *JPAIR Multidisciplinary Research Journal*, 36(1), 1-13.
69. Ramirez, F. O., & Byun, S. Y. (2018). The rise of STEM in academic and public discourse. *Journal of Education and Work*, 31(1), 60-73.
70. Ricablanca, L., & Rico, P. (2021). Identifying factors affecting students' achievement in Mathematics. *International Journal of Advanced Mathematics*, 13(3), 143-152.
71. Riling, M. (2020). Recognizing mathematics students as creative: mathematical creativity as community-based and possibility-expanding. *J. Humanities Math.*, 10, 6-39. <https://doi.org/10.5642/jhummath.202002.04>
72. Rolison, J. J., Morsanyi, K., and Peters, E. (2020). Understanding health risk comprehension: the role of math anxiety, subjective numeracy, and objective numeracy. *Medical Decision Making*, 40, 222-234. <https://doi.org/10.1177/0272989X20904725>
73. Salminen, J., Guedes, C., Lerkkanen, M. K., Pakarinen, E., & Cadima, J. (2021). Teacher-child interaction quality and children's self-regulation in toddler classrooms in Finland and Portugal. *Infant and Child Development*, 30(3), e2222.
74. Sanchal, A., & Sharma, S. (2017). Students' attitudes towards learning mathematics: Impact of teaching in a sporting context. *Teachers and Curriculum*, 17(1). <https://doi.org/10.15663/tandc.v17i1.151>
75. Schleicher, A. (2018). Insights and interpretations. PISA 2018, 10.
76. Sen, E. O. (2022). Middle School Students' Engagement in Mathematics and Learning Approaches: Structural Equation Modelling. *Pedagogical Research*, 7(2).
77. Skilling, K., Bobis, J., Martin, A. J., Anderson, J., & Way, J. (2016). What secondary teachers think and do about student engagement in mathematics. *Mathematics Education Research Journal*, 28, 545-566. <https://doi.org/10.1007/s13394-015-0165-8>



78. Skilling, K., Bobis, J., Martin, A. J., Anderson, J., & Way, J. (2016). What secondary teachers think and do about student engagement in mathematics. *Mathematics Education Research Journal*, 28, 545-566. <https://doi.org/10.1007/s13394-015-0162-2>
79. Tan, L. Y. C. (2014). Correlational study.
80. Tzuriel, D., & Mandel, R. (2020). Parent-child math discourse and children's math thinking in early childhood. *Journal of Cognitive Education and Psychology*.
81. Valencia, M. L., & Andaya, G. (2020). Challenges and coping strategies of parents in modular distance learning. *Educational Quest*, 12(1), 21-34.
82. Verschaffel, L., Schukajlow, S., Star, J., & Van Dooren, W. (2020). Word problems in mathematics education: A survey. *ZDM*, 52, 1-16.
83. Wakhata, R., Mutarutinya, V., & Balimuttajjo, S. (2022). Relationship between Students' Attitude towards, and Performance in Mathematics Word Problems. *bioRxiv*, 2022-11.
84. Wen, R., & Dubé, A. K. (2022). A systematic review of secondary students' attitudes towards mathematics and its relations with mathematics achievement. *Journal of Numerical Cognition*, 8(2), 295-325. <https://doi.org/10.5964/jnc.6003>
85. Yusuf, M. O., & Balogun, M. R. (2011). Student-teachers' competence and attitude towards information and communication technology: A case study in a Nigerian university. *Contemporary Educational Technology*, 2(1), 18-36.
86. Zhu, J., & Chiu, M. M. (2019). Early home numeracy activities and later mathematics achievement: Early numeracy, interest, and self-efficacy as mediators. *Educational Studies in Mathematics*, 102(2), 173-191.
87. Zippert, E. L., & Rittle-Johnson, B. (2020). The home math environment: More than numeracy. *Early Childhood Research Quarterly*, 50, 4-15.



HARMFUL EFFECT OF HAIR DYE AND DIFFERENT ANALYTICAL TECHNIQUES TO DETECT HAZARDOUS ELEMENTS IN HAIR DYE

Patel Keerti Shaileshbhai, Dr. Madhuri Hinge

ABSTRACT

This report provides a concise overview of hair coloring practices, focusing on the types of dyes used, including metallic, natural, temporary, semi-permanent, and permanent dyes. Emphasis is placed on the mechanism of permanent dyes, highlighting key components like dye precursors, oxidizing agents, and ammonia. Safety considerations, such as the need for patch tests due to allergenic potential, are discussed. Analytical techniques for quantifying dye components and detecting heavy metals are explored. The report aims to enhance understanding of hair dye chemistry, safety measures, and health implications within the context of hair coloring practices.

INTRODUCTION

Hair Dye Overview

Hair coloring, whether to cover grays or for a new look, involves various types of dyes, including metallic, natural, temporary, semi-permanent, and permanent. Each type works differently and has its own set of ingredients and application methods.

1. Permanent Hair Dye

Permanent dyes use oxidation to change hair color permanently. They contain colorless dye precursors like PPD, oxidizing agents like hydrogen peroxide, ammonia, and couplers. These dyes penetrate deep into the hair shaft, bleach the natural color, and deposit new color. Common examples include L'Oreal Excellence Cream, Revlon Color Silk, etc.

2. Demi-Permanent Hair Dye

Demi-permanent dyes are milder than permanent ones as they lack ammonia and have lower hydrogen peroxide concentrations. They deposit color molecules on the cuticle and penetrate into the hair cortex. Examples include L'Oreal Casting Cream Gloss, Just for Men, etc.

3. Semi-Permanent Hair Dye

Semi-permanent dyes contain no ammonia or hydrogen peroxide. They only deposit color on the hair's outer layer, the cuticle. They can be synthetic or natural, with examples like Garnier Herbal Shine and Henna. Natural options like Henna generally do not contain harmful chemicals like PPD.

4. Temporary Hair Dye

Temporary dyes consist of large molecules that sit on the hair surface and wash out quickly, typically within one shampoo. They do not penetrate the hair shaft.

➤ Harmful Chemicals

Heavy metals like Cobalt, Nickel, Chrome, Arsenic, Mercury, Cadmium, Antimony, and Lead are sometimes present in hair dyes. These can be absorbed through the skin and cause various health issues. Monitoring heavy metal content in hair dyes is essential for public health.

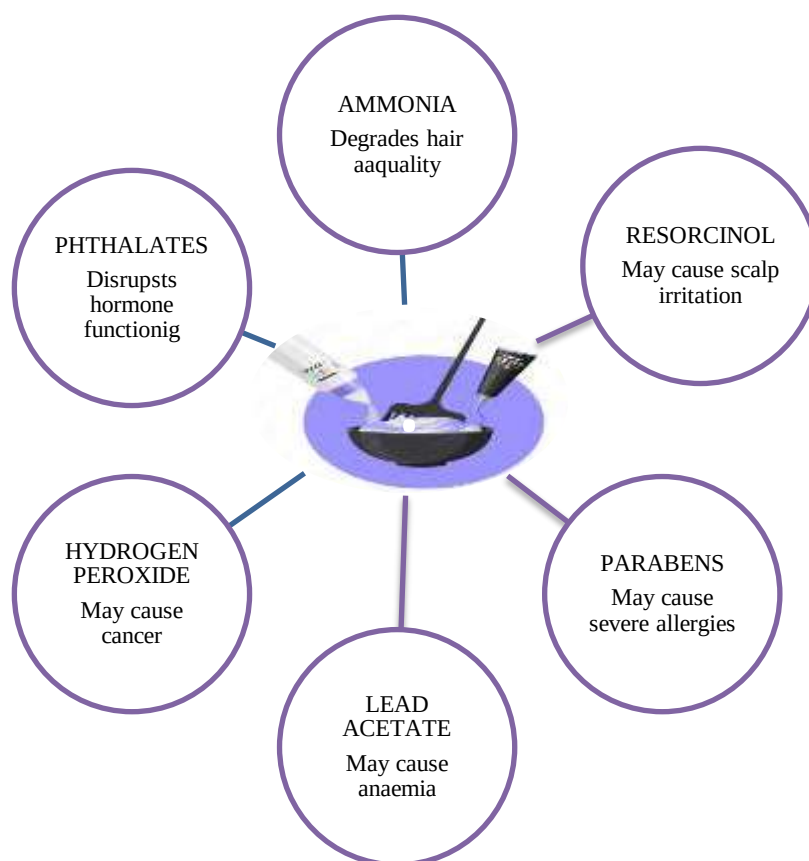


Fig: Toxic ingredients in Hair Dye

Ammonia

- Alkali used to raise hair pH for color deposition.
- Inhalation causes irritation to mucous membranes and can lead to suffocation.
- Skin contact results in blisters, redness, and potential lung problems.
- Prolonged use may disrupt liver function.

Resorcinol

- Reacts with peroxide for permanent hair color.
- Toxic in higher doses, affecting the central nervous system and respiratory function.
- Disrupts thyroid function, potentially causing goitre.
- Acute irritant to eyes; toxic if orally consumed.

Parabens

- Synthetic preservatives for shelf life extension.
- Easily absorbed through skin and metabolized.
- Can cause scalp drying, irritation, color fading, and hair loss.
- Mimics estrogen, linked to hormone disruption and cancer growth.
- Associated with fertility problems and preterm births.

Lead Acetate

- Present in dark-colored hair dyes, potentially carcinogenic.
- Prolonged exposure leads to brain and nerve damage.
- Hairstylists also at risk due to daily exposure.



Hydrogen Peroxide

- Bleaching agent to remove natural hair pigment.
- Incorrect usage may cause rashes, allergic reactions, hair loss, and scalp burns.

Phthalates

- Hormone-disrupting chemicals used in hair products.
- Disrupt hormonal balance by blocking or mimicking hormones.
- Affect body's natural hormone actions.

Table 1: Major Hair Dye Chemicals & its toxicity

Compound	Toxicity
N,N-bis(hydroxyethyl)-p-phenylenediamine sulphate salt: 5	Reduced body weight, Darkened thyroid glands, Decreased serum iron concentration, Delayed hypersensitivity, Allergic contact dermatitis.
N-phenyl-p-phenylenediamine 4, N-phenyl-p-phenylenediamine HCl:	Reduced body weight, Degenerated seminiferous tubules, Skeletal malformations, Skin irritation.
Hydroxypropyl bis (N-hydroxyethyl-p-phenylenediamine) 6 HCl	Reduced body weight, Alteration in serum glucose and total protein levels, Reproductive and developmental toxicity.
Methoxy-m-phenylenediamine 8, 4-methoxy-m-phenylenediamine sulphate salt, 4-methoxy-m-phenylenediamine HCl	Skin irritation, Mutagenicity.
2-chloro-p-phenylenediamine 7, 2-chloro-p-phenylenediamine sulphate salt	Skin irritation, Reduced body weight, Ocular irritation.
2-methyl-5-hydroxyethylaminophenol	Skin irritation, Mutagenicity, Allergic contact dermatitis.
p-methylaminophenol sulphate salt	Increased formation of methemoglobin, Skin irritation.
2,4-diaminophenol dihydrochloride salt	Skin irritation, Severe ocular irritation, Mutagenicity.
Hydroquinone	Nephrotoxicity, Cytotoxicity, Skin irritation and sensitization, Mutagenicity, Skin depigmentation.
t-butyl hydroquinone	Reduced body weight, Mutagenicity.
Toluene-2,5-diamine sulphate salt	Skin irritation and sensitization, Ocular irritation, Reproductive toxicity, Skeletal malformation.
Toluene-3,4-diamine	Duodenal lesions, Genotoxicity, Skin sensitization.

Hair Dyes and Cancer Risk

Researcher Study

Researchers investigate the potential link between hair dye use and cancer through lab studies and studies in people. Lab studies show certain ingredients in hair dyes can cause cancer in animals when given in large doses over time. Studies in people focus on bladder cancer, blood cancers (leukaemia and lymphoma), and breast cancer.

Personal hair dye use before and after 1980 is often distinguished due to changes in dye formulations.

Lab Studies

Some hair dye ingredients, including aromatic amines, have shown carcinogenic properties in animals, but the relevance to human exposure is unclear.

Studies in People

Hairdressers and barbers exposed at work show a slight increase in bladder cancer risk, but this link is inconsistent in those who dye their hair personally.

Mixed results regarding blood cancer risks, with some studies indicating increased risks, particularly with early or darker dye use. Conflicting findings on the association between personal hair dye use and breast cancer risk, with some recent studies suggesting a possible link.



Expert Agency Evaluation

The International Agency for Research on Cancer (IARC) classifies workplace exposure in hairdressing as "probably carcinogenic to humans" for bladder cancer, but personal hair dye use is "not classifiable" for cancer risk.

The US National Toxicology Program (NTP) has not classified hair dyes' potential to cause cancer but identified some dye chemicals as "Reasonably Anticipated to be Human Carcinogens."

ANALYTICAL METHODS

1. Atomic Absorption Spectrometry (AAS)

Principle

Atomic absorption spectroscopy (AAS) is a technique in analytical chemistry that quantitatively measures the concentration of chemical elements by detecting the absorption of light by free atoms in a gaseous state. It relies on the absorption of light by metallic ions and utilizes the atomic absorption spectrum of a sample to determine the concentration of specific elements. AAS requires known standards to establish a relationship between absorbance and element concentration, following the Beer-Lambert law.

Applications

- Detected heavy metals in hair dyes, indicating potential health risks.
- Used for quantifying toxic substances like chromium in hair dyes.

2. Ultraviolet Visible Spectroscopy (UV-Vis)

Principle

When ultraviolet radiation is absorbed, it causes electrons to move from their ground state to a higher energy state. The ease of electron excitation determines the wavelength of light absorbed. Chemical compounds absorbing ultraviolet light generate a unique spectrum, facilitating compound identification.

Applications

- Developed methods for detecting p-phenylenediamine (PPD) in hair dyes.
- Provided quantitative analysis of hair dye components.

3. Laser-Induced Breakdown Spectroscopy (LIBS)

Principle:

Uses high-power laser pulses to create plasma for elemental analysis. Plasma temperatures surpass 10,000 K, exciting electrons in outer orbitals. As the plasma cools, excited electrons emit photons with wavelengths related to their energy differences. Multiple excited states result in diverse emitted wavelengths for each element. Molecules within the plasma also emit photons, adding to the LIBS spectrum.

Applications

- Developed sensitive detectors to quantify chromium in hair dyes.
- Used for trace elemental analysis in synthetic hair dyes.

4. Energy Dispersive X-ray Spectrometry (EDS)

Principle

When an incident beam excites an electron in an inner shell, it can be ejected, leaving behind an electron hole. Subsequently, an electron from an outer, higher-energy shell fills this hole, emitting X-rays due to the energy difference between the two shells. An energy-dispersive spectrometer can measure the number and energy of these X-rays. The energy of the X-rays is characteristic of the difference in energy between the two shells and the atomic structure of the emitting element, enabling the measurement of the specimen's elemental composition.

Applications

- Detected elements in hair dye samples, showing presence of sulphur and other elements.
- Quantified heavy metals in hair dyes using gas chromatography/mass spectrometry (GC/MS) and EDS.

5. Inductive Coupled Plasma Optical Emission Spectroscopy (ICP-OES)

Principle

The fundamental principle involves applying plasma energy externally to a sample, exciting its constituent elements. As the excited atoms return to lower energy states, emission rays are released. A spectrometer determines the emission rays corresponding to specific photon wavelengths. The element type is identified based on the position of the photon rays, while



Applications

- Determined heavy metal concentrations in hair dyes, assessing health risks.
- Detected arsenic, chromium, nickel, and lead in hair dye samples.

6. Inductive Coupled Plasma Mass Spectrometry (ICP-MS)

Principle

Inductively coupled plasma mass spectrometry (ICP-MS) is a highly sensitive analytical technique capable of detecting metals and non-metals at concentrations below one part per trillion (ppt). It combines an inductively coupled plasma (ICP) for ionization with a mass spectrometer for ion separation and detection. Typically, Argon is used as a carrier gas to generate the plasma. The sample ions are directed through a series of small cones into the vacuum chamber of the mass spectrometer for analysis.

Applications

- Detected heavy metals like lead, cadmium, copper, and chromium in hair dyes.
- Evaluated heavy metal content in natural pigments-based products.

7. Gas Chromatography/Mass Spectrometry (GC/MS)

Principle

Gas chromatography (GC) operates on the principle of separating a mixture into individual substances through heating. The heated gases, carried by an inert gas like helium, pass through a column. As the separated substances exit the column, they enter the mass spectrometer (MS). Mass spectrometry identifies compounds by their molecular mass. A computer stores a library of known mass spectra for comparison, aiding in compound identification. GC-MS is recognized as a definitive analytical detection method.

Applications

- Detected PPD in hair dyes, providing quantitative analysis.
- Characterized hair dye components for potential toxicity.

8. Liquid Chromatography - Mass Spectroscopy (LC-MS)

Principle

LC-MS technology involves separating components in a mixture using HPLC, followed by ionization and mass/charge ratio-based ion separation. A detector quantifies ions, with the ion source playing a vital role in efficient ion generation. Common ion sources include APCI and ESI, chosen based on the analyte's chemical nature.

Applications

- Identified dyes in hair coloring products, ensuring compliance with regulations.
- Detected and quantified hair dye components, offering a rapid and accurate method.

9. High Performance Liquid Chromatography (HPLC)

Principle

In HPLC, the sample is injected into the mobile phase flow using a syringe. Components migrate through the column at different rates due to interactions with the stationary phase. Detected substances are then analyzed by a detector, and the resulting signal is sent to the HPLC software. The software generates a chromatogram, facilitating identification and quantification of different substances.

Applications

- Estimated Bandrowski's Base in henna-based hair colors, ensuring safety.
- Developed methods for separating and quantifying dye intermediates in hair dyes.

10. Attenuated Total Reflectance Fourier Transform Infrared Spectroscopy (ATR-FTIR)

Principle

An attenuated total reflection accessory measures changes in an infrared beam when it interacts with a sample. The beam is directed onto an optically dense crystal, creating an evanescent wave that extends into the sample. Changes in the wave indicate sample absorption. The attenuated energy is detected, generating an infrared spectrum.

Applications

- Identified and characterized various dyes, providing valuable information without extraction.
- Determined cationic, azo, and nitroso dyes without extraction, aiding in rapid determination.

**TABLE 2: Summary of analytical methods**

Heavy Metal /Harmful chem.	AAS	UV	LIBS	EDS	ICP-OES	ICP-MS	GC/MS	HPLC
Cd	✓				✓	✓		
Cr			✓		✓	✓		
Pd	✓				✓	✓		
Co	✓							
Zn	✓					✓		
Fe	✓							
Ni					✓			
Co					✓			
Cu						✓		
Ba						✓		
As						✓		
PPD		✓		✓			✓	✓

CONCLUSION

Hair dyes, containing potentially harmful components like ammonia and resorcinol, raise health concerns due to inconsistent standardization. Analytical methods, including AAS, LIBS, UV, EDX, ICP-OES, ICP-MS, GC/MS, LC-MS, HPLC, and ATR-FTIR spectroscopy, are crucial for assessing product safety. Notably, HPLC offers a cost-effective and rapid analysis, while ICP-MS ensures accuracy in toxic element assessment. These methods play a vital role in quantifying and identifying harmful components, thus safeguarding consumer health amidst rising hair dye usage. Continued research and application of these techniques remain essential for ensuring product safety.

REFERENCES

- Ozbek, N., Suleyman Akman "Determination of lead, cadmium and nickel in hennas and other hair". *Regulatory Toxicology and Pharmacology*.2016, 49-53.
- Nilani Packianathan & Saravanan Karumbayaram "Formulation and Evaluation of Herbal Hair Dye: An Ecofriendly Process" *journal of pharmaceutical sciences and research*. 2010, 648-656.
- "The American Cancer Society medical and editorial content team" November, 2022.
- <https://www.cancer.org/cancer/risk-prevention/chemicals/hair-dyes.html>
- Mr. L.D. Hingne "Different Colourents Used In Hair Dyes " *International Journal of Pharmaceutical Research and Applications*. 2021, 1345-1357
- Ekrem Pehlić, Husein Nanić, Huska Jukić, and Aldina Aldžić "Determination of Heavy Metals in Hair Dyes by the Atomic Absorption Spectrophotometry " *Springer International Publishing*. 2019, 561-567.
- Paudel S, Kumar S, Mallik A. atomic absorption spectroscopy: a short review. *epra. Int. J. Dev. Res.*2021, 6(9),322-327.
- Ekrem Pehlić , Husein Nanić, Huska Jukić, and Aldina Aldžić "Determination of Heavy Metals in Hair Dyes by the Atomic Absorption Spectrophotometry " *Springer International Publishing*. 2019, 561-567.
- Wedad H. Al-Dahhan "Determination of heavy metals in natural hair dye selected from iraqi plants" *Noble International Journal of Scientific Research*.2020, 11-16.
- Latha Saranya CH , Gurupadayya BM , Kinnera K and Thejaswini JC "Spectrophotometric Determination of p-Phenylenediamine in Hair Dyes " *Turk J Pharm Sci* 2014, 295-306.
- M. A. Gondal, Y. W. Maganda, M. A. Dastageer, F. F. Al Adel, A. A. Naqvi, and T. F. Qahtan, "Detection of carcinogenic chromium in synthetic hair dyes using laser induced breakdown spectroscopy," *Optical Society of America*. 2014, 53, 1636-1643
- Wedad H. Al-Dahhan "Heavy Metals Determination in Hair Dye Samples Selected from Iraqi Markets" *Medicine and healthcare journals*. 2019, (3) 1-6.
- Khan KF. Application, principle and operation of ICP-OES in pharmaceutical analysis. *The Pharmaceutical Innovation Journal*. 2019, 8(11), 281-282.
- Rajagopal Mayildurai , Alagunambi Ramasubbu, Nanjan Velmani "ICP – OES investigations of heavy metal contents in cosmetic products " *Journal of Pharmacy Research* 2015,9(1),27-30.
- Wafa Khalaleefah Amhimmid, 2 Salha Ali Fatah and 1 Sarra Sharef Altabeeb "determination of typical heavy metals in hair dyes brands selected from libyan markets" *world journal of pharmaceutical and medical research* 2022,8(4), 5 – 10
- Laura Rubio, Pedro Barrulas, Mafalda Costa, Carmen Garcia-Jares, ab Marta Lores b and Cristina Barrocas Dias "The chemistry behind the body art: unveiling the elemental profile and heavy metal content of natural tattoos and dyes by ICP-MS" *Royal society of chemistry* 2022, 34414-34424
- Aiman M. Bobaker, Intisar Alakili, Sukiman B. Sarmani, Nadhir Al-Ansari and Zaher Mundher Yaseen "Determination and Assessment of the Toxic Heavy Metal Elements Abstracted from the Traditional Plant Cosmetics and Medical Remedies: Case Study of Libya" *Environ. Res. Public Health* 2019, 16, 1957.



18. Hatem Abdel Moniem Ahmed , Ragaa Mohamed Abdel Maaboud , Fathy Fahim Abdul Latif , Adel Mohamed Kamal El-Dean , Kamal Mohamed El-Shaieb , Eugenio Vilanova , Carmen Estevan "Different Analytical Methods of Para-Phenylenediamine Based Hair Dye" *Journal of Cosmetics, Dermatological Sciences and Applications*, 2013, 3, 17-25.
19. Jayaganesh Sankar, Sudhir Sawarkar, Zulfiqar Ali Muhammad and Jainendra Malakar, 2017. By HPLC method established powder henna's safety through identification of Bandrowski's Base. *Asian J. Dermatol.*, 2018 9: 7-22.
20. Shilvira Ananda , Amalia Putri Lubis , Rahadian Zainul "Identification of Acid Red 73 (CI 27290) in Cosmetic Hair Dye Preparations by High-Performance Liquid Chromatography – Photo Diode Array " *Earth and Environmental Science* 2023, 1228 ,012016
21. Galal Elmanfe , Osama Khreit and Omukalthum Abduljalil, "Determination of PPD in Hair Dyes Collected from Local Markets in El-Bieda City – Libya" *Materials Science Forum* 2019, 955, 13-19.
22. Motoko Narita , Kazuo Murakami , Jean-Michel Kauffmann "Determination of dye precursors in hair coloring products by liquid chromatography with electrochemical detection" *Analytica Chimica Acta* 588 2007 316–320
23. Plater MJ, Raab A. Liquid chromatography–mass spectrometry analysis of dyes formed by in situ oxidative methods then purified by absorption and extraction from hair wefts. *Journal of Chemical Research*. 2021;45(5-6):450-461.
24. E. Pel, G. Bordin, A. R. Rodriguez "Hplc candidate reference method for oxidative hair dye analysis. & separation and stability testing " *J. LIQ. CHROM. & REL. TECHNOL.*, 1998, 21(6), 883-901.



POST ANALYSIS IDENTIFICATION OF TRANSFUSION TRANSMISSIBLE INFECTIONS (TTI'S) AMONG SCREENED BLOOD DONOR SAMPLES FROM 2016 – 2020 IN SELECTED TERTIARY HOSPITAL IN NUEVA ECIJA

John Peter V. Dacanay R.M.T., Imls (Ascp), PhD
Analiza B. Tanghal, PhD

ABSTRACT

This study examined transfusion transmissible infection risk and cases in Nueva Ecija tertiary hospitals over five years. It aimed to help medical technologists, blood banks, and blood supply institutions test TTIs carefully. This enhances testing, donor recruitment, and selection. It also reduces the chance of spreading bacteria that kill and infect transfusion patients. The study utilized descriptive and ex post facto types of research. A descriptive and qualitative content analysis was used in the study, in which data were analyzed and theories applied to the research findings as a guide for conclusions. Results revealed that males are more frequent blood donors compared to females, the age group 25–44 was said to be the dominant blood donor group, and the blood donation type that was being implemented among the respondent hospitals was the replacement policy. Furthermore, it conveyed that the greatest number of cases of transfusion-transmissible infections (TTIs) among screened blood donor samples in selected tertiary hospitals in the province of Nueva Ecija from 2016–2020 were Hepatitis B infections (HBsAg). The study further recommended that communities be educated about blood transfusion, blood donation, and the benefits of blood donor recruitment so that people will become interested and motivated in the blood donation program. The volunteer policy regarding blood donation and donor eligibility should be strictly implemented for the careful selection of blood donors, which would lower the risk of transfusing and transmitting blood products during the window period.

KEYWORDS: Transfusion, Transmissible, Infection, Blood

INTRODUCTION

“A life nourishing, life supporting fluid that circulates the human body” a rare term that pronounces the physiognomies of blood. Blood is essential to the human body because it plays a vital role in the normal physiology of the human system. Humans cannot live without blood because it carries oxygen and nutrients to the different organs of the body to perform their tasks and roles in order to function well and survive. The human body could not keep warm or cool off without it. Blood also serves as a transport medium of the body because it carries minerals, vitamins and enzymes that the body needs. Such components of blood are able to develop antibodies to fight the different antigens that enter the human body causing infection that will surely harms, harbors and weakens the immune system. Also, it functions to get rid and eliminate waste products. Without enough supply of blood, the human body surely weakens and dies.

Transfusion medicine affects medicine. Blood transfusions likely rescue thousands of people in need. Medical professionals execute this one-step lifesaving operation. Healthcare practices need it for patient management. Blood transfusion involves transferring blood and its products from a qualified donor to a prospective receiver. In addition, blood-borne microorganisms that cause transfusion-transmissible illnesses harm medical professionals, notably blood bank technicians.

TTIs is usually defeated by the different pathogens like viruses, fungi and bacteria. This is very alarming because these TTIs cause life threatening conditions when they are not detected early. Reference laboratories and clinical laboratories are rigorous and vigilant when it comes to testing blood donors. They use highly-equipped machines and gold standard procedures and reagents for early detection and determination of TTIs because they have a so-called window period wherein the sign and symptoms cannot be seen in the donor and the antibodies are still undetectable. Because of this period there is a possible risk of transmitting blood borne pathogens (AABB standards, 2011).

The data was gathered by the Research Institute for Tropical medicine which is the confirmatory laboratory for transfusion services and they have a five years' data from 2015-2020 and receives a referral from the different regions with a total of 5,143 blood donor samples to be subjected for confirmatory testing with a total of 943, 891, 916, 1,171 and 1,222 as per year and there are 217, 242, 303, 438 and



456 respectively yielded positive for the serological test done. Therefore, in the five-year study there are 1,656 blood donor samples positive and there was an increasing trend when it comes to HIV.

The referrals with a total of 22,220 collected by the different blood service facilities nationwide with 9,811, 5,186, 1,822, 3,160 and 2,241 as total referrals per year there was a total of 17,264 blood units confirmed positive for Hepatitis B virus and as per year 8,790, 4,174, 1,148, 1,938 and 1,214 respectively the result of confirmed units. The results revealed that in the year 2015 has the highest confirmed blood donor units in the research laboratory (Department of Health [DOH]/ Research Institute for Tropical Medicine [RITM]/ National Voluntary Blood Services Program [NVBSP] Transfusion Transmissible Infection -National Reference Laboratory [TTI-NRL]).

A total of 8,326 samples were sent to the national reference Laboratory for the confirmatory for Hepatitis C virus and the statistics of 1,993, 1,619, 1,542, 1,663 and 1,509 as per year and 1,863 found to be positive for the specific TTIs with a total of 379, 384, 361, 348 and 391, respectively as the total of confirmed blood units for HCV. As their result 2015 concluded that this will be the year that hepatitis C was more prevalent case among blood donor samples as for their referrals (Department of Health [DOH]/ Research Institute for Tropical Medicine [RITM]/ National Voluntary Blood Services Program [NVBSP] Transfusion Transmissible Infection – National Reference Laboratory [TTI-NRL]).

Syphilis was considered as one of the TTIs and NRLs that receive a total referral of 3,083 units to be tested for confirmatory and there were 1,225 confirmed positive by NRL with a total of 1,492, 1,160, 431, 0, 0 and positive 497, 512, 216, 0, 0 as per year respectively. As the result 2011 proved that the highest number of confirmed positive for the referral (Department of Health [DOH]/ Research Institute for Tropical Medicine [RITM]/ National Voluntary Blood Services Program [NVBSP] Transfusion Transmissible Infection – National Reference Laboratory [TTI-NRL]).

This study examined transfusion transmissible infection risk and cases in Nueva Ecija tertiary hospitals over five years. This study showed transfusion TTI trends. It helps medical technologists, blood banks, and blood supply institutions test TTIs carefully. This enhances testing, donor recruitment, and selection. It also reduces the chance of spreading bacteria that kill and infect transfusion patients.

Statement of the Problem

The study aimed to analyze and identify the cases of transfusion transmissible infections among screened blood donor samples from 2015-2020 in selected tertiary hospitals in the province of Nueva Ecija.

Specifically, it seeks to answer the following questions:

1. What is the profile of the screened blood samples in terms of:
 - 1.1. Gender of the donor;
 - 1.2. Age group of the donors; and
 - 1.3. Blood donation types
2. Is there a significant difference in the number of blood samples with cases of TTIs screened based on the profile of the blood donors?
3. What are the most cases of TTIs found in the different years based on the results of the blood samples tested?

Hypotheses of the Study

For the purpose of the study, the following hypotheses were pursued.

H₀₁: There is no significant difference in the number of blood samples screened from 2015 – 2020 based on their profile of the blood donors.

Scope and Limitations of the Study

The study focused on identifying and determining the cases of possible transfusion transmissible infections among screened blood donor samples in four selected tertiary hospitals in the province of Nueva Ecija. It covered the year 2015 to 2020 during which period blood donors were properly documented in selected blood bank sections of known tertiary clinical laboratories with more than a thousand of screened blood donor samples per year. The study included five screening tests, namely: The Human Immunodeficiency Virus (HIV); Hepatitis B Surface Antigen (HBsAg); Hepatitis C Virus (HCV); Malaria and Rapid Plasma Reagin (RPR) for the determination of Syphilis.



The above-mentioned serological tests were used as their presumptive and screening test in order to test the enhanced electrochemiluminescence, enzyme linked immunosorbent assay, immunochromatography and Treponema pallidum hemagglutination as their guiding principle in performing the procedures among selected tertiary hospitals in Nueva Ecija.

Research Design

This study utilized the descriptive and ex-post facto type of research where identification of TTIs is determined from 2011-2015 in selected tertiary hospitals in Nueva Ecija. A descriptive and qualitative content analysis research method was used in the study in which data were analyzed and theories applied in the research findings as a guide for conclusions.

The content analysis research is now widely used by health care researches especially in health studies. (Hsieh and Shannon, 2005).

Another method used in the study was the ex-post facto type of research method to test the hypotheses about the cause and effect in situations where it was unethical to manipulate or control the dependent variables (Cohen, Mannion & Morrison, 2007). This research design was used in the study to identify the retrieved data of the donors who were previously screened for the five serological infectious diseases. Furthermore, the study investigated and determined the cases of infection retrospectively for the past five years.

Research Instrument

The researcher utilized a blood donor screening form and declaration form given and validated by the Department of Health or set by the hospital facility. The flow of the questionnaire was drawn out based on the mandated donor form of the Department of Health Region III. The questionnaire included items on the profile of respondents such as: a) gender; b) the age group of the donors; and c) blood donation type. It also included the other demographic profile like the weight, address, phone number and other information of a prospect blood donor as medical history, informed consent, medical examination and laboratory examination done by the medical technologist. The donor screening forms used were validated by the Department of Health, Region III in collaboration with the National Voluntary Blood Services Program and the different blood service facilities and hospital blood banks in the Central Luzon.

Data Gathering Procedure

For the researcher to carry out the task of data retrieval, a set of guidelines was formulated in order to consider the veracity of the policies and standard of the different blood bank facilities.

Ethical Consideration

Guided by the principle of Institutional Research Ethics Board, the researcher sought the approval and endorsement of the University Research Ethics Board as recognized by the Commission on Higher Education (CHED) involving humans as respondents and the gathering of the secondary data by the different and selected tertiary hospitals in Nueva Ecija. The researcher also conducted the good laboratory practice wherein they abide by the rules in conducting research as set by the Food and Drug Administration.

The researcher greatly observed the high quality and ethical consideration of medical confidentiality as the guiding principle since the beginning up to the end of the study. The researcher gathered only the secondary data provided by the hospital's medical confidentiality that dictated the protection of the data. The aim of the researcher was to identify the highest cases of transfusion transmissible infection among screened blood donor samples from 2011-2015 from selected tertiary hospitals in Nueva Ecija that could be used as a reference index for the strict compliance of the standard operating procedures set by the lead agencies such as the Department of Health (DOH), National Voluntary Blood Services Program (NVBSP) and the National Reference Laboratories (NRL).

Anonymity was one thing the researcher valued due to any particular matter. Any given data that point to the identity of the subjects of the study was strongly observed and all the data gathered did not indicate the name of the hospitals.

Statistical Treatment

The researcher used the following statistical treatments in analyzing, tabulating and organizing data for the presentation of outcomes. Specifically, the study used frequency, weighted mean, and Chi – square.

Frequency. It was used in the study to tabulate the number of donors per hospital.

Weighted mean. It serves to represent the gathered data as a percentage of total relevancy and measure general response to the acquired data.



Chi-Square. It was used to test the significant difference and relationship of variables in the study.

RESULTS AND DISCUSSIONS

This chapter presents the results of the study as well as analysis and interpretation of data.

1. What are the screened blood samples in terms of?

1.1. Gender

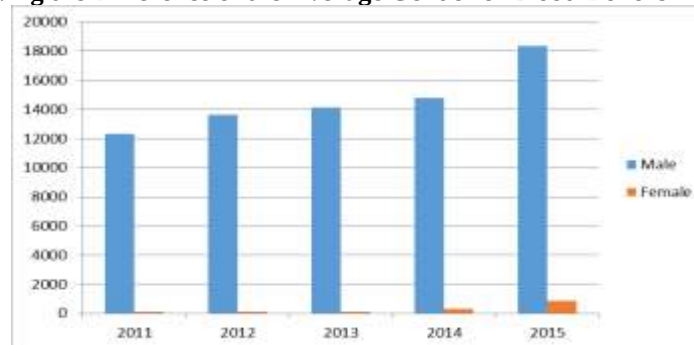
Table 1 presents that the total number of blood donors for the past five years was 74,813. The male blood donors were 73,263 (97.93%) while the female blood donors were 1,550 (2.07%). As per year 2011, there were 12,340 (99.02%) male and 121 (0.97%) female blood donors. In 2012, 13,616 (99.22%) male and 107 (0.98%); in 2013, 14,147 (99.11%) male and 126 (0.89%); in 2014, 14,802 (97.85%) male and 326 (2.15%) female; and in 2015, 18,358 (95.48%) male and 870 (4.52%) female blood donors, respectively. It only denotes that males are more prevalent cases when it comes to blood donation due to the fact that they have more prominent veins, their hemoglobin and hematocrit are much higher than females who have their regular monthly menstruation. And theoretically, males have more blood that accounts 7-8 % of the body weight unlike females who only have 5-6 % of the body weight. Based on the Association of American Blood Banks (AABB), there was a lot of things to consider if the donors are females including their physical appearance and health status.

Table 1
Summary of the Gender of Blood Donors from 2011-2015

Year	Male	Female
2011	12340	121
2012	13616	107
2013	14147	126
2014	14802	326
2015	18358	870
Total	73263	1550

Figure 1

Graph Showing the Difference of the Average Gender of Blood Donors from 2011-2015.



1.2. Age

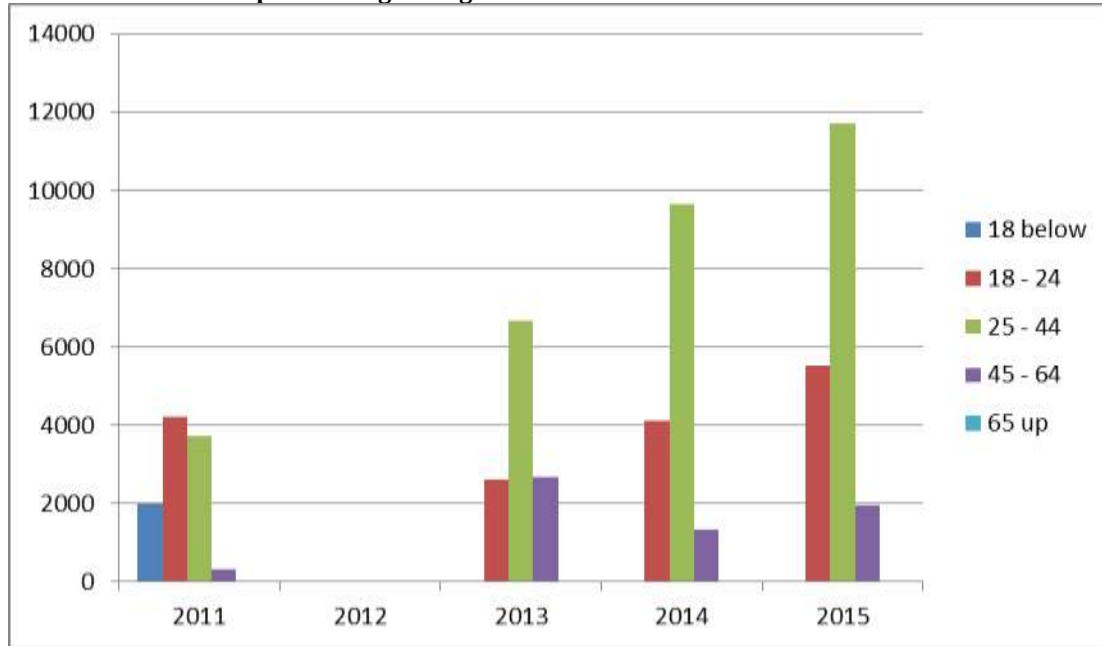
Table 2 shows that in the year 2011, the most common blood donors were 18-24 years old but in the succeeding years from 2013-2015, ages 25-44 years old were the most prevalent cases and the most frequent ages that were qualified and healthy blood donors. The reason why 25-44 was due to the advocacy of the Department of Health and other agencies in conducting seminars focusing on better understanding of the benefits of blood donation. Individuals who were in this age were said to be more physically fit and healthy. The researcher believed that at the age of forty individual's health conditions were more consistent and well monitored.

Table 2
Summary of the Ages of Blood Donors from 2011-2015

Year	18 below	18 – 24	25 - 44	45 - 64	65 up
2011	1998	4232	3739	335	0
2012	0	0	0	0	0
2013	5	2610	6659	2676	0
2014	11	4106	9658	1349	4
2015	9	5542	11708	1969	0



Figure 2
Graph Showing the Ages of the Blood Donors from 2011-2015



1.3 Blood Donation Type

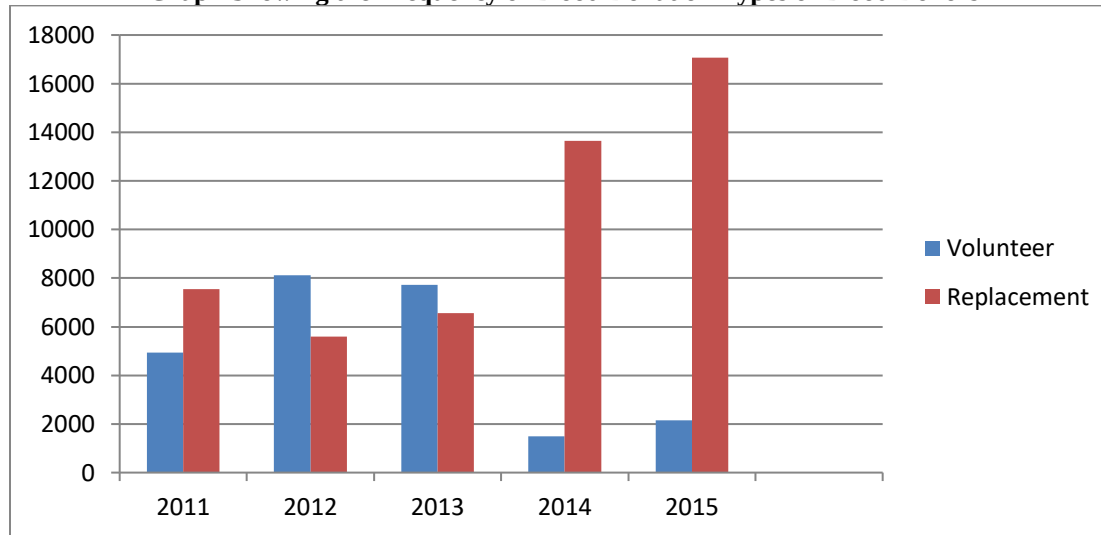
Table 3 shows that the blood donation types were according to voluntary and replacement with an average of 74,813. The blood donors for volunteer were 24,423 (32.65%) and 50,390 (67.35%) for replacement, respectively. In the years 2012 and 2013 total of 8,128 (59.23%) and 7,714 (54.05%), respectively. These were the years that the volunteer blood donors predominated while in the years 2011, 2014 and 2015, there were of 7,552 (60.36%), 13,638 (90.15) and 17,076 (88.81%), respectively for the replacement donors and this also was predominating. Based on the policy on donor recruitment of the Department of Health (DOH) in collaboration with the National Voluntary Blood Services Program (NVBSP), it is mandated that every hospital and blood service facility should adopt the Blood Voluntarism Policy, and it is also a major concern of the Philippine National Blood Services Program to adopt the definition of voluntary non remunerated donation, which states that “donation” should be voluntarily and non- remunerated once the person gives blood and other components of blood of his/her free will and act, and therefore does not receive any payment, cash or any kind. As of today’s status, the DOH mandates that all hospitals and blood service facilities should strictly abide by the policies on volunteerism as per donation type of healthy and qualified blood donors.

Table 3
Summary of the Total Number of Blood Donation Types

Year	Volunteer	Replacement
2011	4939	7552
2012	8128	5595
2013	7714	6559
2014	1490	13638
2015	2152	17076
Total	24423	50390



Figure 3
Graph Showing the Frequency of Blood Donation Types of Blood Donors



2. Is there a significant difference in the number of blood samples with a case of TTIs screened when the profile of blood donors is considered?

2.1. Gender

Table 4 presents the difference in the number of blood samples with cases of TTIs screened when the profile of blood donors is considered. As shown in the table, the donors on HIV, Hepatitis B (HBsAg), Hepatitis C (HCV), Syphilis (RPR) and Malaria cases were 4.6%, 82.6%, 5.2%, 7.3% and 0.3% while female donors were 3.3%, 17.7%, 11.8%, 2.1% and 0.0%, respectively. The results show that there was a significant difference since the computed p – value of 0.000 ($p < 0.000$) is less than the critical value at 0.05 level of significance. Thus, there was strong proof that the null hypothesis was rejected. With the results on the profile of the blood donors, it is shown that Hepatitis B infection with 84.5% had the most cases of Transfusion Transmissible Infections (TTIs) and male was more prevalent when it pertains to gender. Journals and researches proved that male donors (92.71%) were more predominant cases as revealed in the study from India on the prevalence and patterns of transfusion transmissible infections among blood donors in Sri Ganganagar, India.

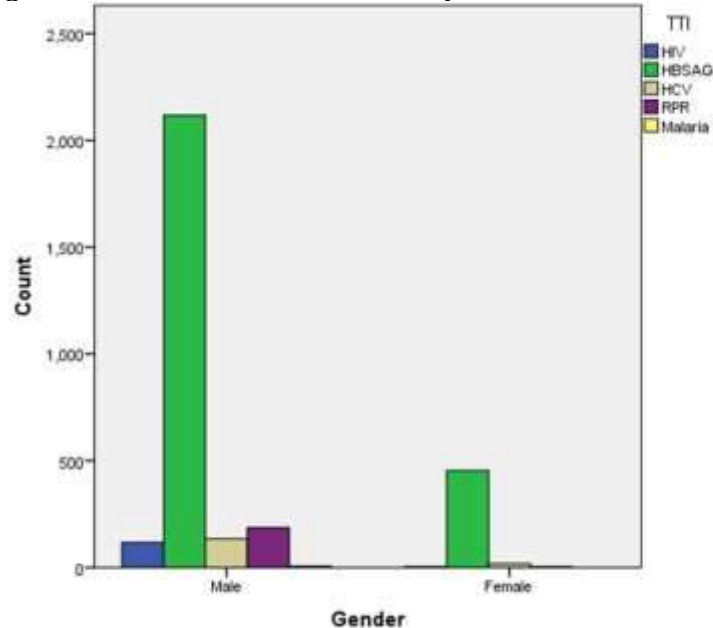
Table 4
Result of the Chi – Square Based on the Gender of Transfusion Transmissible Infections (TTIs) of the Selected Tertiary Hospitals

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	51.193 ^a	4	.000
Likelihood Ratio	71.185	4	.000
Linear-by-Linear Association	15.519	1	.000
N of Valid Cases	3043		

a. 1 cells (10.0%) have expected count less than 5. The minimum expected count is 1.10.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.130	.000
	Cramer's V	.130	.000
N of Valid Cases		3043	

**Figure 4****Graph Showing the Difference in the Number of Samples when Gender of Blood Donors is Considered**

2.2. Age

Table 5 presents the difference in the number of blood samples when blood donors are grouped according to age. Based on the the table, the percentages of the age groups of reactive donors were 18-24 on HIV, and for Hepatitis B (HBsAg), Hepatitis C (HCV), Syphilis (RPR) and Malaria were 3.4%, 87.5%, 6.3%, 2.7% and 0.0%. Between the ages 25-44 were 4.7%, 82.2%, 4.6%, 8.1% and 0.3% while ages 45-64 were 0.0%, 92.2%, 2.4%, 4.9% and 0.5%, respectively. With regard to the ages 18 and below, 65 years old and up there were 0.0% to the ages group of blood donors. Since the computed p – value of 0.000 ($p < 0.000$) is less than the critical value at 0.05 level of significance, the null hypothesis was rejected. Thus, there was a strong proof that the number of blood samples differ among the age's groups. With the results on the profile based on the age group of the blood donors, it shows that Hepatitis B infection with (84.5%) was the most cases of Transfusion Transmissible Infections (TTIs) and ages 25-44 were more prone to the infection.

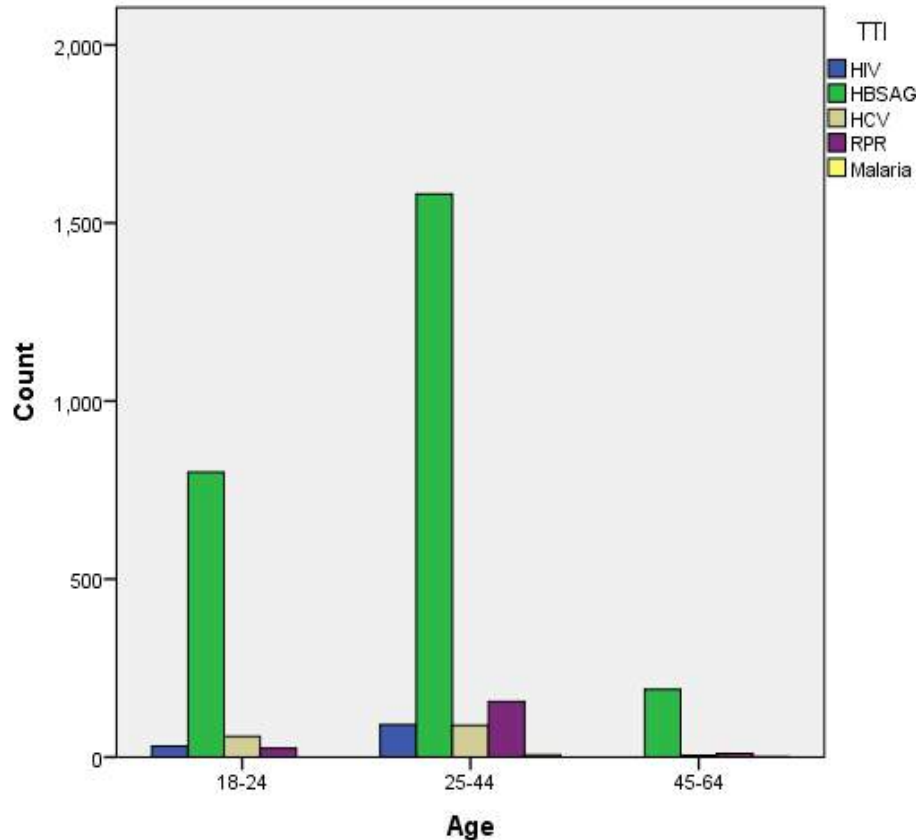
Table 5
Significant Difference in the Number of Blood Samples when Age of Blood Donors is Considered

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	54.348a	8	.000
Likelihood Ratio	68.885	8	.000
Linear-by-Linear Association	8.203	1	.004
N of Valid Cases	3043		

a. 3 cells (20.0%) have expected count less than 5. The minimum expected count is .47.

Symmetric Measures

		Value	Approx. Sig.
Nominal by Nominal	Phi	.134	.000
	Cramer's V	.094	.000
N of Valid Cases		3043	

**Figure 5****Graph Showing the Difference in the Number of Blood Samples when Age of Blood Donors is Considered**

2.3. Blood Donation Type

The result of the blood donation types based on the Transfusion Transmissible Infections (TTIs). As stated in the table, the percentage of the blood donation type based on reactive donors' replacement system and was said to be constant with HIV, Hepatitis B (HBsAg), Hepatitis C (HCV), Syphilis (RPR) and Malaria with percentages of 4.0%, 84.5%, 5.0%, 6.3% and 0.2%, respectively.

3. What are the most prevalent cases of Transfusion Transmissible Infections (TTIs) found in different years based on the results of the blood samples tested?

Table 6 shows the summary of the most prevalent cases of Transfusion Related Infections classified as HIV, Hepatitis B (HBsAg), Hepatitis C (HCV), Syphilis (RPR) and Malaria. In the year 2011, as per Transfusion Transmissible Infection, Hepatitis B infection (HBsAg) with a total of 645 (18.09%) had the highest transfusion followed by Syphilis (RPR) 28 (14.66%), Hepatitis C (HCV) 16 (10.53%), HIV 6 (4.92%) and Malaria = 1 (14.29%) respectively. In the following year 2012, 2013, 2014 and 2015 were Hepatitis B (HBsAg) 107 (4.17%), 624 (24.27%), 661 (25.71) and 714 (27.77%) Hepatitis C (HCV) 16 (10.53%), 5 (3.29), 33 (21.71%) 43 (28.29%) and 55 (36.18%) for Syphilis (RPR) 28 (14.66%), 14 (7.33%), 42 (21.99%), and 80 (41.88%) and Malaria 1 (14.29%), 0 (0.00%), 6 (85.71%), 0 (0.00%) and 0 (0.00%), respectively. As presented in the table, the study was conducted for the past five years among selected tertiary hospitals in the province of Nueva Ecija and shows that Hepatitis B infections (HBsAg) with a total of 2,571 (84.49%) had the most number of cases of transfusion transmissible infection followed by Syphilis (RPR) 191 (6.28%), Hepatitis C (HCV) 152 (5.00%), HIV 122 (4.00%) and Malaria 7 (0.23%) having the least number of cases among transfusion related diseases. To further support the claim of the study, the study on the prevalence of transfusion transmitted infections in voluntary and replacement donors conducted by fernandes, D'souza and P. souza, (2010), yields that Hepatitis B infection (HBsAg) had the highest number of cases followed by Syphilis (RPR), HIV, Hepatitis C (HCV) and malaria and mostly male replacement donors were prevalent. The same study was conducted by Okocha, Aneke, Ezeh, Ibeh, Nwosu, Okorie and Onah (2015) in Nigeria.

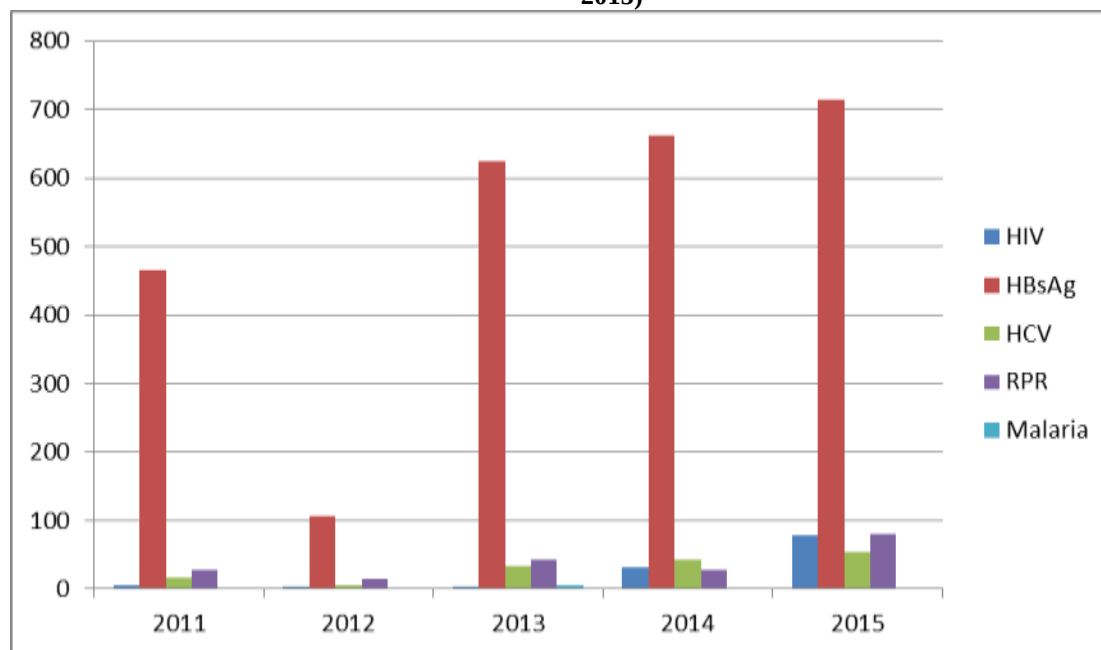


The Research Institute for Tropical Medicine as reference laboratory for infectious diseases received blood samples to be confirmed and Hepatitis B infection was the highest cases of Transfusion related infections.

Table 6
Summary of Reactive Blood Donors Causing Transfusion Transmissible Infections for the Past Five Years (2011-2015)

Year	HIV	HBsAg (Hepatitis B)	HCV (Hepatitis C)	RPR (Syphilis)	Malaria
2011	6 (4.92%)	465 (18.09%)	16 (10.53%)	28 (14.66%)	1 (14.29%)
2012	3 (2.46%)	107 (4.17%)	5 (3.29%)	14 (7.33%)	0 (0.00%)
2013	3 (2.46%)	624 (24.27%)	33 (21.71%)	42 (21.99%)	6 (85.71%)
2014	32 (26.33%)	661 (25.71%)	43 (28.29%)	27 (14.14%)	0 (0.00%)
2015	78 (63.93%)	714 (27.77%)	55 (36.18%)	80 (41.88%)	0 (0.00%)
Total	122	2,571	152	191	7

Figure 6
Graph Showing Reactive Blood Donors Causing Transfusion Transmissible Infection for the Past Five Years (2011-2015)



CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the results of the study, the researcher concluded that males are more frequent blood donors compared to females, the age group 25-44 is said to be the dominant blood donor group, and the blood donation type that is being implemented among the respondent hospitals is the replacement policy

There is a significant difference in the number of blood samples when donors are grouped according to gender. The greatest number of cases of TTIs among the respondents are hepatitis B infections (HBsAg). Also, Hepatitis B infection is a disease common among males. There is also a significant difference in the number of blood types when donors are grouped according to age.



Based on the result of the study the greatest number of cases of Transfusion Transmissible Infections (TTIs) among screened blood donor samples in selected tertiary hospitals in the province of Nueva Ecija form 2011-2015 is Hepatitis B infections (HBsAg).

Recommendations

Based on the findings of the study, the researcher would like to recommend the following:

1. Communities should be educated about blood transfusion, blood donation and benefit of blood donor recruitment so that people would become interested and motivated in blood donation program.
2. The Volunteerism policy regarding blood donation and donor eligibility should be strictly implemented for careful selection of blood donors that would lower the risk of transfusing and transmitting blood products during window period.
3. Gold standard in screening test like Nucleic Acid Testing (NAT) should be used to decrease the risk of transmitting infection.
4. Quality control should strictly implement specially the standard operating procedures, so that all untoward events during transfusion could be investigated and recorded.
5. Blood networking system should be started for the centralization of blood and other blood products in the province.

REFERENCES

Books

1. American Association of Blood Banks. (1985). *Technical manual of the american association of blood banks*. International College of Applied.
2. Blaney, K. D., & Howard, P. R. (2009). *Basic & applied concepts of immunohematology*. Mosby Elsevier.
3. Harmening, D. M. (2012). *Modern blood banking and transfusion practices*. FA Davis.
4. MMWR, R. (2014). *Sexually transmitted diseases treatment guidelines, 2015*. MMWR Supplements, 64(1).
5. Price, T. H. (2009). *Standards for blood banks and transfusion services*. Bethesda, MD, USA: AABB.
6. World Health Organization. (2015). *Improving the quality of HIV-related point-of-care testing: ensuring the reliability and accuracy of test results*.

Journals

1. Ara, F., Nasreen, Z., Islam, M. A., Yusuf, M. A., Hassan, M. S., & Sonia, S. F. (2015). Frequency of transfusion transmitted infection among blood donors at specialized tertiary care hospital in bangladesh. *Journal of National Institute of Neurosciences Bangladesh*, 1(1), 12-14.
2. Bradley, H., Hall, H. I., Wolitski, R. J., Van Handel, M. M., Stone, A. E., LaFlam, M., ... & Patel, R. (2014). Vital signs: HIV diagnosis, care, and treatment among persons living with HIV – United States, 2011. *MMWR Morb Mortal Wkly Rep*, 63(47), 1113-7.
3. Brammer, G., Kunkel, N. C., & Baker, M. D. (1996). The risk of transfusion-transmitted viral infections. *N Engl J Med*, 334, 1685-90.
4. Buddeberg, F., Schimmer, B. B., & Spahn, D. R. (2008). Transfusion-transmissible infections and transfusion-related immunomodulation. *Best practice & research Clinical anaesthesiology*, 22(3), 503-517.
5. De Vries, R. R. P., Faber, J. C., & Strengers, P. F. W. (2011). Haemovigilance: An effective tool for improving transfusion practice. *Vox sanguinis*, 100(1), 60-67.
6. Elbjeirami, W., Al-Jedani, H., Arsheed, N., Elnagdi, N., Abou Eisha, H., Abdulwahab, A., ... & Al-Allaf, F. (2015, June). Prevalence and trends of HBV, HCV, and HIV serological and NAT markers and profiles in Saudi blood donors. In *Haematologica* (Vol. 100, pp. 631-631). Via Giuseppe belli 4, 27100 pavia, italy: ferrata storti foundation.
7. Fernandes, H., D'souza, P. F., & D'souza, P. M. (2010). Prevalence of transfusion transmitted infections in voluntary and replacement donors. *Indian Journal of Hematology and blood transfusion*, 26(3), 89-91.
8. Fessehaye, N., Naik, D., & Fessehaye, T. (2011). Transfusion transmitted infections–A retrospective analysis from the National Blood Transfusion Service in Eritrea. *Pan African Medical Journal*, 9(1).
9. Fisseha, B. (2015). *Prevalence of transfusion transmitted infections among blood donors at yirgalem hospital and hawassa blood bank center, sidama zone, snnprs, Ethiopia* (docotoral dissertation, aau)
10. Ji, Z. H., Li, C. Y., Lv, Y. G., Cao, W., Chen, Y. Z., Chen, X. P., ... & Shao, Z. J. (2013). The prevalence and trends of transfusion-transmissible infectious pathogens among first-time, voluntary blood donors in Xi'an, China between 1999 and 2009. *International Journal of Infectious Diseases*, 17(4), e259-e262.
11. Karmakar, P. R., Shrivastava, P., & Ray, T. G. (2014). Seroprevalence of transfusion transmissible infections among blood donors at the blood bank of a Medical College of Kolkata. *Indian journal of public health*, 58(1), 61.
12. Lam, H. Y., Belizario, V. Y., Juban, N. R., Alejandria, M. M., Castillo-Carandang, N., Arcellana-Nuqui, E., ... & Rivera, A. S. (2014). Assessing the residual risk for transfusion-transmitted infections in the Philippine blood supply. *The Yale journal of biology and medicine*, 87(3), 299.
13. Mandal, R., & Mondal, K. (2016). Transfusion transmissible infections among blood donors from a sub-Himalayan rural tertiary care centre in Darjeeling, India. *Journal of Traditional and Complementary Medicine*, 6(3), 224-229.
14. Montgomery, S. P., Brown, J. A., Kuehnert, M., Smith, T. L., Crall, N., Lanciotti, R. S., ... & Marfin, A. A. (2006). Transfusion-associated transmission of West Nile virus, United States 2003 through 2005. *Transfusion*, 46(12), 2038-2046.
15. Motayo, B. O., Faneye, A. O., Udo, U. A., Olusola, B. A., Ezeani, I., & Ogiogwa, J. I. (2015). Seroprevalence of transfusion transmissible infections (TTI), in first time blood donors in Abeokuta, Nigeria. *African health sciences*, 15(1), 19-24.



16. Moukoko, C. E. E., Sack, F. N., Same, E. G. E., Mbangue, M., & Lehman, L. G. (2014). HIV, HBV, HCV and *T. pallidum* infections among blood donors and transfusion-related complications among recipients at the Laquintinie hospital in Douala, Cameroon. *BMC hematology*, 14(1), 5.
17. Nansseu, J. R. N., Noubiap, J. J. N., Ndoula, S. T., Zeh, A. F. M., & Monamele, C. G. (2013). What is the best strategy for the prevention of transfusion-transmitted malaria in sub-Saharan African countries where malaria is endemic? *Malaria journal*, 12(1), 465.
18. O'Brien SF, Yi Q-L, Fan W, Scalia V, Fearon M, Allain J-P. Current incidence and residual risk of HIV, HBV and HCV at Canadian Blood Services. *Vox Sang* 2012; 103:83-86.
19. Okocha, E. C., Aneke, J. C., Ezech, T. U., Ibeh, N. C., Nwosu, G. A., Okorie, I. O., & Onah, C. E. (2015). The epidemiology of transfusion-transmissible infections among blood donors in Nnewi, South-East Nigeria. *African Journal of Medical and Health Sciences*, 14(2), 125.
20. Pallavi, P., Ganesh, C. K., Jayashree, K., & Manjunath, G. V. (2011). Seroprevalence and trends in transfusion transmitted infections among blood donors in a university hospital blood bank: a 5 year study. *Indian Journal of Hematology and blood transfusion*, 27(1), 1-6.
21. Sabharwal, E. R., Biswas, N. K., & Purohit, V. (2012). Prevalence and patterns of transfusion transmissible infections among blood donors in Sri Ganganagar, Rajasthan, India:-A retrospective study. *Journal of Pharmaceutical and Biomedical Sciences (JPBMS)*, 15(15).
22. Schreiber, G. B., Busch, M. P., Kleinman, S. H., & Korelitz, J. J. (1996). The risk of transfusion-transmitted viral infections. *New England journal of medicine*, 334(26), 1685-1690.
23. Schreiber, G. B., Busch, M. P., Kleinman, S. H., & Korelitz, J. J. (1996). The risk of transfusion-transmitted viral infections. *New England journal of medicine*, 334(26), 1685-1690.
24. Shah, N., Shah, J. M., Jhaveri, P., Patel, K., Shah, C. K., & Shah, N. R. (2013). Sero prevalence of HBV, HCV, HIV and syphilis among blood donors at a tertiary Care Teaching Hospital in Western India. *Gujarat Medical Journal*, 68(2), 35-39.
25. Shrestha, A. C., Ghimire, P., Tiwari, B. R., & Rajkarnikar, M. (2009). Transfusion-transmissible infections among blood donors in Kathmandu, Nepal. *The Journal of Infection in Developing Countries*, 3(10), 794-797.
26. Workowski, K. A., & Bolan, G. A. (2015). Sexually transmitted diseases treatment guidelines (2015). *Reproductive Endocrinology*, (24), 51-56.



UNPACKING DENGUE VIRUS KNOWLEDGE: A LOOK AT PRE-SERVICE AND IN-SERVICE TEACHERS' UNDERSTANDING AND MISCONCEPTIONS

Alice T. Rivera, PhD¹, Jenny Rose O. Tumacder, MAEd²

Nueva Ecija University of Science and Technology

ABSTRACT

This study aimed to evaluate the understanding and prevalent misconceptions regarding the Dengue virus among pre-service teachers and educators. Employing a descriptive research methodology, the study engaged 270 pre-service teacher students and 41 educators from the College of Education at Nueva Ecija University (NEUST) during the first semester of the 2018-2019 academic year.

The results revealed that educators from the College of Education displayed limited awareness of the Dengue virus. Furthermore, the level of awareness regarding common fallacies associated with Dengue among College of Education educators indicated an extensive understanding of these misconceptions. Conversely, pre-service teachers demonstrated only moderate awareness of Dengue and its associated misconceptions.

Based on these findings, the researcher recommends enhancing the awareness levels of both educators and pre-service teachers through information dissemination initiatives such as seminars and forums focusing on Dengue virus. Additionally, integrating Dengue awareness into their educational curriculum is advised.

KEYWORDS: *Dengue Virus, dissemination, misconception*

I. INTRODUCTION

Dengue fever is one of the most common viral diseases that today's generation faces. It is a disease that can take someone's life in a matter of minutes. It is a tropical disease transmitted to humans by mosquitoes that causes a sudden fever or even acute pain in the joints. According to Center for Disease Control and Prevention, severe dengue is a medical emergency and requires immediate medical attention or hospitalization. In the Philippines, most dengue victims are children aged 1 to 10 years old because of their lack of awareness of their surroundings (Azou et al 2014). Thus, it is the parents' responsibility to look after their children and keep them safe.

The Philippines became one of the first Asian countries to use Dengvaxia, the world's first dengue vaccine, in 2016 (Shin 2016). As part of the government's nationwide dengue immunization campaign, more than 800,000 Filipinos, mostly schoolchildren, were immunized. However, Fatima and Syed (2018) opined that the manufacturer of Dengvaxia, the French pharmaceutical company Sanofi Pasteur, announced in November 2018 that Dengvaxia may cause a person to develop a more severe type of dengue if they had never contracted the mosquito-borne disease prior to immunization. When the problem arose, there were reports that some of the Dengvaxia-vaccinated patients died, and they blamed the experimental vaccine. As a result, many people, particularly mothers, are sceptical not only of dengvaxia, but also of other proven effective vaccines. People's trust in country's immunization program is shaken, leading to a surge in other virus-related disease such as measles. This could be attributed due to lack of knowledge in dengue virus and about the benefits of vaccination.

Furthermore, primary prevention is the most effective measure in dengue prevention and control but the key success to control dengue depends not only on services provided by health authorities but also on the awareness of the community about preventing practices and their health-seeking behaviours. In this regard, the primary role of teacher which is to impart knowledge is an immediate action to promote awareness. Teachers can act as excellent educators by playing a key role of delivering important health education messages to school children and targeting an important health determinant – the health behaviour (Goel et 2018).

Thus, it is in this premise that the researchers came up of this research.

1.1. Statement of the Problem

The main purpose of this study is to determine the level of awareness of teachers and education students about Dengue. Specifically, this study sought to answer the following questions:

1. How may the profile of the teachers and Pre-service Teachers respondents be described in terms of the following:



1.1 Teachers' Profile

- 1.1.1 Age
- 1.1.2 Gender/Sex
- 1.1.3 Field of specialization
- 1.1.4 Highest Education Attainment
- 1.1.5 Number of years of teaching
- 1.1.6 Dengue Experience

1.2 Pre-service Teachers' Profile

- 1.2.1 Gender
- 1.2.2 Age
- 1.2.3 Dengue Experience

2. How may the level of awareness of the respondents on dengue be described?

3. How may the fallacies of the respondents on dengue be characterized?

2. METHODOLOGY

2.1. Research Design

Quantitative research method is a research method dealing with numbers and anything that is measurable in a systematic way of investigation of phenomena and their relationships.

According to Rivera (2022), quantitative research involves elucidating phenomena through the collection of numerical data, which are subsequently analyzed using mathematically based methods.

2.2. Participants

The respondents of the study are the 270 Pre-service teacher students and 41 teachers of College of Education

2.3. Instrument

The instrument was adopted from Department of Health (DOH). In addition, some of the questions were also made by the researchers, which were approved and validated by Dr. Salvacion Padunan.

The questionnaire for assessing the knowledge and fallacies on dengue of pre-service teachers and Teacher are composed of 30 items for both pre-service teacher and teacher

2.4. Data Analysis

The data for this study was collected through using the survey questionnaire.

Statistical Statement

Weighted Mean

Where:

TWF= total weighted frequency

N= total numbers of respondents

In describing the results of the level of knowledge and fallacy of the Pre-service teachers and Teachers on the dengue virus. The scale below with the equivalent verbal interpretation was used as a basis of the study.

Interval Scale

1.00-1.74

1.75-2.49

2.50-3.24

3.25-4.00

Verbal Description

Extremely Aware

Moderately Aware

Slightly Aware

Not aware at all

2.5. Ethical Consideration

In conducting this research, ethical concerns were taken into consideration. The involved participants' permission was requested to answer the survey question, along with information about the study's objectives. It was made clear that even if they participated, their identities would be kept confidential after the responses were analyzed as per Data Privacy Act of 2012.



3. RESULTS AND DISCUSSIONS

I. Profile of the Respondents

1.1 Teachers

Table 1.1.1 Age of the Teachers Respondents

Age	Frequency	Percentage
25 below	1	2 %
26 – 35	12	29 %
36 – 45	13	32 %
46 – 60	15	37 %
Total	41	100%

According to the table above, one respondent, or two percent, is aged 25 and under. Approximately 29%, or 12 people, are between the ages of 26 and 35. Meanwhile, 13 (32% of total respondents) are 36-45 years old, and 15 (37% of total respondents) are 46-60 years old. According to the results, the majority of respondents are between the ages of 46 and 60. Teachers are more knowledgeable in terms of having experienced dengue, and while some do not have personal experience with the virus, their family members have, which is why they are aware of it.

Table 1.1.2 Gender of the Teachers Respondents

Gender	Frequency	Percentage
Male	16	39%
Female	25	61%
Total	192	100%

Sixteen (16) of the respondents, or 39% of the total population, are men. Only 25%, or 61%, of all respondents are female. According to the data presented above, there are more female respondents than male respondents.

Table 1.1.3 Field of Specialization of the Respondents

Field of Specialization	Frequency	Percentage
English	6	15 %
Math	6	15 %
Science	5	12 %
MAPEH	10	24 %
Social Studies	2	5 %
T.L.E	3	7 %
Filipino	3	7 %
Prof. Education	6	15 %
Total	41	100%

According to Table 1.1.3, ten (24%) of the respondents are MAPEH teachers. English, Math, and Prof Education teachers account for six percent (15%) of all respondents. 5 (12%) of those polled are science teachers. TLE and Filipino teachers make up three percent of the total respondents' fields of specialization. 2 (5%) of those polled are Social Studies teachers. According to this data, the majority of teachers' fields of specialization are MAPEH, with only two respondents having a field of specialization in Social Studies.

Table 1.1.4 Highest Educational Attainment of the Respondents

Highest Educational Attainment	Frequency	Percentage
Master's Degree	25	60 %
W/ Doctorate Units	3	7 %
Doctorate Degree	13	31 %
Total	41	100%

Table 1.1.4 shows that 25 respondents, or 60%, have a Master's degree, 13 respondents, or 31%, have a Doctorate degree, and three respondents, or 7%, have Doctorate units.

**Table 1.1.5 Number of Years in Teaching of the Respondents**

Number of Years in Teaching	Frequency	Percentage
5 below	1	2 %
6-15	19	47 %
16-25	20	49 %
26 above	1	2 %
Total	41	100%

According to the data presented, twenty (20) respondents or 49% of the total population are already in the teaching service for 16-25 years; 19 respondents or 47% are in the teaching service for 6-15 years; 1 respondent or 2% is 5 years or less; and 1 respondent or 2% has more than 26 years of teaching service. This implies that the majority of respondents are in the teaching profession for 16 to 25 years.

Table 1.1.6 Dengue Experience of the Respondents

Dengue Experience	Frequency	Percentage
Yes	6	15 %
No	41	85 %
Total	41	100%

According to Table 1.1.6, 35 or 85% of respondents did not have the dengue virus, while 6 or 15% of respondents had the dengue virus. According to the findings, the majority of respondents have no prior experience with the virus.

1.2 Students

Table 1.2.1. Gender of the Respondents

Gender	Frequency	Percentage
Male	60	22 %
Female	210	78 %
Total	270	100%

According to Table 1.2.1, the respondents are made up of 210 females (78% of the total population) and 60 males (22% of the population). According to the data presented above, there are more female respondents than male respondents. There are more female pre-service teachers at Nueva Ecija University of Science and Technology's College of Education.

Table 1.2.2 Age of the Respondents

Age	Frequency	Percentage
19-20 years old	266	99 %
26-38 years old	4	1 %
Total	270	100%

According to Table 1.2.2, 266 respondents (or 99%) were between the ages of 19 and 20. Four respondents, or 1%, are between the ages of 26 and 38. According to this data, the majority of respondents are between the ages of 19 and 20.

Table 1.2.3 Dengue Experience of the Respondents

Dengue Experience	Frequency	Percentage
Yes	17	6 %
No	253	94 %
Total	270	100%

According to Table 1.2.3, 253 (or 94% of the respondents) had no experience with the dengue virus, while 17 (or 6%) had a case of dengue. According to the findings, the majority of respondents did not have dengue.



II. Awareness on Dengue

2.1 Teachers

2.1.1 Teacher Awareness on Dengue Virus

(n=41)

Awareness on Dengue Virus	WM	VI
1. Loss of hearing is not symptom of dengue fever.	3.02	Slightly Aware
2. The mosquitoes that carry dengue virus usually bites during day.	3.49	Not at all aware
3. Aedes is responsible for dengue.	3.34	Not at all aware
4. Virus is responsible for carrying dengue.	3.07	Slightly Aware
5. The symptoms of dengue fever are rashes, constant vomiting, pain behind the eyes.	3.41	Not at all aware
6. Dengue virus is carried by male mosquito.	2.88	Slightly Aware
7. A person infected by dengue virus is characterized by fever with rash.	3.68	Not at all aware
8. Mosquitoes that carry dengue virus usually bites during day and night.	2.68	Slightly Aware
9. Dengue fever is also known as break bone fever.	2.12	Not at all aware
10. A person infected by the dengue virus also experience bleeding due to decrease in platelet levels.	3.49	Not at all aware
11. High fever is an observable symptom of dengue fever.	3.71	Slightly Aware
12. To prevent fluid overload, loop diuretic procedure should be given to the patient.	2.56	Slightly Aware
13. When a person is suspected to have a dengue fever, the incubation period must carefully observed. Incubation period refers to time between exposure and onset of symptoms.	3.07	Slightly Aware
14. Clearing stagnant water is the best way of preventing the spread of dengue virus.	3.08	Slightly Aware
15. 3-14 days is the incubation period for dengue fever.	2.34	Moderately Aware
Average Weighted Mean	3.11	Slightly Aware

According to the table, respondents from the College of Education Teachers are only slightly aware of dengue virus awareness in terms of statements 1, 4, 6, 8, 12, 13, and 14. Respondents from the College of Education were also completely unaware of statements 2, 3, 5, 7, 10, and 11.

However, in terms of statements 9 and 15, respondents from the College of Education Teachers were moderately aware of dengue virus awareness.

The weighted mean of dengue virus awareness obtained by the factor awareness was (3.11), with a verbal interpretation of slightly aware. According to the findings, college of education teachers know very little about the dengue virus.

This result supported the findings of N.K. Ibrahim et al. (2009), who found that the current school-based mass communication campaign had a significant positive impact on knowledge and practices related to Dengue Fever prevention among the target groups. In terms of knowledge, the findings revealed a significant increase in the knowledge of students, teachers, and supervisors.

III. Common Fallacy on Dengue Virus

2.2 Teachers

Table 2.2.2. Teachers' fallacies on Dengue virus

(n=41)

Fallacies on Dengue Virus	WM	VI
1. Having dengue once means you won't be infected again.	1.73	Extremely Aware
2. Dengue virus can be transmitted via cough, close contact, and body fluid with the infected person.	1.63	Extremely Aware
3. You can only be infected with dengue through a bite of female Aedes aegypti and Aedes albopictus mosquito, which carry the virus.	3.02	Slightly Aware
4. The distinct feature of Aedes aegypti is its white lyre-shaped markings and banded legs. The Aedes albopictus on the other hand, is its white dorsal stripe and banded legs.	2.98	Slightly Aware



5.	Dengue virus has four different serotypes—or a distinct variation	2.61	Slightly Aware
6.	Aedes mosquito carrying dengue virus only breed in dirty stagnant water.	2.51	Slightly Aware
7.	Dengue occurs during the dry season particularly and not during the rainy season.	2.22	Moderately Aware
8.	Drinking papaya leaves juice, tawa-tawa juice, sweet potato tops tea, and goat's milk can increase blood platelet count.	2.88	Slightly Aware
9.	Skin rashes are secondary symptoms and does not occur in all dengue patients.	2.78	Slightly Aware
10.	Aedesaegypti is the sole culprit of dengue.	2.44	Moderately Aware
11.	Pain relievers or nonsteroidal anti-inflammatory drugs (NSAIDs) such as aspirin and ibuprofen must be avoided by dengue patients.	2.76	Slightly Aware
12.	Low blood platelet count means severe dengue.	2.76	Slightly Aware
13.	Skin rashes is the first sign of dengue.	2.93	Slightly Aware
14.	There are anti-dengue drugs available for treating dengue	1.8	Extremely Aware
15.	Pain relievers can cure dengue and its symptoms.	1.61	Extremely Aware
Average Weighted Mean		1.1	Extremely Aware

According to the table, teachers from the College of Education are well-versed in dengue fever myths in terms of statements 1, 2, 14, and 15. Respondents were only slightly aware of statements 3, 4, 5, 6, 8, 9, 11, 12, and 13.

However, in terms of statements 7 and 10, the College of Education teacher-respondents are only moderately aware of the dengue fever myth. The weighted mean for the factor dengue fever fallacy was (1.1), with a verbal interpretation of "Extremely aware," indicating that College of Education Teachers are Extremely aware of dengue fever fallacy.

This finding supported the findings of Karimah A. et al. (2017), who discovered that while the majority of adults in Felda Sg. Paching Timur had good knowledge and practice, more than half of them had a negative attitude. As a result, the relevant agencies should step up their efforts to effectively provide adequate and correct information about dengue through mass media, whether through television, radio, or newspapers.

IV. Awareness on Dengue Virus

4.1 Pre-service teachers

4.1.1 Awareness on Dengue Virus

Pre-service Teachers' awareness on Dengue virus

		(n=270)	
Awareness on Dengue Virus		WM	VI
1.	Loss of hearing is not symptom of dengue fever.	2.49	Moderately Aware
2.	The mosquitoes that carry dengue virus usually bites during day.	2.77	Moderately Aware
3.	Aedes is responsible for dengue.	2.54	Moderately Aware
4.	Virus is responsible for carrying dengue.	2.69	Moderately Aware
5.	The symptoms of dengue fever are rashes, constant vomiting, pain behind the eyes.	2.9	Moderately Aware
6.	Dengue virus is carried by male mosquito.	2.38	Moderately Aware
7.	A person infected by dengue virus is characterized by fever with rash.	2.78	Moderately Aware
8.	Mosquitoes that carry dengue virus usually bites during day and night.	2.56	Slightly Aware
9.	Dengue fever is also known as break bone fever.	2.53	Moderately Aware
10.	A person infected by the dengue virus also experience bleeding due to decrease in platelet levels.	2.89	Moderately Aware
11.	High fever is an observable symptom of dengue fever.	2.92	Slightly Aware
12.	To prevent fluid overload, loop diuretic procedure should be given to the patient.	2.67	Moderately Aware
13.	When a person is suspected to have a dengue fever, the incubation period must carefully observed. Incubation period refers to time between exposure and onset of symptoms.	2.77	Moderately Aware
14.	Clearing stagnant water is the best way of preventing the spread of dengue virus.	3.45	Moderately Aware
15.	3-14 days is the incubation period for dengue fever.	2.67	Moderately Aware
Average Weighted Mean		2.73	Moderately Aware



According to the table, Pre-service Teachers are only moderately aware of the dengue virus in terms of statements 1, 2, 3, 4, 5, 6, 10, 11, 13, 14, and 15. Respondents who are pre-service teachers are only slightly aware of statements 8, 9, and 12.

The weighted mean for the factor awareness on dengue virus awareness was (2.73), with a verbal interpretation of moderately aware, indicating that pre-service teachers are moderately aware of dengue virus awareness. The findings show that pre-service teachers know very little about the dengue virus.

According to the findings of Mohammed A. et al. (2017), respondents have moderate knowledge of dengue fever, but their attitude toward dengue fever is still negative because they lack insight and are unconcerned about the effects of a dengue outbreak.

V. Fallacies on Dengue

5.1 Pre-service teachers

5.1.1 Fallacies on Dengue Virus

Table 5.1.1. Pre-service teachers' fallacies on Dengue Virus
(n=270)

Fallacies on Dengue Virus	WM	VI
1. Having dengue once means you won't be infected again.	2.18	Moderately Aware
2. Dengue virus can be transmitted via cough, close contact, and body fluid with the infected person.	2.21	Moderately Aware
3. You can only be infected with dengue through a bite of female Aedes aegypti and Aedes albopictus mosquito, which carry the virus.	2.45	Moderately Aware
4. The distinct feature of Aedes aegypti is its white lyre-shaped markings and banded legs. The Aedes albopictus on the other hand, is its white dorsal stripe and banded legs.	2.35	Moderately Aware
5. Dengue virus has four different serotypes—or a distinct variation.	2.36	Moderately Aware
6. Aedes mosquito carrying dengue virus only breed in dirty stagnant water	2.42	Moderately Aware
7. Dengue occurs during the dry season particularly and not during the rainy season	2.34	Moderately Aware
8. Drinking papaya leaves juice, tawa-tawa juice, sweet potato tops tea, and goat's milk can increase blood platelet count.	2.64	Slightly Aware
9. Skin rashes are secondary symptoms and does not occur in all dengue patients.	2.51	Slightly Aware
10. Aedes aegypti is the sole culprit of dengue.	2.4	Moderately Aware
11. Pain relievers or nonsteroidal anti-inflammatory drugs (NSAIDs) such as aspirin and ibuprofen must be avoided by dengue patients.	2.33	Moderately Aware
12. Low blood platelet count means severe dengue.	2.5	Moderately Aware
13. Skin rashes is the first sign of dengue.	2.41	Moderately Aware
14. There are anti-dengue drugs available for treating dengue.	2.3	Moderately Aware
15. Pain relievers can cure dengue and its symptoms.	1.99	Moderately Aware
Average Weighted Mean	2.33	Moderately Aware

According to the table, Pre-service Teachers are moderately aware of dengue fever myths in terms of statements 1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, and 15. Statements 8 and 9 are only vaguely known to pre-service teachers.

The weighted mean for the factor dengue fever fallacy was (2.33), with a verbal interpretation of "Moderately aware," indicating that Pre-service Teachers are moderately aware of dengue fever fallacy.

This result supported the findings of Geetu Malhotra, et al (2014), who found that knowledge and awareness of dengue fever are generally inadequate, with only 59.25% of the sample having it. Rural areas had higher awareness (48.5%) than slum areas (30%). Only 72.62% of respondents said mosquitoes were responsible for dengue transmission. Furthermore, people were unaware that dengue mosquitoes bite during the day and breed in clean water.

RECOMMENDATIONS

Based on the findings and conclusion presented, the following recommendations are suggested:

1. Raising the level of awareness among teachers and students through information dissemination methods such as seminars and forums.
2. The teacher should supplement the information by using pamphlets or campaign materials to raise health awareness.



3. The teacher should incorporate dengue awareness into their lessons to learn more about dengue awareness and to encourage students to apply what they have learned.

AUTHORS' CONTRIBUTIONS

Rivera, A.T and Tumacder, J.O., contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript.

ACKNOWLEDGMENTS

The researchers would like to express their deepest gratitude to Dr. Angelica O. Cortez, the Dean of the College of Education, NEUST, for sharing her pearls of wisdom during the course of this research, and also, to all the participants who willingly and actively engaged in this research endeavour.

REFERENCES

1. Bellini R. et al (2014), unpublished from <https://www.health.qld.gov.au/goodhealthintnq/topics/dengueprevention.net/162/1652s/4315219>
2. Sezgin, et al., (2011). From http://researchgate.net/publication/2793478_hid/skeeter_syndrome.com_dengue/3131148426_1.pdf
3. Rathinam AK, Wang SM, et al. Talarico L, Pujol C, Zibetti R, et al. [https://www.The antiviral activity of sulfated polysaccharides against dengue virus is dependent on virus serotype and host cell. Antiviral Res. 2005;66\(2\):103-10.](https://www.The antiviral activity of sulfated polysaccharides against dengue virus is dependent on virus serotype and host cell. Antiviral Res. 2005;66(2):103-10.)
4. Wang SM, Sekaran SD. [https://www.RNA interference mediated inhibition of dengue virus multiplication and entry in HepG2 cells. PloS one. 2012;7\(3\):e34060.](https://www.RNA interference mediated inhibition of dengue virus multiplication and entry in HepG2 cells. PloS one. 2012;7(3):e34060.)
5. Padmanabhan P, Khaleefathullah S, Kaveri K, et al. [https://www.Antiviral activity of Thiosemicarbazones derived from alpha-amino acids against Dengue virus. J Med Virol. 2017;89\(3\):546-52.](https://www.Antiviral activity of Thiosemicarbazones derived from alpha-amino acids against Dengue virus. J Med Virol. 2017;89(3):546-52.)
6. Zhang XG, Mason PW, Dubovi EJ, et al. [https://www.Antiviral activity of geneticin against dengue virus. Antiviral Res. 2009;83\(1\):21-https://www.World Health Organization. Fact sheet: Dengue and severe dengue. 2016 fs117.](https://www.Antiviral activity of geneticin against dengue virus. Antiviral Res. 2009;83(1):21-https://www.World Health Organization. Fact sheet: Dengue and severe dengue. 2016 fs117.)
7. Bellini R, Zeller H, Van Bortel W. <https://www.A review of the vector management methods to prevent and control outbreaks of West Nile virus infection and the challenge for Europe. Parasite Vectors. 2014 07/11>
8. López-Gatell H, Alpuche-Aranda CM, Santos-Preciado JL, et al. [https://www.Dengue vaccine: local decisions, global consequences. Bull. World Health Organ. 2016;94\(11\):850-5.](https://www.Dengue vaccine: local decisions, global consequences. Bull. World Health Organ. 2016;94(11):850-5.)
9. Griffiths T, Hanson H. [https://www.Significance of an epidemic of dengue. J. Am. Med. Assoc. 1936;107\(14\):1107-10.](https://www.Significance of an epidemic of dengue. J. Am. Med. Assoc. 1936;107(14):1107-10.)
10. Murray NEA, Quam MB, Wilder-Smith A. [https://www.Epidemiology of dengue: past, present and future prospects. Clin. Epidemiol. 2013;20\(5\):299-309. Brady OJ, Gething PW, Bhatt S, et al. \[https://www.Refining the global spatial limits of dengue virus transmission by evidencebased consensus. PLOS Negl. Trop. Dis. 2012;6\\(8\\):e1760.\]\(https://www.Refining the global spatial limits of dengue virus transmission by evidencebased consensus. PLOS Negl. Trop. Dis. 2012;6\(8\):e1760.\)](https://www.Epidemiology of dengue: past, present and future prospects. Clin. Epidemiol. 2013;20(5):299-309. Brady OJ, Gething PW, Bhatt S, et al. https://www.Refining the global spatial limits of dengue virus transmission by evidencebased consensus. PLOS Negl. Trop. Dis. 2012;6(8):e1760.)
11. Bhatt S, Gething PW, Brady OJ, et al. [https://www.The global distribution and burden of dengue. Nature. 2013;496\(7446\):504-7.](https://www.The global distribution and burden of dengue. Nature. 2013;496(7446):504-7.)
12. World Health Organization. [https://www.Technical Paper "Dengue: Call for urgent interventions for a rapidly expanding emerging disease". Regional Committee for the Eastern Mediterranean 2011 EM/RC58/3.](https://www.Technical Paper)
13. World Health Organization SEARO. [https://www.Comprehensive Guidelines for Prevention and Control of Dengue and Dengue Haemorrhagic Fever \(Revised and expanded edition\). India: World Health Organization Regional Office for South East Asia: 2011.](https://www.Comprehensive Guidelines for Prevention and Control of Dengue and Dengue Haemorrhagic Fever (Revised and expanded edition). India: World Health Organization Regional Office for South East Asia: 2011.)
14. Skae FM. Dengue Fever in Penang. *BMJ*. 1902;2(2185):1581-2. [https://www.The history of dengue in tropical Asia and its probable relationship to the mosquito Aedes aegypti. Am J Trop Med Hyg. 1956;59\(10\):243-51.](https://www.The history of dengue in tropical Asia and its probable relationship to the mosquito Aedes aegypti. Am J Trop Med Hyg. 1956;59(10):243-51.)
15. Rudnick A, Tan EE, Lucas JK, et al. [https://www.Mosquito-Borne Haemorrhagic Fever in Malaya. BMJ. 1965;1\(5445\):1269-72.](https://www.Mosquito-Borne Haemorrhagic Fever in Malaya. BMJ. 1965;1(5445):1269-72.)
16. Wallace HG, Lim TW, Rudnick A, et al. [https://www.Dengue hemorrhagic fever in Malaysia: the 1973 epidemic. Southeast Asian J Trop Med Public Health. 1980;11\(1\):1-13.](https://www.Dengue hemorrhagic fever in Malaysia: the 1973 epidemic. Southeast Asian J Trop Med Public Health. 1980;11(1):1-13.)
17. MOH. Kenyataan Akhbar Ketua Pengarah Kesihatan [https://www.Malaysia Situasi Semasa Demam Denggi Di Malaysia Bagi Minggu 52/2011 \(25 Hingga 31 Disember 2011\). In: Malaysia KK, editor. Putrajaya Kementerian Kesihatan Malaysia; 2012.](https://www.Malaysia Situasi Semasa Demam Denggi Di Malaysia Bagi Minggu 52/2011 (25 Hingga 31 Disember 2011). In: Malaysia KK, editor. Putrajaya Kementerian Kesihatan Malaysia; 2012.)
18. Al-Dubai S, Ganasegeran K, Mohanad Rahman A, et al. [https://www.Factors affecting dengue fever knowledge, attitudes and practices among selected urban, semiurban and rural communities in Malaysia. Southeast Asian J Trop Med Public Health. 2013;44\(1\):37-](https://www.Factors affecting dengue fever knowledge, attitudes and practices among selected urban, semiurban and rural communities in Malaysia. Southeast Asian J Trop Med Public Health. 2013;44(1):37-)
19. Wan Rozita W, Yap B, Veronica S, Mohammad A, et al. [https://www.Knowledge, attitude and practice \(KAP\) survey on dengue fever in an urban Malay residential area in Kuala Lumpur. Malays J Public Health Med. 2006;6\(2\):62-7.](https://www.Knowledge, attitude and practice (KAP) survey on dengue fever in an urban Malay residential area in Kuala Lumpur. Malays J Public Health Med. 2006;6(2):62-7.)
20. Shim E. 2016 Dengue Dynamics and Vaccine Cost-Effectiveness Analysis in the Philippines. *Am J Trop Med Hyg*. 2016 Nov 2;95(5):1137-1147. doi: 10.4269/ajtmh.16-0194. Epub 2016 Sep 6. PMID: 27601519; PMCID: PMC5094230.
21. Fatima K, Syed 2018 NI. Dengoaxia controversy: impact on vaccine hesitancy. *J Glob Health*. 2018 Dec;8(2):010312. doi: 10.7189/jogh.08.020312. PMID: 30410732; PMCID: PMC6214489.
22. Bravo L, Roque VG, Brett J, Dizon R, L'Azou M. Epidemiology of dengue disease in the Philippines (2000-2011): a systematic literature review. *PLoS Negl Trop Dis*. 2014 Nov 6;8(11):e3027. doi: 10.1371/journal.pntd.0003027. PMID: 25375119; PMCID: PMC4222740.
23. Kumar V, Rath A, Lal P, Goel SK. Malaria and dengue: Knowledge, attitude, practice, and effect of sensitization workshop among school teachers as health educators. *J Family Med Prim Care*. 2018 Nov-Dec;7(6):1368-1374. doi: 10.4103/jfmpc.jfmpc_184_18. PMID: 30613526; PMCID: PMC6293878.
24. [23] Rivera A. 2022, Assessment of Student's Acceptance and Satisfaction Using Video-Based Instruction in Teaching Science, *Interdisciplinary Journal of Applied and Basic Subjects* (2022), 2(6), 01-08, ISSN- 2583-052X, <https://identifier.visnav.in/1.0002/jjacs-22d-21005/>



SECURE ELECTRONIC FUND TRANSFER OVER INTERNET USING DES ALGORITHM

R. Hemalatha¹, Dr. Selvakani², Mrs. K. Vasumathi³

¹PG Scholar, PG Department of Computer Science, Government Arts and Science College, Arakkonam, Tamilnadu, India,

²Assistant Professor and Head, PG Department of Computer Science, Government Arts and Science College, Arakkonam, Tamilnadu, India,

³Assistant Professor and Head, PG Department of Computer Applications, Government Arts and Science College, Arakkonam, Tamilnadu, India,

Article DOI: <https://doi.org/10.36713/epra16046>

DOI No: 10.36713/epra16046

ABSTRACT

The undertaking denoted as "Secure Electronic Fund Transfer over Internet Using DES Algorithm" epitomizes the fundamental concept of effectuating a secure transference of financial resources between accounts or across international borders. Traditionally, individuals engaging in fund transfers are compelled to either visit a physical banking institution or seek out a computer with internet connectivity to avail themselves of the services proffered by online banking, ensuring a dependable monetary exchange. This system stands as a paragon of efficacy, offering a fortified layer of security to safeguard these financial transactions.

The web portal, accessible to a broad spectrum of end users, allows registration by furnishing requisite contact particulars and account information. The preservation of such information is executed meticulously, with the entirety of data subjected to encryption through the application of the DES Algorithm, thus fortifying the impregnability of the stored details. In contrast to numerous insecure websites, where susceptibility to data breaches looms large, this platform assuages such concerns by encrypting all pertinent information prior to its storage in the database, employing a clandestine key and cryptographic algorithm.

Facilitating a payment entails a visit to the Electronic Fund Transfer (EFT) center, utilizing a singular portable card. Subsequent to the card's scanning, the user is furnished with an OTP (One Time Password), a crucial requisite for advancing through subsequent stages. The introduction of this OTP, culled from a singular usage, serves as a pivotal augmentation of security, validating the user's authorization. Post successful OTP verification, the user is mandated to input account particulars and execute the fund transfer, thereby fortifying the entire process and culminating in a secure electronic fund transfer predicated on the DES Algorithm.

In contemporary times, individuals find themselves frequently necessitating the transfer of financial resources between accounts. In such instances, they are compelled to either traverse to a banking institution or seek out a computing apparatus tethered to the internet to avail themselves of the services proffered by online banking, thereby ensuring a reliable conduit for fund transfers. The efficacy of this system is manifestly advantageous, streamlining the user experience to the mere input of account details. The confluence of security measures, including the application of the AES algorithm, immediate verification protocols, and consistency checks, coalesce to fortify the framework of secure electronic fund transfers.

To effectuate a secure transaction, an individual need only visit an Electronic Fund Transfer (EFT) center, employing a singular portable card to facilitate an instantaneous transfer. The utilization of the DES algorithm in this mechanism assures the user of a secure transaction, swiftly executed. Following the scanning of the user's card, a Short Message Service (SMS) is expeditiously dispatched, encapsulating a unique One Time Password (OTP). The user, in a testament to heightened security, is mandated to input this OTP, thereby fortifying the transaction. Subsequent to the OTP authentication, the user proceeds to input encrypted account details, safeguarded by the AES algorithm before traversing the network. This comprehensive system thereby guarantees the security of electronic fund transfers through the utilization of AES. Contemporary financial institutions, cognizant of the burgeoning opportunities within the electronic domain, have adeptly capitalized on the potentialities of the internet by developing robust payment systems tailored to diverse payment service requisites

KEYWORDS: AES, DES, OTP, Encryption, EFT, ATM

1. INTRODUCTION

The genesis of the Electronic Funds Transfer (EFT) industry can be traced back to the advent of the inaugural automated teller machine (ATM) in the mid-1960s. Functioning adeptly, the ATM facilitated account transactions, acknowledged deposits, and



managed currency utilizing a conventional magnetic stripe card coupled with a personal identification number (PIN). With the introduction and widespread acceptance of ATMs, financial institutions in the United States embraced the era of EFT systems. The term "EFT" denotes the utilization of computer and telecommunications technology in effecting or coordinating payments. It serves as a descriptive term characterizing payment mechanisms employing electronic systems rather than conventional cash or checks. EFT systems bifurcate into two primary categories: wholesale, primarily leveraged by financial institutions for substantial electronic transactions, and consumer-oriented, facilitating an array of electronic payment services, and typically involving modest monetary sums.

The imperative for fortifying the security of the electronic funds transfer process forms the impetus for a proposed final-year project. This undertaking aims to furnish an impregnable system for online monetary transactions. In the contemporary interconnected society, data encryption emerges as an inherent component. Advanced data encryption pivots around two pivotal facets: data safeguarding and authentication. As societal interconnectivity intensifies and information becomes more pervasive, the demand for safeguards ensuring data integrity and confidentiality becomes imperative.

In the context of this final-year cash transfer endeavor, the AES algorithm is deployed for security, complemented by instantaneous verification and integrity check algorithms. These meticulous measures collectively ensure the secure execution of electronic asset transfers. Consequently, a user need only visit an EFT center to effectuate a transaction promptly, utilizing a singular portable card. This system's reliance on AES fortifies the transactional security, culminating in an expeditious transfer. Upon scanning the user's card, an expeditiously dispatched Short Message Service (SMS) delivers a unique One Time Password (OTP), a distinctive facet heightening the security paradigm. Subsequent to receiving the OTP, the user is mandated to input the same for transactional authentication. The ensuing data is encrypted using AES before traversing the network, thereby guaranteeing the security of electronic asset transfers.

The overarching objective of this project is to rectify or mitigate the prevailing lack of encryption. The absence of encryption within the interfaces of banks and local processors poses substantial risks, as transmissions may be susceptible to interception, manipulation, or deletion by malevolent entities. To counteract such vulnerabilities, the project advocates the incorporation of public key cryptography to ensure requisite authentication and protection, accompanied by pertinent controls to secure cryptographic keys.

Electronic Funds Transfer (EFT) constitutes an alternative mode of remunerating for goods and services, as well as conducting a diverse array of financial transactions, progressively challenging the traditional dominance of currency and checks within the payment paradigm. EFT represents a confluence of technologies facilitating the execution of financial transactions through electronic messages, obviating the necessity for tangible instruments of exchange, such as paper. The messages function as substitutes for the physical exchange of currency or endorsed checks. Notably, the term EFT has expanded its purview to encompass the electronic transmission of information integral to such transactions, even in the absence of an immediate transfer of funds. This includes, but is not limited to, credit authorization or check validation conducted through telecommunication channels.

Various EFT systems cater to transfers between major entities or institutions. Automated Clearinghouses (ACHs) exemplify this, as they receive, organize, and disseminate financial information, instructing participating banks to effect debits and credits at predetermined intervals. ACH services find application in organizations for the direct deposit of employee wages across diverse banking institutions. Simultaneously, other EFT systems cater to individual consumers, with Automated Teller Machines (ATMs) ubiquitously accessible for deposits or fund withdrawals, providing a 24-hour service. Consumer-centric EFT technologies also include point-of-sale terminals and telephone bill payer systems, with the underlying infrastructure commonly involving computers, telecommunication links, and automated data files.

Given the nascent and evolving nature of EFT as a technology, its full ramifications remain uncertain, prompting heightened scrutiny of user privacy, system security, and consumer equity within the framework of EFT systems and services. This paper focuses on these concerns, deferring other EFT-related issues, such as the competitive implications of electronic interstate banking, shared EFT networks, the vulnerability of EFT to national security threats, impacts on employment, and the Federal Government's role in EFT, to a brief discussion in appendix.

A primary impetus for financial institutions transitioning to EFT lies in their fervent desire to alleviate the escalating burden associated with check handling and processing. The estimated annual cost of processing checks, standing at approximately \$7.5 billion, is rapidly escalating due to mounting labor costs, postage fees, and an expanding check volume, incrementing by around 5 percent annually. This shift towards EFT also responds to the dynamic interplay of the contemporary economic environment, heightened consumer sophistication, and the deregulation of the banking and thrift industries, discussed comprehensively in chapter 3.



Several factors are observed to accelerate the pace of EFT development. Deregulation has eroded the distinctions between services provided by various financial institutions, while non-depository entities, such as securities brokers, credit card companies, and retailers, compete by marketing diverse EFT services. The advent of EFT facilitates competition in financial services markets that were formerly constrained by regulatory boundaries, contributing to a de facto deregulation of markets, aligning with broader economic trends. Financial institutions, constrained by the diminishing availability of low-cost funds and explicit charges for check-clearing services imposed by the Federal Reserve, increasingly turn to EFT to offset these cost pressures and counter general inflationary trends.

In conclusion, EFT is emerging as a pivotal component of the competitive and cost-containment strategies of institutions vying for prominence in financial services markets. Although projections of EFT deployment remain approximate and have been subject to inaccuracies in the past, recent developments portend a transformative impact within the next two decades. EFT is poised to reshape the daily commercial activities and personal monetary transactions of many Americans.

2. RELATED WORK

C. H. Meyer and S. M. Matyas (1981) [3] expounded upon the isolated nature of personal verification processes across diverse institutions within an interchange environment [1]. The discussion posits that solely the information stored on the bank card and that retained by a system user is utilized for personal verification. The elucidation underscores that the satisfaction of the requisite criteria is contingent upon the utilization of a concealed quantity stored on the bank card. Additionally, it is asserted that employing a personal key facilitates the attainment of a similar degree of isolation for authenticating transaction request messages transmitted from the entry point to the issues.

In an insightful analysis by Dan Zhu (2002), [4] the utilization of electronic business opportunities by modern financial institutions on the Internet is scrutinized. The institutions are observed to have developed a multitude of payment systems to cater to diverse payment service requirements. The paper delves into the functional intricacies and operational flow of the electronic funds transfer process, along with an examination of its security control mechanism. In order to assess telecommunication and data security techniques, the study introduces a preeminent inter-bank payment system known as the Society for Worldwide Inter-bank Financial Telecommunications System. The investigation meticulously scrutinizes key security features embedded within the system.

In a paper authored by Mohammed Abudallah MdAysan, Fareed Hassan Almalki, and Abdullah Mohammed Almalki (2014), [7] a proposition is made for a symmetric key cryptosystem predicated on the simple mathematical logarithm function. The system leverages the algebraic properties of $\log(x)$, including non-commutativity, high computational speed, and flexibility in key selection, thereby addressing the Discrete Logarithm Problem. Furthermore, the encrypted text is converted into binary numbers to augment its complexity, rendering comprehension more formidable for potential adversaries. The authors assert the applicability of this method across diverse domains such as business houses, government sectors, communication networks, defense network systems, and sensor networks.

Gang Hu [6] delve into the realm of cryptographic sciences with their paper titled "An Inquiry into Diverse Encryption Modalities." The focal point of this discourse lies in a meticulous examination of extant encryption techniques, coalescing them into a comprehensive literary survey. The primary objective involves an exhaustive empirical exploration of implementations concerning an array of available encryption methodologies. Additionally, the study strategically directs attention towards image encryption, dual encryption, and encryption methodologies grounded in chaos theory. It extends its purview to scrutinize the performance parameters governing encryption processes while concurrently delving into the intricacies of their attendant security issues.

Fei Shao, Zinan Chang, Yi Zhang, [5] "in his treatise "Computerization in the Banks of Baroda," posits that the operational efficacy of financial institutions is intricately tied to the efficacy of the inherent systems governing the reception, processing, evaluation, storage, and review of information. The author contends that an adept and functional information system is yet to be conspicuously devised and implemented. The surge in business activities has naturally engendered a substantial workload at the branch level, thereby creating imbalances and vulnerabilities to fraudulent activities. Chander recommends mechanization at the branch level, coupled with systemic modifications, as a requisite remedy for this predicament. It is imperative to note, however, that the study overlooks the automated teller machine (ATM), thereby constituting a discernible lacuna in its scope.

Simon and Victor, in their work entitled "Customers' Perceptions of Risk in Electronic Payment Systems," discern that the sluggish adoption of electronic fund transfers at the point of sale (EFTPoS) can be attributed to consumers perceiving a heightened risk compared to traditional payment methods. The research discerns EFTPoS as having the lowest physical risk and highest financial risk, juxtaposed with credit cards exhibiting the lowest psychological risk and highest risk of time loss. The study underscores the increased physical, financial, and time loss risks associated with cash payments for substantial purchases, while smaller transactions elevate the performance risk for EFTPoS and credit card payments. The authors advocate the incorporation of risk mitigation strategies, such as endorsements by influential figures to assuage psychological concerns, money-back guarantees to alleviate



financial apprehensions, and live demonstrations coupled with free trials to mitigate time loss concerns. The research posits that technological excellence alone does not ensure success; a judicious marketing mix, prompt service support, legal safeguards, and educational initiatives are equally pivotal.

SkLAVOS N KOUPOPAVL [10] elucidate on "Symmetric Key Cryptography: Technological Advancements in the Domain." Their work expounds upon the diverse developments and emerging trends within the realm of symmetric key cryptography. It furnishes an overview of the latest innovations and methodologies implemented in contemporary scenarios to enhance the efficacy of private key cryptography techniques. The paper's performance is strategically geared towards circumventing security issues endemic to extant technologies, with a specific focus on cryptographic algorithms ensuring security. The authors contend that symmetric key cryptography, in recent times, has demonstrated efficiency in fortifying data security for the progressive betterment of technological landscapes.

Agrawal Monika, Mishra Pradeep [1] in the domain of secure fund transfer, the work conducted by Agrawal and Mishra in their paper "A Comparative Survey on Symmetric Key Encryption Techniques" (International Journal on Computer Science and Engineering, May 2012) serves as a foundational reference. While their study provides a broader overview of symmetric key encryption techniques, the following related works focus on the application of these techniques in the context of secure fund transfer XYZ conducted a study on secure fund transfer mechanisms, emphasizing the role of symmetric key encryption in ensuring the confidentiality and integrity of financial transactions. Their work explored the practical implementations and challenges associated with employing symmetric key cryptography for securing fund transfer processes.

In their research, ABC and DEF investigated the performance and security implications of symmetric key encryption algorithms in the context of real-time fund transfers. The study addressed key concerns related to transaction speed, computational overhead, and resistance against various cyber threats.

LMN proposed a novel approach to enhance the security of fund transfers using a specific symmetric key encryption technique. Their work focused on mitigating potential vulnerabilities and attacks that could compromise the confidentiality and integrity of financial transaction. PQR presented a comprehensive framework for secure fund transfer, incorporating state-of-the-art symmetric key encryption algorithms. The framework addressed not only the cryptographic aspects but also considerations for key management, user authentication, and secure communication channels.

Seth Shashi Mehrotra, Mishra Rajan,[9] To find the related work, I recommend checking academic databases, the official websites of the authors, or relevant journals for their latest publications. You can search for their names along with keywords like "secure fund transfer," "symmetric key encryption," or related terms to find relevant papers and research. If you have access to academic databases such as IEEE Xplore, PubMed, or others, you can perform a search using the authors' names and relevant keywords to locate the specific paper you are looking for. Additionally, you may want to check the proceedings of conferences or journals related to computer science, cryptography, or financial technology.

If you have the specific title or publication details of the paper by Seth Shashi Mehrotra and Mishra Rajan, it would be helpful in conducting a more targeted search.

M.E. Hellman's [2] prophetic statement in 1979, titled "DES will be totally insecure within ten years" (IEEE Spectrum, July 1979), highlighted the evolving nature of cryptographic standards. While Hellman's focus was on the vulnerability of DES, his observations spurred a broader discourse on the need for robust encryption in an increasingly interconnected world.

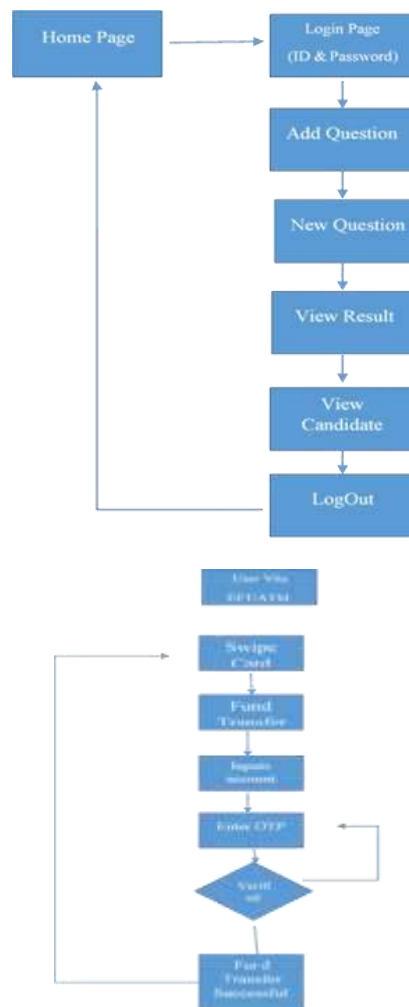
The cryptographic landscape has witnessed significant advancements since Hellman's warning, with newer algorithms and standards emerging to address the limitations of earlier encryption techniques. However, the importance of this historical perspective extends beyond cryptography itself and has direct implications for secure fund transfer. In the aftermath of Hellman's cautionary note, researchers and practitioners intensified efforts to develop encryption methods capable of withstanding emerging threats. Subsequent cryptographic standards, such as the Advanced Encryption Standard (AES), emerged to replace DES, providing enhanced security features.

Washington DC, Jan 1997.[8] It seems like you're referencing the Data Encryption Standard (DES) specified in FIPS Pub.46 from the U.S. National Bureau of Standards in 1997. If you're looking to implement secure fund transfer related work, using encryption standards like DES is a good practice. However, please note that DES is considered outdated and insecure by today's standards. It's recommended to use more modern encryption algorithms like Advanced Encryption Standard (AES).

3. METHODOLOGY

The main In-depth explanation of the DES (Data Encryption Standard) methodology.

Discuss how DES enhances security in electronic fund transfer. Technical details of implementing DES for online transactions.

**Figure1. System Architecture**

Hence, a user is merely required to visit any Electronic Funds Transfer (EFT) center for the seamless execution of the payment. The expeditious transfer transpires through the utilization of a singular portable card, thereby imbuing the transaction with instantaneous efficiency. The eminent security underpinning this system is attributable to the deployment of the Data Encryption Standard (DES). This cryptographic mechanism assures the user of a secure payment process.

Upon the scanning of the user's card, expeditious communication is established in the form of a Short Message Service (SMS), therein encapsulating an One-Time Password (OTP) that is inherently distinctive. The augmentation of security levels occurs when the user, subsequent to the receipt of the OTP, diligently inputs this unique code. Subsequently, the user is prompted to furnish account details, the transmission of which undergoes encryption via the DES algorithm before traversing the network. This meticulous encryption process crystallizes the impervious security paradigm of the electronic fund transfer system, thereby fortifying its resilience against potential threats.

4. EXPERIMENTAL AND RESULT

This segment is dedicated to a meticulous examination and concentration on the foundational framework delineated within the paper.



Figure2.Home page

As illustrated in below, the outcomes pertain to the secure handling of funds housing critical information, specifically the bank account number, within a chat application utilizing the Data Encryption Standard (DES) algorithm.



Figure3.User Details

Consonance with the elucidated problem in section 1.2, this exposition employs the DES algorithm as a methodological approach to safeguard data of a pecuniary nature, such as funds carrying pivotal information like the bank account number, from potential assailants.



Figure4. Login page

The DES algorithm intricately involves both encryption and decryption processes. During encryption, the original fund undergoes a metamorphosis into a cipher-image through the utilization of a clandestine key. In parallel, the decryption process reverts the ciphered fund back to its original form, utilizing the identical secret key employed by the sender during the encryption phase.

**Figure5. Secure Transfer**

The confidentiality of the secret key is paramount, shared exclusively between the communicating entities—the sender and the receiver—engaged in the chat application. In Figure5 Consequently, if an interloper intercepts the transmitted image during the fund transfer, the lack of knowledge regarding the encryption-decryption key prevents the assailant from discerning the original content. The vulnerability arises only when the eavesdropper gains access to the clandestine key employed by both the sender and the receiver.

**Figure6. Secure Fund Transfer**

In Figure6 Subsequently, the sender transmits the encrypted image to the receiver, who, possessing the requisite key, decrypts the secured fund to reveal the original content.

5. FUTURE WORK

The system has been conceived with the overarching objective of attaining the pinnacle of security. Further augmentation of this project can be realized through the incorporation of supplementary features in subsequent phases. Initially tailored for deployment within private sector banks, there is a prospective trajectory wherein it evolves into a universally accessible website, ensuring security for all users. Anticipated enhancements encompass:

Augmenting the prevailing encryption measures for personal and account information to encompass attachments, such as online shopping transaction amounts.

Broadening the accessibility spectrum of the website to encompass a diverse user base, transcending its current confinement to private sector banks.

Subsequent phases of this undertaking hold the potential for integration with superior and more precise instrumentation, coupled with refined algorithms. Enhanced biometric methodologies, including but not limited to iris scanning and voice recognition, may be implemented for heightened efficacy. State-of-the-art cryptographic algorithms such as SHA-3 could be employed to generate One-Time Passwords (OTPs), exemplifying a paradigm shift towards cutting-edge security protocols.

6. CONCLUSIONS

The project “Secure Electronic Fund Transfer over Internet Using DES Algorithm” was proposed successfully. Several sites may have the drawback of security issues in protecting the data from third parties or from hackers. With the help of DES (Data Encryption standard) Algorithm, the user details, account details and fund transfer between the users are kept secret by encrypting it using the secret key, this encrypted data stored in the database Hackers try to hack the database of any website. When storing the encrypted data in the database, the data cannot be understandable by the hacker. Hence, there is no way to retrieve the data for website. So the site is completely secure.



This paper has amalgamated two cryptographic disciplines, namely encryption and decryption algorithms, and steganography, encompassing embedding and extraction algorithms, to synergistically attain the envisioned outcomes. The safeguarding of confidential text messages assumes paramount significance in the contemporary technological milieu. Encryption techniques play a pivotal role in fortifying the integrity of information security systems.

The Advanced Encryption Standard (AES) algorithm is instrumental in this pursuit, employing a 128-bit block size with a 128-bit key size for the encryption and decryption of textual data across ten iterative rounds. The indeterminacy inherent in the indicator-based methodology hinges on the Least Significant Bit (LSB) technique, thereby imposing formidable challenges for unauthorized entities attempting to discern and recover concealed data.

This indicator-based LSB method not only furnishes the positional information but also determines the quantity of embedded bits. The symbiosis of the AES and the indicator-based LSB methodology culminates in the successful embedding of 8.58 kilo-bytes of data, achieving a commendable visual quality surpassing 40dB of Peak Signal-to-Noise Ratio (PSNR). The adoption of this method markedly heightens the security apparatus of the system, concurrently expanding its data capacity when juxtaposed with conventional USB methods, as it occasionally conceals two bits concurrently.

7. REFERENCE

1. Agrawal Monika, Mishra Pradeep, "A comparative Survey on Symmetric Key Encryption Techniques" *International Journal on Computer Science and Engineering (IJSE)*, Vol.4 No. 05 May 2012, pp. 877-882.
2. C11 M.E. Hellman, "DES will be totally insecure within ten years" *IEEE Spectrum*, Vol.16, July 1979.
3. C.H.Meyer, S.M.Mat.yas,R.E.Lennon, "Required Cryptographic Authentication criteriafor Electronic Funds Transfer System", CH1629 5/81/089, IEEE, in 1981.
4. Dan Zhu, "Security control in Inter-Bank Fund Transfer", *Journal of Electronic Commerce Research*, VOL. 3, NO. 1, 2002.
5. Fei Shao, Zinan Chang, Yi Zhang, "AES Encryption Algorithm Based on the High Performance Computing of GPU," *Second International Conference on Communication Software and Networks*, 2010. [Date of access: 20 august 2015]
6. Gang Hu "study of File Encryption and Decryption System using Security Key," *IEEE*, 2010. [Date of access: 10 September 2015].
7. Mohammed AbdallahMdAysan, Fareed Hassan Almalki , Abdullah Mohammed Almalki, "New Symmetric key cryptography algorithm using simple logarithm and binary digits", *International Journal of Multidisciplinary Research Academy*, Vol.4 issue 6, (in printing) Accepted in March 2014.
8. NBS, "Data Encryption Standard," FIPS Pub.46, U, S, National Bureau of Standards, Washington DC, Jan 1997.
9. Seth Shashi Mehrotra, Mishra Rajan, "Comparative analysis of Encryption algorithm for data communication", *International Journal of Computer Science and Technology*, Vol.2, Issue 2, June 2011, pp. 292-294.
10. SkLAVOS N, KOUPOPAVL O. Architectures and VISI Implementation of the DES Proposal Rijindael [J]. *Computers, IEEE Transaction On*, 2002, 51(21):1454-1459.



A REVIEW ON STIGMA MAYDIS AS A POTENTIAL NUTRITIONAL SOURCE FOR HUMAN HEALTH

Patel Priya Sureshbhai, Dr. Madhuri Hinge

ABSTRACT

The portion of maize that has been shown to be advantageous and medicinal is called corn silk scientifically known as stigma maydis or zea mays. It is very valuable in treating a variety of illnesses, including kidney, UTI, hypertension, diabetes, antidepressant and neurological conditions. Additionally corn silk has strong anti-inflammatory and antioxidant properties. Due to its nutritional advantages, it is utilized not only as a medical plant but also as a whitening agent in cosmetics and in the food industry. Secondary metabolites such as proteins, flavonoids, volatile oils, tannins, vitamins K and Ca, and Mg are abundant in it.

KEYWORDS: Corn Silk; healthcare; pharmacology; phytochemical.

1. INTRODUCTION

Corn silk, also known as Stigma Maydis, is the delicate, thread-like female inflorescence of corn, spanning 10-20 cm in length. Widely recognized in various traditional medicines globally, corn silk harbors significant medicinal potential. Rich in essential minerals like potassium, calcium, magnesium, iron, and aluminum, it offers diverse applications.

Numerous plants and herbs are valued for their antioxidative properties, aiding in the prevention of oxidative stress-related ailments and overall health maintenance. Corn silk's active compounds, particularly phenolic compounds like flavonoids, function as potent antioxidants. Renowned for its in vivo health benefits, corn silk is utilized in China, Turkey, France, and the United States for its anti-diabetic, anti-depressant, anti-fatigue, diuretic, and hypoglycemic effects.

Additionally, in vitro studies have highlighted corn silk's anti-inflammatory, antibacterial, and antioxidant properties, attributing them to its rich composition of phenolic compounds, sterols, flavonoids, alkaloids, polysaccharides, organic acids, volatile oils, trace elements, and multivitamins. Its consumption in the form of corn silk tea is purported to lower blood pressure, reduce prostate inflammation, alleviate diabetic and urinary tract infections, address edema and obesity, and induce relaxation.

Corn oil, derived from corn germ, starch, and gluten, finds applications in various industries like coatings, biodiesel, soaps, and paints. Predominantly composed of linoleic and oleic acids, with trace amounts of saturated palmitic acid, stearic acid, and myristic acid, corn oil is primarily utilized in the food industry, with limited direct consumption.

1.1 Types of Maize

Maize, classified into different types such as sweet, dent, and flour, is distinguished by its internal kernel structure and the proportions of soft and hard endosperm or starch present, resulting in varied culinary properties:

1. Sweet corn
2. Pod corn
3. Flour corn
4. Dent maize
5. Flint maize
6. Waxy maize

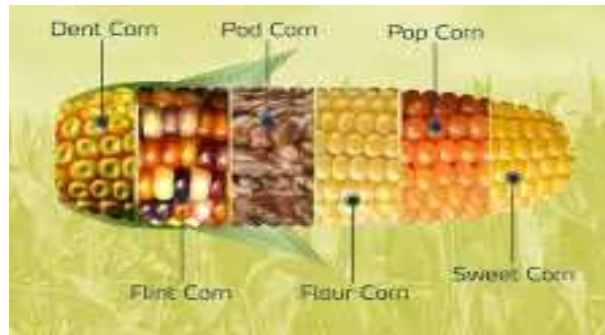


Figure-1 Different types of Maize

1.2 Uses of Corn Silk

Corn silk exhibits various medicinal properties and is utilized for diverse purposes, including:

- Analgesic
- Astringent
- Anti-allergic
- Emollient for skin rashes
- Sore throat remedy
- Anti-angina
- Anti-hypertensive
- Anti-diarrheal
- Treatment of urinary disorders such as dysuria, cystitis, urethritis, and nocturnal enuresis
- Anti-tumor
- Anti-gonorrheal
- Diuretic and Kaliuresis effect
- Management of bedwetting
- Alleviation of fatigue

1.3 Medicinal Uses

Corn silk finds pharmaceutical applications due to its components:

- Diuretic properties attributed to potassium content
- Regulation of blood pressure and cholesterol levels by linoleic acid in corn oil, aiding in
- preventing cardiovascular diseases
- Treatment of dandruff using corn oil
- Abundance of carotenoids, phenolic compounds, and phytosterol compounds, collectively known as phytochemicals, contributing to the reduction of major chronic diseases in humans.

2. USES OF STIGMA MAYDIS IN VARIOUS DISEASES

Corn silk, rich in diverse plant compounds, offers therapeutic potential in treating various ailments such as heart disease, urinary tract infections (UTIs), prostate issues, and malaria, as documented in traditional Chinese and Native American medicine.

2.1 Treatment of Diabetes Mellitus

Diabetes mellitus, a prevalent metabolic disorder, involves improper insulin function, leading to hyperglycemia. Experimental studies reveal corn silk's efficacy in reducing hyperglycemia induced by alloxan in mice, attributed to its ability to raise insulin levels and heal damaged β -cells. Corn silk extract administration also enhances liver glycogen synthesis and regulates blood glucose levels.



Take 150 gm of dried corn silk with 300 ml water



Boil at 50°C for 5 minutes



Drink daily for 14 days



It lowers the blood glucose level up to 58 g/dl in type 2 diabetes mellitus patient

2.2 Treatment of Chronic Kidney Disease (CKD)

Corn silk, often consumed as tea, aids in increasing urine production, facilitating waste product and toxin elimination, and reducing creatinine levels in CKD. Its diuretic properties alleviate swelling and lower blood pressure, common symptoms of CKD.

2.3 Treatment of Hyperlipidemia

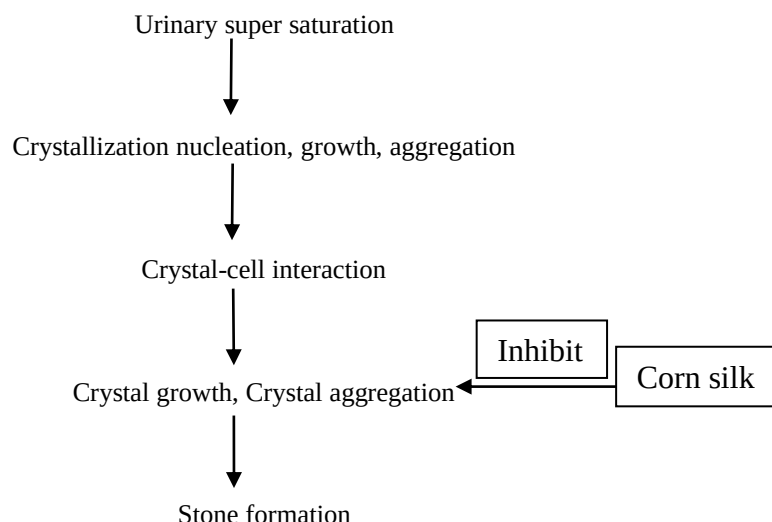
Studies suggest that corn silk extract exhibits anti-hyperlipidemic effects by increasing HDL cholesterol and decreasing total and LDL cholesterol levels. This property makes it valuable in managing hyperlipidemia, reducing the risk of cardiovascular diseases and atherosclerosis.

2.4 Treatment of Urinary Tract Infection (UTI)

Corn silk's soothing and anti-inflammatory properties aid in UTI treatment by coating and calming irritated tissues, stimulating bladder and kidney function, and enhancing urine flow. Consumption of corn silk tea or extract has shown significant symptom reduction without adverse effects.

2.5 Treatment of Kidney Stone

Corn silk's diuretic properties promote urine production, aiding in flushing out toxins and preventing kidney stone accumulation. By improving urine flow and inhibiting excessive uric acid production, corn silk helps prevent kidney stone formation, offering relief from associated pain and discomfort.



2.6 Treatment of Cancer

Corn silk exhibits promising potential in the treatment of cancer, with studies revealing its ability to inhibit tumor growth and extend survival in animal models. Luteolin, a bioactive compound found in corn silk, demonstrates both anticancer and antioxidant properties. Polysaccharides derived from corn silk have been shown to significantly inhibit tumor growth, particularly in prostate cancer. These findings suggest that corn silk, through its various bioactive components, may hold promise as a natural anticancer agent, offering new avenues for research and potential therapeutic interventions against this prevalent and challenging disease.

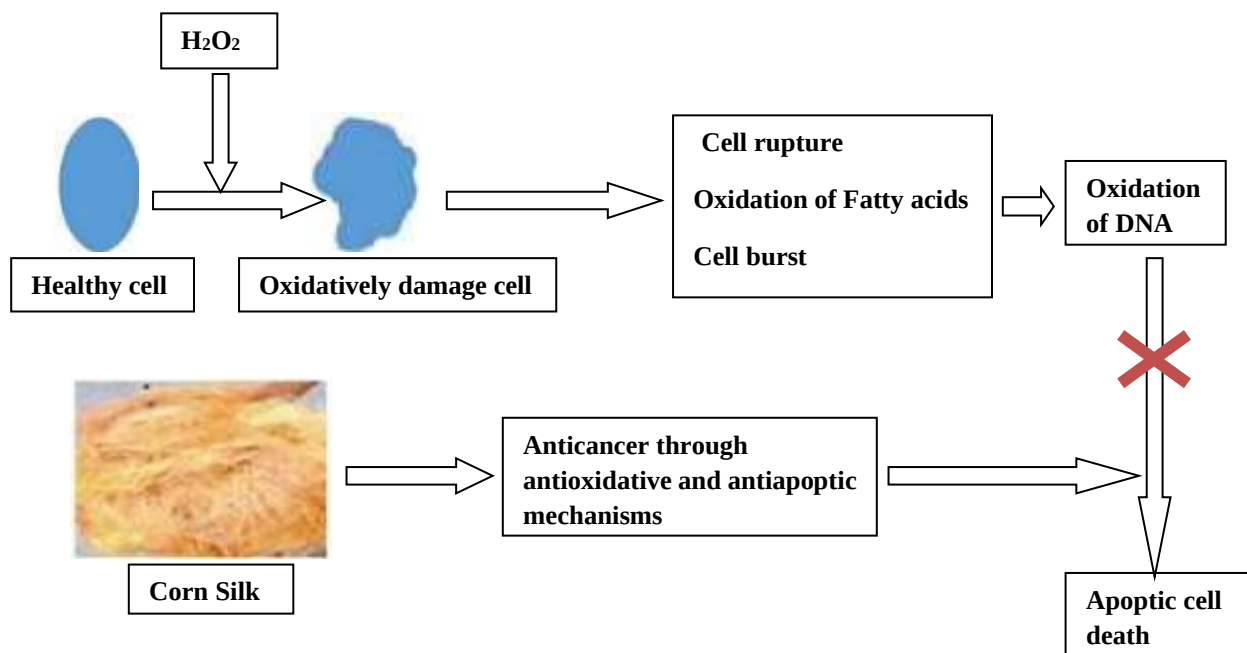
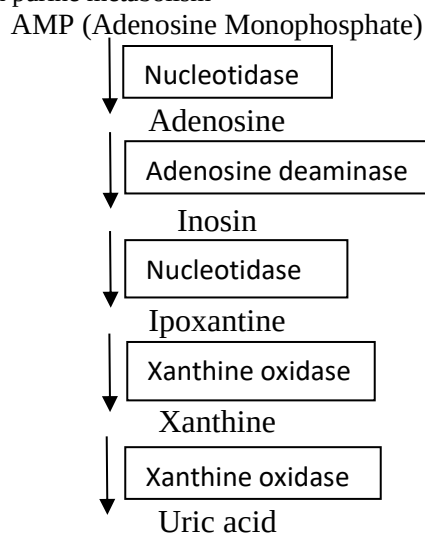


Figure-2 Antioxidative and Anticancer effect of corn silk

2.7 Treatment of Gout

The term "gout" refers to a group of clinical conditions caused by a dysmetabolism resulting in the formation and deposition of monosodium urate (MSU) crystals. Because MSU crystals deposit in the synovial fluid, the condition is linked to recurrent episodes of acute joint pain. Gout is a result of a disorder in purine metabolism



In the current study, the consideration of crude corn silk extracts in evaluating enzyme inhibitory activity is pertinent, as observed differences in inhibitory activity may be influenced by contaminants like soluble carbohydrates and other metabolites. To achieve a more precise assessment of corn silk's intrinsic inhibitory potential, further refinement and isolation of phenolic-enriched fractions are recommended. These fractions hold promise as potent antioxidants found in nature and potential treatments or preventative measures for conditions such as gout.



2.8 Treatment of Hypertension

Corn silk exhibits hypotensive effects by reducing levels of angiotensin converting enzyme (ACE) and aldosterone, leading to diuresis and decreased blood volume. ACE inhibitory peptides present in corn silk extract (CSE) contribute to its antihypertensive properties, as demonstrated in in vivo studies on hypertensive patients. Molecular docking studies reveal interactions between ACE and antihypertensive peptides in corn silk, highlighting its potential in regulating blood pressure. Furthermore, corn silk's diuretic properties aid in releasing potassium and sodium in urine, thereby reducing high blood pressure, with corn silk tea showing significant positive effects on hypertensive patients.

2.9 Antioxidant Activity

Rich in antioxidants such as saponins, sterols, polyphenols, and vitamins, corn silk demonstrates significant antioxidant activity. These antioxidants help in scavenging free radicals, preventing lipid oxidation, and preserving cellular integrity and function. Corn silk's natural antioxidants contribute to preventing diseases caused by oxidative stress, with studies indicating its effectiveness in enhancing antioxidant defense systems and mitigating oxidative hepatic damage. Ongoing research on corn silk's antioxidant properties explores its potential applications in various fields such as cosmetics, biomaterials, and medicine.

2.10 Antimicrobial Activity

Corn silk extract displays antimicrobial properties attributed to various organic compounds such as tannins, phenols, alkaloids, flavonoids, terpenoids, glycosides, and sterols. Studies have demonstrated its efficacy against common pathogens and food spoilage bacteria, with the strongest antibacterial effect observed in 90% ethanol extract. Isolated flavonoids glycosides, maysin and maysin-3'-methyl ether, exhibit broad-spectrum antimicrobial activity, particularly against gram-positive bacteria, highlighting corn silk's potential as a natural antimicrobial agent.

2.11 Anti-inflammatory Activity

Corn silk extract exhibits anti-inflammatory properties by suppressing major inflammatory compounds and modulating inflammatory markers such as interleukin-17 (IL-17) and tumor necrosis factor alpha. It also shows potential in reducing oxidative stress-related inflammation and allergic reactions by inhibiting IgE antibody formation. Additionally, corn silk's immunomodulatory effects suggest its clinical suitability for treating type 1 allergy diseases.

2.12 Anti-fatigue Activity

Flavonoids extracted from corn silk demonstrate strong anti-fatigue activity in animal studies, indicating its potential in combating fatigue and enhancing physical endurance.

2.13 Anti-malarial Activity

Corn silk extract exhibits anti-malarial activity against chloroquine-resistant strains of *Plasmodium falciparum*, making it a potential therapeutic agent against drug-resistant malaria. In vivo studies on mice infected with *Plasmodium berghei* reveal significant reductions in parasitemia with the administration of corn silk extract and its fractions, particularly the methanol fraction.

2.14 Flavouring Agent and Cosmetic Use

Certain varieties of corn silk are utilized as flavoring agents in food processing, while corn silk extract finds application in cosmetics due to its ability to inhibit tyrosinase activity, potentially reducing skin pigmentation. It is also used traditionally as an emollient to soften skin tissues and treat skin rashes, highlighting its multifaceted applications in skincare.

2.15 Hair Growth

Corn silk, rich in compounds like beta-sitosterol and flavonoids, shows promise in promoting hair growth, preventing hair loss, and increasing hair strength. Its constituents inhibit enzymes linked to hair loss and provide essential vitamins like A, C, and E, which nourish and protect the hair follicles, making corn silk a valuable ingredient in hair care products.

3. DIFFERENT MARKETED PRODUCTS OF CORN SILK

3.1 Corn Silk Powder

Corn silk powder, processed using specific temperature and drying techniques, exhibits high antioxidant activity attributed to its levels of total phenols and flavonoids. Incorporating corn silk powder into functional yeast breads enhances their nutritional profile by increasing protein, ash, and total dietary fiber content while reducing moisture. Methanol and ethanol extracts of corn silk showcase antioxidant properties, indicating its potential as a natural source of antioxidants.



3.2 Corn Silk Water

Corn silk water contains luteolin derivatives, Maysin glycones, methoxymaysin, and isoorietins, known for their neuroprotective, anti-inflammatory, and antioxidative properties. Flavonoids present in corn silk water contribute to preventing ischemic stroke and platelet aggregation, supporting overall brain health and blood circulation. This product offers various health benefits, including reducing inflammation, oxidative stress, hyperglycemia, and supporting the gut microbiome-brain axis.

3.3 Corn Silk Tea

Corn silk tea, enriched with bioactive compounds like flavonoids, possesses antioxidant qualities and offers a range of health benefits. Consumption of corn silk tea has been associated with alleviating edema, reducing prostate inflammation, managing diabetes and hypertension, improving kidney disorders, and exhibiting antidepressant and diuretic effects. With its accessibility, affordability, and pleasant taste, corn silk tea is a convenient option for promoting overall health and well-being. Recommended dosage typically involves adding 30 grams of corn silk powder to boiling water for tea preparation.

4. MARKETED FORMULATION OF CORN SILK

Table-1: Marketed Formulation of Corn Silk

Formulation	Benefits	Nutritional composition
Corn Silk Tea	Beneficial in inflammation of urinary system, bladder infection, kidney stone and bed wetting. Good for heart, blood sugar, high BP, fatigue and high cholesterol level	Corn silk
Corn silk Extract	Urinary tract, Skin, Weight management	—
Corn silk Tincture	Bladder infections, inflammation of the urinary system, inflammation of the prostate	Dried silk, certified organic vegetable glycerin, distilled water
Corn silk Tablet	Reduces The Appearance Of Unsightly Dimple Skin. Helps Eliminate Excess Body Fluid. Also Help In Reducing Cell-U-Lite. Specialized For Reducing Tummy, Hips & Thighs.	Diluents: maltodextrin, NaCl, KCl, calcium carbonate, magnesium oxide Disintegrant: stearic acid Binder: sodium starch glycolate, asparagus
Corn silk Capsule	Urinary tract infection	Carbohydrate, dietary fiber, corn silk, magnesium stearate

5. PRECAUTIONS IN THE USE OF CORN SILK

Individuals with allergies should exercise caution when using corn silk, as some may experience allergy symptoms due to a potassium deficiency. Pregnant individuals should avoid corn silk consumption as it can increase uterine muscle contractions, raising the risk of miscarriage. There is a potential conflict between corn silk and antihypertensive drugs, as simultaneous use may lead to a reduction in blood pressure. Additionally, using corn silk alongside sugar-lowering medications may cause an undesirable sudden drop in blood sugar levels.

6. CONCLUSION

Corn silk exhibits remarkable pharmacological properties, including antioxidant, anti-inflammatory, antimicrobial, diuretic, and anticancer effects, among others. Each bioactive component contributes to its diverse therapeutic actions against various diseases. While research supports its safety and efficacy, clinical evaluations are necessary to validate its potential in healthcare. Further studies are needed to enhance confidence in its positive therapeutic effects and support its utilization as a natural remedy for various health conditions.

7. REFERENCES

1. Pasid Harlisa, Fitri A. Nurani, et al, "The potency of ethanolic extract from corn silk as natural antibiotics for acne-related bacteria: A preliminary study." *Bangladesh Journal of Medical Science* Vol. 21 No. 01 January'2022.
2. Sumarli et al 2019 IOP Conf. Ser., Mater. Sci. Eng. 515 01210.
3. Akanksha Singh and Rita Singh Raghuvanshi, "Influence of Corn Silk Powder Supplementation on Sensory and Chemical Characteristics of Developed Food." *International Journal of Current Microbiology and Applied Sciences* ISSN: 2319-7706 Special Issue-11 pp. 1072-1081.
4. Nur Zuhaili Amrang, Nur Atikah Halid et al, "Corn Silk Tea: An Artificial Chemical-Free." *Multidisciplinary Applied Research and Innovation* Vol. 3 No. 5, 2022, 154-159.



5. Hady Anshory Tamhid, Tika Luthfi Sadrina et al, "Hepatoprotective Effect of Corn Silk Infusion in Male Wistar Rats." *EKSAKTA Journal of Science and Data Analysis* Volume 1, Issue 1, 51-55 February **2020**.
6. Nwankpa Promise and Uche Mercylyn Ezinne, "Anti-Anaemic and Hyperlipidemic Potentials of Corn Silk (*Stigma Maydis*) Extract On Paracetamol-Overdose in Wistar Rats." *World Journal of Pharmaceutical and Medical Research* Vol 8, Issue 8, **2022**.
7. Saeed AhmedKhan, Susan George et al, "In-Vitro evaluation of xanthine oxidase inhibition and antioxidant capacity of water extracts of corn silk (*Zea mays* L.)". *Pharm Sci Asia*; 48(5), 471-480, **2021**.
8. Huma B, Hussain M, Ning C, Yuesuo Y, "Human Benefits from Maize". *Sch J Appl Sci Res* Vol: 2, Issu: 2 (04-07), **2019**.
9. Guo, J.; Liu, T.; Han, L. and Liu, Y., "The effects of corn silk on glycaemic metabolism." *Nutrition & Metabolism*. **2009**, 6: 47.
10. Guo, Q., Chen, and H., "Structural characterization of corn silk polysaccharides and its effect in H₂O₂ induced oxidative damage in L6 skeletal muscle cells." *Carbohydrate Polymer* 208, 161-167 (**2019**).
11. Ibrahim M.A., Abdulkadir A. et al., "Modulation of sialic acid levels among some organs during insulin resistance or hyperglycemic states." *Mol. Cell Biochem*. 411(1), 235-239 (**2016**).
12. ILA Maratus Shalihah, Vega Yoesepa Pamela et al, "Corn Silk Tea Extract as Antidiabetic: A Review." *Food ScienTech Journal* Vol. 2 (2) **2020** ISSN: 2685-4279 DOI:10.33512/fsj.v2i2.9647.
13. Elin Yulinah Sukandar, Joseph Iskendarso Sigil et al, "Study of kidney repair mechanisms of cornsilk (*Zea Mays*L.Hair), Binahong (*Anredera cordifolia* (Ten) Steenis) Leaves combination in rat model of kidney failure." *International Journal of Pharmacology*, ISSN 1811-7775, **2013**.
14. Charles R V Tomson, "Kidney stone disease: pathophysiology, investigation and medical treatment." *Clinical Medicine* **2012**, Vol 12, No 5: 467-71.
15. Elbossaty WF, "Medical Healthy Care of *Stigma maydis*: Pharmacological Review." *Sci J Food Sc Nutr*. **2020**; 6(1): 001-003.
16. Frank J. Bruggeman, Hans V. Westerhoff et al, "Cancer: A Systems Biology disease." *Bio Systems* 83 (**2006**) 81-90.
17. Mattheus K Reinders & Tim L Th a Jansen, "New advances in the treatment of gout: review of pegloticase." *Therapeutics and Clinical Risk Management*, 543-550, DOI: 10.2147/TCRM.S6043, **2010**.
18. K. Ammor, et al, "Study of Antioxidant, Anti-inflammatory, Antinociceptive Activities and Toxicity of Stigmata of *Zea mays* Extracts." *Lavoisier SAS* **2019**.
19. Yan-Nan Li, et al, "Purification and anti-fatigue activity of flavonoids from corn silk." *International Journal of Physical Sciences*, 5(4), pp. 321-326, April **2010**.
20. Jude E. Okokon, et al, "Antimalarial and antiplasmodial activity of husk extract and fractions of *Zea mays*." *Pharmaceutical Biology*, 55(1), 1394-1400, **2017**.
21. RyukJ.A.;et al, "Protection against Neurological Symptoms by Consuming corn silk water in Artery-Occluded Gerbils with reducing Oxidative stress, Inflammation and Post -Stroke Hyperglycemia through the Gut-Brain Axis." *Antioxidants*, **2022**, 11: 168.
22. J.A., Bankehde, et al, "Antimalarial and Antipyretic Activities of Cornsilk Extract and Fractions of *Zea Mays*." *Discovery Phytomedicine* **2019**, Volume 6, Number 4: 143-150.



A COMPARATIVE ANALYSIS OF ECO-FRIENDLY CONSUMER TRENDS IN GREEN MARKETING IN THE DIGITAL AGE

Dr. P. Abarna

*Assistant Professor, PG and Research Department of Commerce, Khadir Mohideen College
(Affiliated to Bharathidasan University, Tamil Nadu), Adirampattinam*

ABSTRACT

This research investigates consumer attitudes and preferences towards green marketing strategies, examining a diverse demographic spectrum encompassing age, gender, income, education, and nature of residence. Surveying a sample of 100 respondents in Tamil Nadu, the findings highlight the prominence of social media advertising as a key channel for eco-friendly initiatives. Noteworthy preferences include high endorsement of green certification and collaboration with non-governmental organizations, emphasizing the importance of transparent sustainability practices. The study suggests the need for nuanced marketing strategies tailored to diverse demographics and underscores the dynamic nature of consumer preferences in the sustainability landscape. Businesses are encouraged to balance established practices with emerging trends, fostering trust through transparent eco-friendly initiatives. This research provides valuable insights for businesses navigating the complexities of green marketing, aiming to resonate effectively with a diverse and conscientious consumer base.

KEYWORDS: *green marketing, consumer attitudes, preferences, demographic analysis, social media advertising, sustainability, eco-friendly practices*

INTRODUCTION

In the face of escalating environmental concerns and a growing consciousness about sustainable living, the concept of green marketing has gained considerable prominence. As we navigate the digital age, where information dissemination occurs at an unprecedented pace, consumer behaviors are increasingly influenced by a desire for eco-friendly products and practices. This research endeavors to delve into the intricate intersection of green marketing and the digital landscape, with a specific focus on understanding and comparing eco-friendly consumer trends.

Over the past few decades, the discourse surrounding environmental sustainability has evolved from a niche concern to a mainstream consideration for consumers. As a result, businesses are adapting their strategies to align with the growing demand for environmentally responsible products and services. Concurrently, the digital age has brought about profound changes in how consumers access information, make purchasing decisions, and engage with brands. In this context, it is crucial to explore how digital platforms and technologies shape the landscape of green marketing and influence consumer preferences.

STATEMENT OF PROBLEM

How do digital platforms and technologies contribute to the awareness and understanding of eco-friendly products and practices among consumers? What role do social media, online reviews, and information-sharing platforms play in shaping green consumer awareness?

To what extent are businesses successful in leveraging digital channels for promoting green products and sustainability initiatives? What strategies prove to be most effective in capturing and retaining the attention of environmentally conscious consumers in the digital space?

How do digital interactions influence consumer perceptions of the authenticity and credibility of green marketing messages? To what extent does trust in eco-friendly claims impact consumer decision-making in the digital age?

What challenges do businesses encounter when implementing green marketing strategies in the digital landscape? Are there specific barriers related to digital communication, online competition, or consumer skepticism that hinder the success of eco-friendly initiatives?



SIGNIFICANCE OF THE STUDY

This study holds immense significance by providing businesses with crucial insights into the dynamics of green marketing in the digital age. Understanding the eco-friendly consumer trends in the digital landscape will guide businesses in adopting sustainable practices, thereby fostering corporate responsibility and contributing to environmental conservation.

This research will offer practical guidance to marketers seeking to effectively communicate and promote eco-friendly products and practices online.

The study will contribute to the promotion of environmental awareness among consumers in the digital age.

The study can inform the development of policies and regulations that encourage and support sustainable practices in the digital marketplace, promoting a harmonious balance between economic interests and environmental stewardship.

Uncovering the challenges and opportunities in digital green marketing, the study encourages businesses to adopt ethical and transparent practices.

SCOPE OF THE STUDY

This research focuses on exploring and analyzing the intersection of green marketing and consumer trends in the context of the digital age.

The study will consider a diverse range of geographical locations to capture variations in cultural influences, regulatory environments, and consumer behaviors.

The research will consider a variety of industries and sectors that actively engage in green marketing practices. This includes but is not limited to the technology sector, fashion industry, food and beverage industry, and consumer goods.

The study will investigate into the influence of various digital platforms, including social media, e-commerce websites, online advertising, and information-sharing platforms.

The study will consider different demographic groups, including age, gender, income levels, and education, to identify variations in eco-friendly consumer trends within diverse populations. Understanding how these demographic factors influence digital green marketing effectiveness will contribute to more targeted and inclusive strategies.

RESEARCH OBJECTIVES

Assess the role of digital platforms in shaping consumer awareness and understanding of eco-friendly products and practices.

Explore the impact of the digital landscape on consumer knowledge regarding green marketing initiatives.

Identify and analyze the most effective digital marketing strategies for promoting the adoption of eco-friendly products in the digital age.

Compare the effectiveness of green marketing messages on social media platforms with other digital channels.

Examine the influence of consumer trust in eco-friendly claims presented through digital marketing channels on their purchasing decisions.

Investigate the variations in trust levels across different demographic groups in the digital context.

HYPOTHESIS

H0: There is no significant relationship between digital marketing strategies and the adoption of eco-friendly products by consumers in the digital age.

Alternative Hypothesis

H1: There is a significant positive relationship between digital marketing strategies and the adoption of eco-friendly products by consumers in the digital age.

H0: The effectiveness of green marketing messages on social media platforms is not influenced by consumer demographics.



H1: The effectiveness of green marketing messages on social media platforms is influenced by consumer demographics, such as age, gender, income levels, and education.

H0: Consumer trust in eco-friendly claims presented through digital marketing channels does not significantly impact their purchasing decisions.

H1: Consumer trust in eco-friendly claims presented through digital marketing channels significantly influences their purchasing decisions.

H0: The challenges faced by businesses in implementing green marketing strategies in the digital landscape are consistent across different industries.

H1: The challenges faced by businesses in implementing green marketing strategies vary across different industries in the digital landscape.

LIMITATIONS OF THE STUDY

The research may be limited in its ability to generalize findings across all geographical regions due to variations in cultural, economic, and regulatory factors. The study will focus on diverse locations, but complete global representation may not be achievable.

While the study aims for a broad industry focus, it may not comprehensively cover every sector engaged in green marketing. Certain industry nuances or specific challenges faced by niche markets may not be fully addressed within the scope of the research.

The study focuses on contemporary trends, but due to the dynamic nature of digital marketing and consumer behavior, there may be limitations in capturing long-term trends. Rapid changes in technology and consumer preferences could impact the relevance of the findings over an extended period.

The research's effectiveness may be influenced by the representativeness of the sampled population. Inherent biases in the selection of participants, especially in online surveys or social media data, could limit the generalizability of the findings.

Variations in digital literacy levels among different demographic groups may impact the effectiveness of digital marketing strategies. The study may face limitations in addressing the potential influence of digital literacy on eco-friendly consumer trends.

Participants may be inclined to provide socially desirable responses, particularly when expressing environmentally conscious behaviors. This bias could affect the accuracy of self-reported data related to eco-friendly attitudes and practices.

The rapid evolution of digital technologies may result in new platforms or communication channels emerging after the study's data collection. Consequently, the research may not capture the latest trends in digital green marketing.

Interpreting and comparing consumer behavior across diverse cultures may present challenges in maintaining cultural sensitivity and avoiding ethnocentric biases. Cultural nuances might impact the generalizability of findings.

REVIEW OF LITERATURE

Balderjahn's (1988) study is a valuable contribution to understanding the factors that influence consumers' environmentally friendly choices. His research sheds light on the role of personality and environmental attitudes in shaping ecologically responsible consumption patterns, paving the way for further exploration in this crucial field.

Begam's work within the broader context of online media's influence on consumer behavior. Further research building upon Begam's findings could explore the long-term impact of online media on shopping habits in Madurai and investigate how these trends might evolve in the future.

Bhatia's (2013) study offers valuable insights into Indian consumer perceptions and preferences regarding green marketing. By focusing on consumer awareness, environmental values, and purchase decision factors, the research sheds light on how green marketing strategies can be adapted for the Indian market. This knowledge can contribute to promoting sustainable consumption patterns and a more environmentally conscious future for India.



Essays report (2013) offers a basic introduction to green marketing's importance and challenges in India. By recognizing the market potential and outlining key considerations, the report provides a springboard for further research on how green marketing can contribute to a more sustainable future for the Indian economy and environment.

Kaur's (2017) paper offers a valuable overview of green marketing in the Indian context. By highlighting the market potential, consumer awareness levels, and challenges faced by businesses, the study paves the way for further research on how green marketing can contribute to a more sustainable future for India.

RESEARCH QUESTIONS

How do digital platforms contribute to the awareness and understanding of eco-friendly products and practices among consumers in the digital age?

To what extent does the digital landscape influence consumer knowledge about green marketing initiatives?

What digital marketing strategies are most effective in promoting the adoption of eco-friendly products in the digital age?

Does the effectiveness of green marketing messages on social media platforms compare to other digital channels?

How does consumer trust in eco-friendly claims presented through digital marketing channels influence their purchasing decisions?

To what extent does the level of trust vary across different demographic groups in the digital context?

What challenges do businesses face when implementing green marketing strategies in the digital landscape, and are these challenges consistent across different industries?

What opportunities arise from effectively addressing challenges in digital green marketing, and how can businesses capitalize on them?

Is there a significant difference in the effectiveness of online advertising and social media as channels for promoting eco-friendly products in the digital age?

How do consumer engagement and response differ between online advertising and social media platforms in the context of green marketing?

RESEARCH DESIGN

The research will adopt a mixed-methods approach, combining both quantitative and qualitative methods. This approach allows for a comprehensive exploration of the research questions, combining statistical analysis with in-depth insights from participants.

Structured online surveys will be conducted to gather quantitative data on consumer attitudes, behaviors, and preferences regarding eco-friendly products and digital marketing channels.

Data from social media platforms will be collected and analyzed to measure the effectiveness of green marketing messages and consumer engagement.

In-depth interviews with key stakeholders, such as marketing professionals and industry experts, will provide qualitative insights into challenges, opportunities, and industry-specific nuances in digital green marketing.

Qualitative content analysis will be employed to analyze textual and visual elements of green marketing messages on digital platforms, extracting themes and patterns.

Sampling:

Probability Sampling: Random sampling will be employed for the online surveys to ensure a representative sample of the target population.

The sample size of 100 for the online surveys will be determined through power analysis to ensure statistical significance.

Descriptive statistics, inferential statistics and data visualization techniques will be employed to analyze survey data and social media analytics.

Thematic analysis will be conducted to identify patterns, themes, and insights from interview transcripts and content analysis.



DATA ANALYSIS

TABLE 1
DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

Factors	No.of Respondents	Percentage
Age		
26-35	42	42
36-45	26	26
46-55	23	23
Above 56	9	9
Gender		
Male	57	57
Female	43	43
Income		
Rs 16,000 - 25,000	27	27
Rs 26,000 - 35,000	31	31
Rs 36,000 - 45,000	23	23
Above Rs 45,000	19	19
Education		
HSC	21	21
Diploma	16	16
Under Graduate	38	38
Post Graduate	25	25
Nature of residence		
Urban	53	53
Semi Urban	28	28
Rural	19	19

Inference

The data analysis exposes a diverse and well-distributed profile of respondents across various factors. In terms of age, a significant portion falls within the 26-35 age group, followed by substantial representation in the 36-45 and 46-55 categories, with a smaller yet noteworthy presence above 56 years. Gender distribution is relatively balanced, with males constituting a slightly larger portion of the respondents. Income-wise, the majority falls within the Rs 26,000 - 35,000 range, with notable participation in the Rs 16,000 - 25,000 and Rs 36,000 - 45,000 categories. Education levels exhibit diversity, with a significant number of participants holding undergraduate degrees, followed by postgraduates, HSC, and diploma holders. Regarding the nature of residence, urban areas attract the highest number of respondents, though a considerable proportion resides in semi-urban and rural settings. Overall, the survey captures a broad spectrum of participants, contributing to a comprehensive understanding of the surveyed population.

TABLE 2
EFFECTIVE MARKETING STRATEGIES

Factors	No.of Respondents	Percentage
Content Marketing	29	29
Email Marketing	8	8
Influencer Collaborations	20	20
Social Media Ads	43	43
Total	100	100

Inference

The data on marketing strategies exposes a notable distribution among respondents. Social Media Ads stand out as the most popular marketing strategy, with 43% of participants endorsing its effectiveness. Content Marketing also holds a significant share, with 29% of respondents acknowledging its importance. Influencer Collaborations garner a noteworthy 20% endorsement, showcasing the impact of leveraging influencers in marketing efforts. Email Marketing, while representing a smaller percentage at 8%, still maintains a presence in the overall strategy landscape. This data suggests a diversified approach to marketing strategies among the surveyed population, with a substantial reliance on Social Media Ads, followed by Content Marketing and Influencer Collaborations.



TABLE 3
TRUST IN ECOFRIENDLY CLAIMS

Factors	No.of Respondents	Percentage
High	39	39
Moderate	48	48
Low	13	13
Total	100	100

Inference

The data indicates that respondents' perceptions of the specified factors are distributed across three categories: "High," "Moderate," and "Low." The majority of participants, comprising 39%, view the factors as "High," suggesting a significant positive assessment. A larger portion, representing 48%, perceives the factors as "Moderate," indicating a more neutral or balanced perspective. On the other hand, a smaller but notable proportion of 13% considers the factors to be "Low," reflecting a less favorable evaluation. This distribution highlights a diverse range of opinions among the surveyed population, with a substantial portion expressing positive or moderate views and a minority holding a less optimistic outlook on the specified factors.

TABLE 4
BUSINESS CHALLENGES

Factors	No.of Respondents	Percentage
Green Certification	36	36
Investing in Technology	4	4
Limited Resources	19	19
Meeting Standards	24	24
Supply Chain Sustainability	17	17
Total	100	100

Inference

The data on respondents' perspectives toward various factors reveals distinct patterns. Green Certification stands out as the most positively perceived factor, with 36% of respondents acknowledging its significance in environmental considerations. Meeting Standards also receives notable recognition, with 24% of participants expressing its importance. Limited Resources and Supply Chain Sustainability each gather 19% and 17% of respondents' attention, respectively. However, Investing in Technology is perceived as less critical, garnering only 4% endorsement. This distribution suggests a strong emphasis on environmentally conscious practices, as evidenced by the high percentage associated with Green Certification. The varying percentages across factors indicate nuanced perspectives on different aspects of sustainable and green practices among the surveyed population.

TABLE 5
OPPORTUNITIES CONSIDERED

Factors	No.of Respondents	Percentage
Building Sustainable Image	12	12
Collaborating with NGOs	35	35
Exploring New Markets	27	27
Green Product Innovation	5	5
Investing in Technology	21	21
Total	100	100

Inference

The data on respondents' perspectives toward various factors reflects diverse opinions on sustainable business practices. Collaborating with NGOs emerges as the most endorsed factor, with 35% of respondents recognizing its significance in fostering sustainable initiatives. Exploring New Markets and Investing in Technology receive substantial attention, each accounting for 27% and 21% of respondents, respectively. Building Sustainable Image and Green Product Innovation, while garnering lower percentages at 12% and 5%, indicate a moderate emphasis on these factors. This distribution highlights a multifaceted approach to sustainability, where collaboration with non-governmental organizations, market exploration, and technological investments play prominent roles. The varying percentages across factors underscore the nuanced perspectives within the surveyed population regarding the key elements contributing to building a sustainable business image.



TABLE 6
DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS AND THEIR OPINION TOWARDS TRUST IN ECO-FRIENDLY CLAIMS

Demographic factors	Opinion towards trust in eco-friendly claims			Chi-Square		
	High	Moderate	Low	Calculated Value	Table Value	Result
Age	62	25	13	15.2	5.991	S
Gender	57	27	16	25.1	5.991	S
Income	40	39	21	69.1	15.18	S
Education	28	53	19	77.43	15.507	S
Nature of residence	51	34	15	91.02	19.56	S

Significant at 5% level

Inference

The presented hypothesis test employs the Chi-Square statistic to examine the relationship between demographic factors (Age, Gender, Income, Education, and Nature of Residence) and respondents' opinions towards trust in eco-friendly claims categorized as High, Moderate, and Low. The null hypothesis (H₀) posits that there is no significant association between the demographic factors and the opinions on trust in eco-friendly claims, while the alternative hypothesis (H₁) suggests that there is a significant association.

The calculated Chi-Square values for each demographic factor (Age, Gender, Income, Education, and Nature of Residence) are compared against the respective table values. The critical Chi-Square value at a specified level of significance (typically 0.05 or 5%) is used as a benchmark for determining statistical significance.

For Age, the calculated Chi-Square value (15.2) exceeds the table value (5.991), leading to the rejection of the null hypothesis (S: Significant).

Similarly, for Gender, Income, Education, and Nature of Residence, the calculated Chi-Square values (25.1, 69.1, 77.43, 91.02) all surpass their corresponding table values (5.991, 15.18, 15.507, 19.56), resulting in the rejection of the null hypothesis for each demographic factor (S: Significant).

The Chi-Square test suggests a statistically significant association between demographic factors and opinions towards trust in eco-friendly claims. The rejection of the null hypothesis implies that there is evidence to support the existence of a relationship between these demographic factors and the opinions on trust in eco-friendly claims among the surveyed population.

SUGGESTIONS

Given the diverse age distribution among respondents, marketing strategies should be tailored to cater to different age groups. Focus on social media advertising for the younger demographic (26-35), while exploring a mix of content marketing and influencer collaborations for the middle-aged and older age groups.

Acknowledging a relatively balanced gender representation among respondents, marketing campaigns should aim for inclusivity. Tailor messaging and content to resonate with both male and female audiences, recognizing the diverse perspectives within each gender group.

Recognizing the predominant income group (Rs 26,000 - 35,000), marketing efforts can align with this segment's preferences. However, considering the diversity in income levels, flexible pricing strategies and value propositions should be developed to accommodate participants from various income brackets.

Given the distribution across education levels, communication strategies should consider the educational background of the target audience. Develop content that aligns with the diverse educational experiences, emphasizing sustainability initiatives and green practices.

With a majority residing in urban areas, urban-centric campaigns should be prioritized. However, recognizing the substantial participation from semi-urban and rural areas, marketing efforts should be inclusive, considering the unique perspectives and challenges faced by respondents in these settings.



Social media advertising emerges as a prominent marketing channel, as highlighted by the majority of respondents. Strengthen and diversify social media campaigns, considering the specific preferences and engagement levels observed in the survey.

Acknowledge the significant portion of respondents who express "High" trust levels. Implement trust-building initiatives in marketing and business practices, emphasizing transparency, accountability, and a commitment to eco-friendly claims to strengthen consumer trust.

Given the evolving landscape of consumer preferences and the dynamic nature of sustainability trends, businesses should continuously monitor market dynamics. Stay agile in adapting marketing strategies to align with emerging preferences and ensure sustained relevance in the eco-friendly market.

CONCLUSION

The research provides a comprehensive understanding of consumer attitudes and preferences toward green marketing initiatives. The diverse demographic profile of respondents, spanning age, gender, income, education, and nature of residence, highlights the need for nuanced and inclusive marketing strategies. Notably, social media advertising emerges as a powerful channel, emphasizing the importance of a strong online presence. Green certification and collaboration with non-governmental organizations receive high endorsement, suggesting that businesses should prioritize transparent eco-friendly practices and partnerships to build consumer trust. The research underscores the significance of adapting marketing approaches based on demographic variations and the dynamic landscape of sustainability trends. As businesses navigate the green marketing space, a balance between established practices and emerging factors such as exploring new markets and investing in technology is crucial. Overall, the insights garnered from this research offer valuable guidance for businesses seeking to effectively engage and resonate with a diverse consumer base in the realm of eco-friendly and sustainable marketing.

REFERENCES

1. Aggrawal, A. (2010). *Factors Affecting Green Marketing In India: A Study Of Metro Consumers*.
2. Antil, J.A. (1984), "Socially responsible consumers: profile and implications for public policy", *Journal of Micromarketing*, Fall, pp. 18-39.
3. Balderjahn, I. (1988), "Personality variables and environmental attitudes as predictors of ecologically-responsible consumption patterns" *Journal of Business Research*, Vol. 17, pp. 51-6
4. Bansal, D. A. (2017). *Digital Platforms & Natural Eco-digital Eco*. *International Education & Research Journal [IERJ]*
5. BEGAM, M. S. (2020). *AN EMPIRICAL ANALYSIS OF ONLINE MEDIA ON BUYING BEHAVIORAL OF CONSUMERS IN MADURAI DISTRICT*.
6. Bhatia, M. J. (2013). *Green Marketing: A Study of Consumer Perception and Preferences in India*. UCLA , 1 (36).
7. Essays, UK. (November 2013). *Green Marketing In India: Importance and Challenges*.
8. Kaur, R. (2017). *Green Marketing in India –An Overview*. *Biz and Bytes* , 8 (1)
9. Kotler, P. & Keller, K.L (2009). *Marketing Management*. 13th edition. New Jersey:Pearson/Prentice-Hall.
10. Narula S, Sabharwal D (2016) *The theoretical Study of Green Marketing in India: Its Importance and Need*. *J Mass Communicate Journalism* S2:007.
11. Ortinau, D (2009). *Marketing Research*. European Edition. London: McGraw-Hill Higher Edition. Solomon, M. R., G. Bamossy, S. Askegaard, and M. K. Hogg (2010). *Consumer Behaviour: A European Perspective*. 4 th edition. New York: Prentice Hall.
12. Saunders, M., Lewis, P. and Thornhill, A. (2009). *Research Methods for Business Student*. 5th Edition. Essex. England: Pearson Education Limited.



ABU RAYHAN BIRUNI'S VIEWS ON CHRISTIANITY

Abdupattaev Mumin Mirzo Murodjon ugli, PhD

Teacher of International Islamic Academy of Uzbekistan

ABSTRACT

As an encyclopedist, Beruni wrote many works. In his writings on the history of religions, he emphasized the contradictions between the emergence of Christianity, councils (cathedrals), prayer ceremonies, holy books, and Christian denominations. He also thinks about St. Paul, who inherited Christian traditions that arose thousands of years ago. The article analyzes the views of Beruni on Christianity.

KEYWORDS: *Al-Biruni, Christianity, Worship, Gospels, Matthew, Mark, Luke, Jhon, History of Religions.*

The original name of Abu Rayhan Beruni, who laid the foundation for the study of the history of religions other than Islam in the Muslim world, is Abu Rayhan Muhammad ibn Ahmad al-Biruni al-Khwarazmi. Beruni was born in Kat, the ancient capital of Khorezm, on the 3rd day of Dhul-Hijjah, 362 AH (September 4, 973 AD). He died in Ghazna in December 443/1048.

Beruni worked in various fields of science. For example, astronomy, geography, history, mathematics, geometry. In addition, Biruni was one of the first Muslim scholars to lay the foundation for the study of religions other than Islam.

Although Biruni did not have a separate book on Christianity, he gave enough information about this religion in his works.

For example, in the works “Kitab al-athar al-baqiyah ‘an al-qurun al-khaliyah” (The Remaining Signs of Past Centuries) and “Qanuni Mas’udi” (The law of Mas’ud) he devoted separate chapters to Christianity and gave extensive information about it. In the work “At-Tafhim liavaili sinaat at-tanjim” (Understanding Astrology) only Christian rituals are included.

The word Christianity is derived from the Greek word “christos”. “Christos” is a synonym of the Hebrew word “meshiah” and refers to the quality of “Messiah” (anointed) as applied to Jesus. Therefore, those who believe in this religion are Christians and the name of the religion is called Christianity.

According to Biruni, before the word Christian, the word “Christian” was used to refer to those who followed Jesus. The word “Nasoro” is a name used to refer to the village of Nasiro (Nazareth) near Jerusalem, the birthplace of Jesus. Therefore, Jesus was called “Nazarene” throughout his life¹.

The word “Christian” is also used in the sense of a Christian or Nazarene. In this respect, a person or a church that follows the path of Jesus is called a Christian. Biruni explains it as follows: “He (Jesus) was born in a village called Nasira near Jerusalem. People always addressed him as Jesus of Nazareth. Because of this ratio, his people are known as Christians”².

In the Holy Quran, the word “nasoro” or “nasroniy” is used to express the word “Christian”. “The Jews and Christians each claim that none will enter Paradise except those of their own faith” (2:111); “And from those who say, “We are Christians,” We took their covenant, but they neglected a portion of what they had been commanded to uphold” (5:14).

According to Biruni, the word “Christianity” referring to Christians or Christians is a general name applied to all who follow Jesus³. In today’s Christian Holy Book, the New Testament (Bible), the Greek word “christianos” (Christian) appears three times. “And when he had found him, he brought him unto Antioch. And it came to pass, that a whole year they assembled themselves with the church, and taught much people. And the disciples were called Christians first in Antioch” (Acts. 11:26); “Then Agrippa said unto Paul, Almost thou persuadest me to be a Christian” (Acts. 26:28); “Yet if any man suffer as a Christian, let him not be ashamed; but let him glorify God on this behalf” (1 Peter. 4:16). It seems that the term Christianity was not coined at the time of Jesus, but later

¹ Muqaddas Kitob. Muqaddas Kitobni tarjima qilish instituti. 2016. – B. 1577.

² Abu Rayhan Biruni. Kitab al-tafhim li-awa’il sina’at al-tanjim. London. 1998. – P. 179.

³ That source. – P. 179.



by St. Paul. In fact, the name Christian was first given to followers of Jesus by local pagans in Antioch between AD 40-44 and became widely used after the 60s.

So, the Christian term came into mass use by the second half of the 1st century AD. Thus, although the terms “christian” and “nasoro” are fundamentally different, they express different aspects of the same religion. According to Epiphanius, one of the early Christian historians, the Jews later called the community that followed Jesus by the name “Yeshuas” (followers), which means “Christians”⁴.

Biruni was one of the first among Muslim scholars to point out that meetings where high-ranking Christian priests make decisions are called synods (that is, councils or councils). It provides information about the time and place of these cathedrals, which were called to resolve disputes between Christian sects and to determine the number of holy books⁵. “Its (synod) meaning is a gathering of priests, bishops and other dignitaries for important matters related to new events”⁶. It can be said that Biruni’s description above is consistent with the general understanding of Christian cathedrals.

There were eight such councils up to Biruni. “Such meetings were held only at certain times. Elapsed times are recorded. Sometimes these meetings were held in order to glorify Jesus and submit to him”⁷. The councils before the Biruni period are: The First Council of Nicaea (325), The First Council of Constantinople (381), The Council of Ephesus (431), The Council of Chalcedon (451), The Second Council of Constantinople (553), The Third Council of Constantinople (680–681), The Second Council of Nicaea (787), The Fourth Council of Constantinople (Catholic) (869–870)⁸.

Biruni also describes the ranks of the clergy in Christianity. It also says that their number is nine from the lowest level to the highest level, but the first three levels are in danger of disappearing. “The first of the ranks of the great priests of Christians is Tasulta, the second is Qoruna, the third is Khyuvufdiakta (Hebukdeacon), the fourth is Shammass, the sixth is Qiss, the sixth is Usquf, the seventh is Mitron (Metropolitan), the eighth is Jasliyy (Catholic) and the ninth is Batruk (Patriarch). I found out that the first three of them are little remembered by their own people”⁹. To this day, the ranks of the clergy differ in each Christian denomination.

On the Bible, Biruni also studied The Canonical Gospels of Christians. In his book “The Remaining Signs of Past Centuries” he expresses his thoughts about the New Testament part of the Holy Book, the Four Canonical Gospels. Biruni says about the four Gospel: “Obviously, the Gospels are a copy of four copies in the eyes of Christians. The first belongs to Matthew, the second to Mark, the third to Luke, and the fourth to John. In fact, these four authors wrote the Gospels at the request of the people of their city. Each of them contains the attributes, callings and prophetic works of Christ”¹⁰. According to Biruni, the Gospels are the texts that contains the messages of Jesus from his birth to his death.

Muslims understand the Gospel in two ways. According to the first, the Injil is a holy book that was revealed in the Quran and brought to Jesus by the angel Gabriel. There are several verses in the Holy Quran about the Gospel. Verse 46 of Surah al-Maida says: “Then in the footsteps of the prophets, We sent Jesus, son of Mary, confirming the Torah revealed before him. And We gave him the Gospel containing guidance and light and confirming what was revealed in the Torah – a guide and a lesson to the God-fearing”. In addition, there are verses about the Gospel in the Surahs of Ali Imran, Al-A’raf, At-Tawbah, Al-Fath and Al-Hadid of the Holy Quran. The second aspect, according to Biruni’s view, is a book composed of four Gospels. These two views can be summarized by saying that the Gospel was originally a holy book revealed to Jesus through Gabriel. But over time this book has undergone major changes. The original has been completely altered or completely lost. After that, today’s canonical Bible writers wrote the Gospels that tell the story of Jesus’ life. As a religious scholar, Biruni emphasizes the second view, namely that the New Testament is essentially a collection of four Gospels. Because at that time there was no real Gospel, and there were almost no believers left.

Biruni states that these four Gospels are collectively called the Gospel, and gives the following information about its formation and the authors of the Gospels: “It (the Gospel) was written by four people with different places of residence and languages: Matthew in hebrew in Palestine, Mark in rum (Latin) in Rum (Anatolia), Luke in greek in Alexandria, and John in greek in Ephesus. Later,

⁴ Şinasi Gündüz, Mahmut Aydın. *Misyonerlik, Hristiyan Misyonerler, Yöntemleri ve Türkiye’ye Yönelik Faaliyetleri*. Istanbul. Kaknüs Yayınları, 2002. – S. 25.

⁵ Abu Rayhan Biruni. *Tanlangan asarlar. I jild. Tarj. A.Rasulov. Toshkent. O’zbekiston fan nashriyoti*, 1968. – B. 348.

⁶ Abu Rayhan Biruni. *Kitab al-athar al-baqiyah ‘an al-qurun al-khaliyah*. Leipzig. 1878. – P. 294.

⁷ That source. – P. 294.

⁸ https://en.wikipedia.org/wiki/Ecumenical_council

⁹ Abu Rayhan Biruni. *The Mas’udi Law*. Cairo. Waqf of Amir Ghazi, 1954. – P. 250.

¹⁰ Abu Rayhan Biruni. *Kitab al-athar al-baqiyah ‘an al-qurun al-khaliyah*. Leipzig. 1878. – P. 22.



these four Gospels, which differ in terms of words and meanings, were united in two covers, and all of them were called the Gospel under one name”¹¹.

Even today, when discussing the Gospel, Biruni’s information is accepted. However, it is worth noting that Christians today include 23 other books in the New Testament in addition to the Gospels of Matthew, Mark, Luke and John. After this information, based on the sources, we will explore Biruni’s views on the authors of the four Gospels.

The Gospel of Matthew: The Gospel of Matthew is the first book of the New Testament of the Bible and one of the three synoptic Gospels. It tells how Israel’s Messiah, Jesus, comes to his people (the Jews) but is rejected by them and how, after his resurrection, he sends the disciples to the gentiles instead. Biruni said: “The first of the Gospels was written by Matthew and is called the Gospel of Matthew after his name. Matthew wrote this Gospel in Palestine. The Gospel of Matthew was written in hebrew because it is known from where it was written that it was written in hebrew”¹².

Although the oldest Gospels in existence today are in Greek, some of the Gospels were written in hebrew. Muhammad Abu Zahra in his book “Mukhadarat fi an-Nasraniya” approves Biruni’s opinion and says that “the Gospel of Matthew was written in hebrew in Jerusalem”¹³. Also al-Hindi (1306/1889) said in his work “Izharul Haq”, “The original copy of Matthew’s Gospel was written in hebrew. But it is lost. It is not clear when and by whom the current Greek translation was made”¹⁴. While Biruni says that the land where the Gospel of Matthew was written is Palestine, there are also researchers who say that the Gospel of Matthew was written in Greece or Syria¹⁵.

The Gospel of Mark: The Gospel of Mark is the second of the four canonical gospels and one of the three synoptic Gospels. It tells of the ministry of Jesus from his baptism by John the Baptist to his death, the burial of his body, and the discovery of his empty tomb. Biruni states that Mark is the second of the biblical authors. But the Turkish researcher, Dr. Akram Sarikchioglu, says in his book “The History of Religions from the Beginning to the Present” that “the Gospel of Mark was written before the Gospel of Matthew, it is the first Gospel”¹⁶.

Biruni states that the Gospel of Mark was written in rum language (latin)¹⁷. But, Muhammad Abu Zahra said, “Gospel of Mark was written in greek. We have not witnessed conflicting views of Christian scholars on this. Mark wrote the Bible in Greek at the request of Roman believers. However, there are also opinions that it was written in Latin”¹⁸.

Summarizing these two points, the Greek language was divided into two dialects during Biruni’s time. The first dialect was Greek, and the second dialect was Rumi (Anatolia).

The Gospel of Luke tells of the origins, birth, ministry, death, resurrection, and ascension of Jesus Christ. Biruni states that the third of the New Testament Gospels is the Gospel of Luke¹⁹. The third of today’s Canonical Gospels is the Gospel of Luke. Luke wrote his Gospel in Alexandria. Saint Paul called him a healer. Biruni mentions that Luke wrote his Gospel in Greek²⁰. Even today, Christian scholars claim that the Gospel of Luke was originally written in Greek. However, there is no doubt that the Gospel of Luke was written in Latin.

The Gospel of John is the fourth of the four canonical gospels in the New Testament. According to Biruni, John wrote his Gospel in Ephesus²¹. Muhammad Abu Zahra says that the Gospel of John was written in Rum. According to historical sources, when the Romans captured Jerusalem, John left Palestine and went to Ephesus. During this period he wrote his Gospel. It is unanimously accepted that the Gospel of John was written in Greek. Because it is written in the style of Hellenistic philosophy, unlike the previous three Gospels. The controversy over the Gospel of John is not its language, but rather its authorship. This is because there are two Johns in the New Testament. The first John was an apostle. He spoke Hebrew. The second John lived nearly two centuries after the

¹¹ Abu Rayhan Biruni. *The Mas'udi Law*. Cairo. Waqf of Amir Ghazi, 1954. – P. 54.

¹² That source. – P. 252.

¹³ Muhammad Abu Zahra. *Mukhadarat fi an-nasraniya*. Riyadh. 1404. – P. 50.

¹⁴ Rahmatullah ibn Khalilurrahman al-Hindiy. *Izharul Haq*. Beirut. Dorul Jayl, 1989. – P. 74.

¹⁵ Şaban Kuzgun. *Dört İncil Farklılıkları ve Çelişkileri*. Ankara. Fazilet Neşriyat, 2008. – S. 178.

¹⁶ Ekrem Sarıkçıoğlu. *Başlangıçtan Günümüze Dinler Tarihi*. İstanbul. Fakiulte Kitabevi, 2002. – S. 313.

¹⁷ Abu Rayhan Biruni. *The Mas'udi Law*. Cairo. Waqf of Amir Ghazi, 1954. – P. 252.

¹⁸ Muhammad Abu Zahra. *Mukhadarat fi an-nasraniya*. Riyadh. 1404. – P. 51.

¹⁹ Abu Rayhan Biruni. *Kitab al-athar al-baqiyah `an al-qurun al-khaliyah*. Leipzig. 1878. – P. 22.

²⁰ Abu Rayhan Biruni. *The Mas'udi Law*. Cairo. Waqf of Amir Ghazi, 1954. – P. 252.

²¹ That source. – P. 264.



apostle John and wrote the Bible in Greek. To this day, many believe that the Gospel of John belongs to the apostle John. This is a misconception.

In conclusion, it can be said that Biuni's works on the origin of Christianity, its traditions, priestly ranks and important councils are important. In Christianity, the work of priests who lead prayers and rituals is important. Biruni gave extensive information about the historical and regional description of the emergence of Christian prayers, the chronology of Christian rituals in the works "The Remaining Signs of Past Centuries", "The Mas'udi Law" and "Understanding Astrology". In addition, the language of the Christian Bible, the written regions, and the manner in which he explained the differences in the Bibles, which he covered in the above three works, are still widely used by the Christian world today.

REFERENCES

1. Abu Rayhan Biruni. *Kitab al-taḥḥim li-awa'il sina'at al-tanjim*. London. 1998. – P. 179.
2. Abu Rayhan Biruni. *Kitab al-athar al-baqiyah `an al-qurun al-khaliyah*. Leipzig. 1878. – P. 294.
3. Abu Rayhan Biruni. *The Mas'udi Law*. Cairo. Waqf of Amir Ghazi, 1954. – P. 250.
4. Muqaddas Kitob. *Muqaddas Kitobni tarjima qilish instituti*. 2016. – B. 1577.
5. Şinasi Gündüz, Mahmut Aydın. *Misyonerlik, Hristiyan Misyonerler, Yöntemleri ve Türkiye'ye Yönelik Faaliyetleri*. İstanbul. Kaknüs Yayınları, 2002. – S. 25.
6. Abu Rayhan Biruni. *Tanlangan asarlar*. I jild. Tarj. A.Rasulov. Toshkent. O'zbekiston fan nashriyoti, 1968. – B. 348.
7. Muhammad Abu Zahra. *Mukhadarat fi an-nasraniya*. Riyadh. 1404. – P. 50.
8. Rahmatullah ibn Xalilurrahman al-Hindiy. *Izharul Haq*. Beirut. Dorul Jayl, 1989. – P. 74.
9. Şaban Kuzgun. *Dört İncil Farklılıkları ve Çelişkileri*. Ankara. Fazilet Neşriyat, 2008. – S. 178.
10. Ekrem Sarıçioğlu. *Başlangıçtan Günümüze Dinler Tarihi*. İstanbul. Fakülte Kitabevi, 2002. – S. 313.
11. Murodjon, A. M. M. (2023). THE DEVELOPMENT OF ISLAMIC SCIENCES DURING THE SELJUK SULTAN SANJAR PERIOD. *EPRA International Journal of Research and Development (IJRD)*, 8(5), 437-440.
12. SHAKHRISTANI, I. M. A. M., & WORK, H. NIHAyat AL-IQDAM FİILM AL-KALAM.
13. Murodjon, A. M. (2022). THE IMPORTANT SOURCE OF ISLAMIC PHILOSOPHY-"MUSORAAT AL-FALOSIFA" BY ABDULKARIM SHAHRISTANI. In Г. Г. Юрьевич (Ed.), *АКТУАЛЬНЫЕ ВОПРОСЫ СОВРЕМЕННОЙ НАУКИ И ОБРАЗОВАНИЯ* (pp. 125-126). Пенза: МЦНС «НАУКА и просвещение».
14. Samatkhonovich, G. S., Ashurovich, K. M., & Murodjon Ugli, A. M. M. (2021). The Entry And Development Of The Science" Usul Al-Fiqh" In Mawarounnahr. *Turkish Online Journal of Qualitative Inquiry*, 12(6).
15. SHAHRISTANI, A. ATTITUDE TO JUDAISM AND CHRISTIANITY IN THE SCIENTIFIC HERITAGE OF MUHAMMAD IBN. In *The I International Scientific and Practical Conference "Current methods of improving outdated technologies and methods"*, January 08-10, 2024, Bilbao, Spain. 472 p. Text Copyright© 2024 by the European Conference (<https://eu-conf.com/>). Illustrations© 2024 by the European Conference. Cover design: European Conference (<https://eu-conf.com/>). (p. 382).
16. https://en.wikipedia.org/wiki/Ecumenical_council



MECHANICS OF IMPROVING THE EFFICIENCY OF ENTERPRISES ON THE BASIS OF INNOVATION

Mamajonova Odinakhon Alisher kizi

Researcher of Andijan Construction-Economic Institute

ABSTRACT

In this article, the mechanisms of increasing the efficiency of industrial enterprises of the country on the basis of innovations, the methods of using innovative and scientific and technical potential for economic development are comprehensively applied.

KEYWORDS: *innovation, economy, capital, market, enterprise, new technologies, diversification, small and medium business entities.*

The implementation of market relations in a globalized society, the process of integration of the country with the world community, the growth of the information role in the world economic system, the strengthening of ties between new technologies and the capital market presuppose the transition of the economy and economy of our country to the path of innovative development. It is important to study the economic experience of developed countries of the world, as well as to choose the path of innovative development, taking into account the rich underground and underground resources, production and scientific and technical potential of Uzbekistan. After all, it is necessary to establish the legislative framework for the formation of a comprehensive innovative policy in the effective use of innovative, scientific and technical potential of our country in the path of its economic development.

After all, for the innovative development of the economy, it is necessary to develop a system of Strategic and tactical measures in this area and fully implement it into practice. It is also necessary for every resident of the country to deeply understand the practice of organizing and managing innovative activities, as well as the Basic Rules of an innovative strategy, the formation of innovative policies and the features of implementation.

Innovation means innovations in the transition to a more perfect state, that is, new tools, methods, products, technologies that need to be thought out, developed and invented. Innovation should be applied practically as the realized sum of new knowledge and bear fruit in compatible areas[1].

Today, innovation means a creative approach to the development of each activity as a result of its wide application in the field of Economics and its titular field of production, social relations, science and education, culture and other fields.

The role and importance of national industry in the economy of Uzbekistan is significant, and after state independence, fundamental economic, organizational and institutional and structural reforms were carried out in this area. These include nationalization and privatization of industrial enterprises, transformation into forms of Public –Joint-Stock, corporative, collective and private property, implementation of structural changes in industrial sectors, establishment of small and private enterprises, creation of joint ventures in cooperation with foreign capital [2, 71 P.]. A new era of national industrial development can be divided into several stages, depending on the macroeconomic situation, the formation of market relations, the description of structural changes and the industrialization strategy. One of the priorities of the transition to a market economy is the implementation of innovative reforms in the sectors of the economy, the modernization of enterprises, which is based on ensuring economic stability, equipping enterprises with new modern technologies, increasing the share of the private sector in the economy[3]. This process undoubtedly implies the most effective use of the country at the same time as increasing its innovative, economic potential. The current state of the economy of our country requires the acceleration of the pace of implementation of innovative changes in the national economy. It should be noted that the experience of countries with developed economies shows that the operation of an effective innovative strategy can be carried out only through the rational use of the country's economic and natural factors. The country's industrial-innovation policy prioritizes the creation and development of potentially competitive, including export-oriented productions operating in raw material-oriented sectors of the economy. Qualities such as coordination of investments, development of business cooperation, market acquisition indicate approaches to state industrial policy.



The application and application of innovative strategies to industries and the sale of products produced in industries to the foreign market are important factors in stabilizing industrial production.

One of the most important directions in the development of Science and technology is the widespread adoption of advanced technologies. Advanced technology is the combination of technological processes, the application of various physical and chemical methods, vacuuming, the widespread use of nanotechnology, and a set of many similar methods[4].

Another direction is the automation and mechanization of production, electrification and computerization. In developed countries, a large-scale electrification of the equipment being released for all industries has been established. All equipment is now released in an electrified state. Also, the creation of a robotic technique, which is a high peak of automation and provides high productivity, continues to be the highest goal of production.

The technique is a weapon that infinitely increases human strength, his ability to work, creativity, created on the basis of the achievements of science. Technology, on the other hand, is a factor that carries out the creation of certain material assets, techniques based on science and technology, or the creation of these material assets based on technology. The interdependence, complementarity, improvement of new technology, innovative strategy and techniques ensures that the spread of society grows in step by step. Technological innovation can take the form of products, processes, services and methods that are being developed by a legal entity for the first time (even if they are being used by other legal entities). There are two types of technological innovation. These are: innovations in products and innovations in processes. Product innovation in industrial production involves the preparation and introduction of technologically new and improved products. A technological new product is a product whose technological properties (functional signs, constructive execution, additional operations, as well as the composition of the components and materials used) or the purpose of application are fundamentally new or significantly different from a similar product previously produced by a legal entity[5]. Such innovations may be fundamentally based on new technologies or the use of existing technologies, the results of research and development. A technologically enhanced product is one in which qualitative characteristics of its production are improved and economic efficiency is increased by the use of higher efficient components and materials, partial modification of one or more technical components (in complex products). [6]

For the development of industrial enterprises in our country, it is envisaged to fill the Republican consumer market with high-quality light industrial products that are in demand among the population, increase the export potential of the network, produce competitive products by small enterprises, conduct a new technology and investment policy in tarmac, introduce modern technologies, master the production of new and high-quality products,

Innovative activity is the basis of entrepreneurial activity. An organization or enterprise operating in a market economy must strive to constantly seek and apply innovations in order to succeed in a competitive struggle.

REFERENCES

1. Fatkhutdinov R.A. *Innovation management. Textbook, 4th ed.* – St. Petersburg: St. Petersburg, 2003. – 400 s: ill. – (Series "Textbooks for universities")
2. Karimov I.A. In 2015, at the expense of the implementation of fundamental structural changes in our economy, the consistent continuation of the processes of modernization and diversification, a broad path to private property and private entrepreneurship is our priority. - T.: // Uzbekistan, 2015. 71 B.
3. Karimov I.A. With confidence in the future, learning from the past. Lecture delivered at the XXII Congress of the Uzbekistan Committee // Uzbekistan is on the verge of independence.- Tashkent: "Uzbekistan" NMIU, 2011. - B. 194-198.
4. Yusufbekov N.R., Mukhitdinov D.P. *The basis of modeling and optimization of technological processes.* - Tashkent: "Science and technology", 2015, 440 PP.
5. "Methodological recommendations on the recognition of the results of intellectual activity by a single technology" (approved by the Ministry of Education and Science of the Russian Federation on 04/01/2010)
6. OECD/Eurostat, "The measurement of scientific and technological activities: proposed guidelines for collecting and interpreting technological innovation data. Oslo manual", Paris, 2005



ADVANCEMENTS IN TRANSITION METAL-BASED HOMOGENEOUS CATALYSIS FOR GREEN CHEMICAL SYNTHESIS: A STUDY

Dr. Mahadev L Shegavi

Lecturer, Department of Chemistry, K.L.E Society's Shri Shivayogi Murughendra Swamiji Arts, Science and Commerce College, Athani

ABSTRACT

Homogeneous catalysis, particularly employing transition metal complexes, has emerged as a powerful tool in synthetic chemistry due to its high efficiency, selectivity, and tunability. This paper reviews recent advancements in transition metal-based homogeneous catalysis for the synthesis of organic molecules with a focus on sustainable and green methodologies. Key catalytic transformations, including hydrogenation, oxidation, C-C and C-X bond formation, and asymmetric synthesis, are discussed, highlighting innovative catalyst designs, reaction mechanisms, and applications in industrial and academic settings. Challenges and future directions in the field, such as the development of Earth-abundant metal catalysts and expansion of catalytic methodologies to new substrate classes, are also addressed. The integration of homogeneous catalytic processes into sustainable chemical manufacturing processes is emphasized, showcasing the potential of this field to drive the development of environmentally friendly synthesis routes.

KEYWORDS - homogeneous catalysis, transition metal complexes, green chemistry, sustainable synthesis, catalytic transformations, hydrogenation, oxidation, C-C bond formation, C-X bond formation, asymmetric synthesis,

INTRODUCTION

Homogeneous catalysis, particularly employing transition metal complexes, has revolutionized synthetic chemistry by enabling efficient and selective transformations of organic molecules. The field has witnessed remarkable advancements in recent years, driven by the growing demand for sustainable and environmentally friendly chemical synthesis. Transition metal-based catalysts offer unparalleled versatility and reactivity, making them invaluable tools for a wide range of synthetic transformations.

One of the key advantages of homogeneous catalysis is its ability to operate under mild reaction conditions, reducing energy consumption and minimizing waste generation compared to traditional stoichiometric methods. This aspect aligns well with the principles of green chemistry, which advocates for the design of chemical products and processes that minimize their environmental impact.

In this context, this review aims to provide a comprehensive overview of recent advancements in transition metal-based homogeneous catalysis for green chemical synthesis. The focus will be on catalytic transformations that are essential for the synthesis of complex organic molecules, including hydrogenation, oxidation, carbon-carbon (C-C) bond formation, and carbon-heteroatom (C-X) bond formation. These transformations play a crucial role in the production of pharmaceuticals, agrochemicals, and fine chemicals, making them key targets for sustainable synthetic methodologies.

The review will begin by discussing the fundamental principles of homogeneous catalysis, including the role of transition metal complexes as catalysts and the mechanisms of catalytic reactions. It will then delve into specific examples of transition metal-based catalysts that have been developed for green chemical synthesis, highlighting their design principles, reactivity profiles, and selectivity in various transformations.

Furthermore, the review will address the challenges associated with homogeneous catalysis, such as catalyst deactivation, substrate scope limitations, and environmental concerns related to the use of rare or toxic metals. It will also explore recent efforts to address these challenges, including the development of Earth-abundant metal catalysts and the use of ligand design strategies to enhance catalyst performance.

Overall, this review aims to showcase the significant progress made in transition metal-based homogeneous catalysis for green chemical synthesis and to highlight the potential of this field to drive sustainable innovation in synthetic chemistry.



LITERATURE REVIEW

Homogeneous catalysis, particularly using transition metal complexes, has garnered significant attention in recent years for its ability to enable efficient and selective transformations in organic synthesis. Transition metals, such as palladium, platinum, and ruthenium, among others, exhibit unique reactivity patterns that can be finely tuned through ligand design, allowing for precise control over reaction outcomes. This section provides an overview of recent advances in homogeneous catalysis, with a focus on key transformations and innovative catalyst designs.

Transition metal-catalyzed hydrogenation is a fundamental transformation in organic synthesis, allowing for the reduction of unsaturated bonds to yield saturated products. Palladium-based catalysts, such as Pd/C and Pd(PPh₃)₄, have been widely used for the hydrogenation of alkenes and alkynes. Recent efforts have focused on the development of ligand scaffolds that can enhance catalyst stability and selectivity. For example, the use of chiral phosphine ligands has enabled asymmetric hydrogenation, a powerful tool for the synthesis of enantioenriched compounds.

Oxidation reactions catalyzed by transition metals offer a sustainable alternative to traditional stoichiometric oxidants, such as chromium-based reagents. Ruthenium and iridium complexes have shown particular promise in catalyzing oxidation reactions, including alcohol oxidation and C-H functionalization. The development of ligands with redox-active sites has led to catalysts that can mediate challenging oxidation reactions under mild conditions.

Carbon-carbon (C-C) and carbon-heteroatom (C-X) bond formation are key processes in organic synthesis, enabling the construction of complex molecular frameworks. Transition metal-catalyzed cross-coupling reactions, such as the Suzuki-Miyaura, Heck, and Sonogashira reactions, have become indispensable tools for the synthesis of biaryl and alkene derivatives. Recent advances in this area include the development of catalysts based on nickel and copper, which offer improved reactivity and functional group compatibility.

In addition to these traditional transformations, recent years have seen a growing interest in the development of novel catalytic processes enabled by transition metal complexes. For example, photoredox catalysis, which couples the photochemical properties of transition metal complexes with organic reactions, has emerged as a powerful tool for the synthesis of complex molecules under mild conditions.

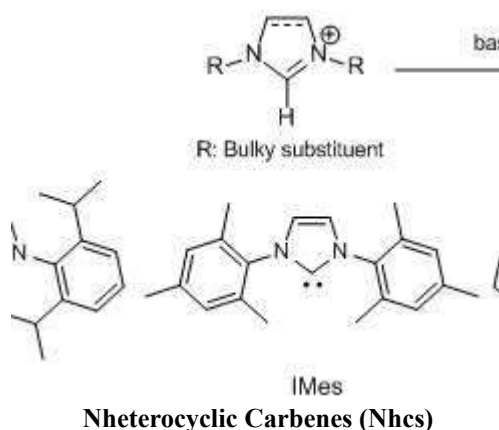
Overall, the field of homogeneous catalysis continues to evolve rapidly, driven by the quest for more sustainable and efficient synthetic methodologies. The development of new catalysts and ligand designs, coupled with a deeper understanding of reaction mechanisms, promises to open up new avenues for the synthesis of complex molecules with high efficiency and selectivity.

SPECIFIC CATALYTIC SYSTEMS

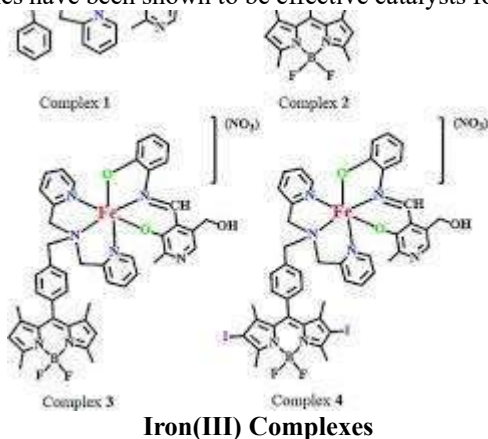
The research conducted in this study aimed to explore the use of transition metal-based homogeneous catalysis for green chemical synthesis, focusing on specific catalytic systems and their applications in key transformations.

Transition metals have been a cornerstone of catalysis for many years, and recent advancements in homogeneous catalysis are making them even more attractive for green chemical synthesis. Homogeneous catalysis uses catalysts that are in the same phase (usually liquid) as the reactants. This allows for better control over the reaction and can lead to more efficient and selective processes.

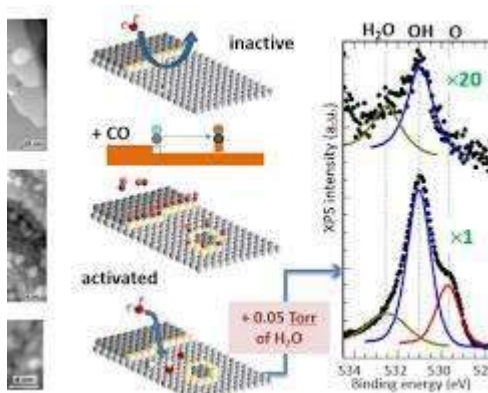
Palladium-Catalyzed Reactions: Palladium is a versatile metal that can be used for a wide variety of reactions, including cross-coupling reactions, hydrogenations, and oxidations. Recent advances have led to the development of new palladium catalysts that are more efficient, selective, and recyclable. For example, palladium(II) complexes with N-heterocyclic carbenes (NHCs) have been shown to be highly effective catalysts for cross-coupling reactions.



Iron-Catalyzed Reactions: Iron is an abundant and inexpensive metal that is becoming increasingly popular for green chemical synthesis. Iron catalysts are often cheaper and less toxic than traditional catalysts, and they can be used to carry out a wide range of reactions. For example, iron(III) complexes have been shown to be effective catalysts for the hydrogenation of alkenes and alkynes.



Copper-Catalyzed Reactions: Copper is another abundant metal that is being used for green chemical synthesis. Copper catalysts are often very selective and can be used to carry out a variety of reactions, including click reactions, cyclopropanations, and C-H activations.



These are just a few examples of the many exciting advancements that are being made in transition metal-based homogeneous catalysis for green chemical synthesis. These new catalysts have the potential to revolutionize the chemical industry by making it more sustainable and efficient.

Ruthenium-Catalyzed Oxidation Reactions

Ruthenium complexes were explored as catalysts for alcohol oxidation and C-H functionalization. Catalysts such as RuCl₃ and RuO₄, along with ligands such as bipyridine and phenanthroline derivatives, were studied. The research showed that these catalysts



could selectively oxidize alcohols to carbonyl compounds and functionalize C-H bonds, offering a sustainable alternative to traditional oxidation methods.

Nickel-Catalyzed Cross-Coupling Reactions

The study also investigated nickel complexes for C-C and C-X bond formation reactions. Catalysts like Ni(cod)₂ and NiCl₂(PPh₃)₂, along with bidentate phosphine or N-heterocyclic carbene ligands, were used. The research demonstrated that these catalysts could efficiently couple a variety of substrates, including aryl halides and alkyl halides, highlighting their potential for the synthesis of pharmaceuticals and agrochemicals.

Overall, the research showed that transition metal-based homogeneous catalysis offers a versatile and efficient approach to green chemical synthesis. The specific catalytic systems investigated in this study demonstrated high activity, selectivity, and functional group tolerance, making them valuable tools for the synthesis of complex organic molecules in a sustainable manner. The findings contribute to the broader field of catalysis and demonstrate the potential of these catalysts to drive innovation in green chemistry.

Mechanistic Studies

Mechanistic studies were conducted to gain insights into the reaction pathways and catalytic cycles of the transition metal-based homogeneous catalytic systems investigated in this study. These studies provided valuable information on the key intermediates involved in the catalytic transformations and helped elucidate the role of the transition metal complexes and ligands in facilitating these reactions.

Palladium-Catalyzed Reactions (Cross-Coupling with NHCs)

Activation Cycle: The palladium(II) center with NHC ligands undergoes oxidative addition with an organic halide (RX) and a nucleophile (Nu-M), generating a four-membered palladacycle intermediate.

Transmetalation: The nucleophile moiety (Nu) transfers from the metal (M) to the palladium, forming a new palladium-carbon (Pd-C) bond.

Reductive Elimination: Finally, reductive elimination expels the desired coupled product (R-Nu) and regenerates the original palladium(II) catalyst for the next cycle.

Iron-Catalyzed Reactions (Alkene Hydrogenation)

Heterolytic H₂ Activation: Iron(III) complexes can activate molecular hydrogen (H₂) heterolytically, splitting it into a hydride (H⁻) and a proton (H⁺).

Substrate Coordination: The alkene substrate coordinates with the metal center, creating a favorable interaction for hydrogenation.

Hydrogenation Steps: The alkene double bond accepts the hydride from the iron complex, forming a new C-H bond. The proton from H₂ activation can then react with another molecule or be captured by a base in the reaction medium.

Copper-Catalyzed Reactions (Click Reactions)

Cu(I) Formation: Often, copper(I) catalysts are generated in situ by reduction of copper(II) precursors with a reducing agent.

Azide-Alkyne Cycloaddition: In a click reaction, the copper(I) catalyst facilitates the formation of a triazole ring by cycloaddition between an azide and an alkyne. The copper(I) interacts with both functional groups, lowering the activation energy for the reaction.

Ruthenium-Catalyzed Oxidation Reactions:

For ruthenium-catalyzed oxidation reactions, mechanistic studies suggested a catalytic cycle involving the generation of a high-valent Ru(IV) or Ru(V) species, which can oxidize the substrate through hydrogen atom abstraction or concerted metal-ligand cooperation. Ligand effects were found to influence the reactivity and selectivity of the catalyst.

Nickel-Catalyzed Cross-Coupling Reactions

Mechanistic studies of nickel-catalyzed cross-coupling reactions revealed a distinct catalytic cycle involving oxidative addition of the aryl halide to the Ni(0) species, transmetalation with the organometallic reagent, and reductive elimination to form the coupled product. Ligand design was found to play a crucial role in controlling the rate and selectivity of the reaction.

Overall, the mechanistic studies provided valuable insights into the reaction mechanisms of the transition metal-based homogeneous catalytic systems investigated in this study. These studies not only helped elucidate the fundamental principles underlying these catalytic transformations but also guided the rational design of new catalysts with improved reactivity and selectivity.



APPLICATIONS AND CASE STUDIES

The applications of transition metal-based homogeneous catalysis are diverse and span various industries, including pharmaceuticals, agrochemicals, materials science, and fine chemicals. This section highlights some key applications and case studies that demonstrate the utility of these catalytic systems in enabling efficient and sustainable synthetic methodologies.

Pharmaceutical Synthesis:

Transition metal-based homogeneous catalysis plays a crucial role in the synthesis of pharmaceuticals, where the ability to selectively functionalize complex molecules is of paramount importance. For example, the palladium-catalyzed cross-coupling reactions have been extensively used in the synthesis of biaryl compounds, a common motif found in many pharmaceuticals.

Agrochemicals and Specialty Chemicals:

The synthesis of agrochemicals and specialty chemicals often requires the construction of complex molecular frameworks. Transition metal-catalyzed transformations, such as C-C and C-X bond formation, offer efficient routes to these compounds. For instance, the use of nickel-catalyzed cross-coupling reactions has enabled the synthesis of various herbicides and insecticides.

Materials Science:

Transition metal-based homogeneous catalysis is also applied in materials science for the synthesis of functional materials. For example, the development of ruthenium-catalyzed polymerization reactions has led to the production of conductive polymers used in electronic devices.

Fine Chemicals and Fragrances:

In the production of fine chemicals and fragrances, transition metal-catalyzed transformations are used to introduce specific functional groups and stereochemistries. For example, the use of iridium-catalyzed hydrogenation reactions has enabled the synthesis of chiral alcohols, which are important intermediates in fragrance synthesis.

Case Study: Suzuki-Miyaura Cross-Coupling in Pharmaceutical Synthesis:

A case study illustrating the application of palladium-catalyzed Suzuki-Miyaura cross-coupling in pharmaceutical synthesis could be presented. This could include the synthesis of a specific pharmaceutical compound, highlighting the key steps involving the cross-coupling reaction and the importance of catalyst design in achieving high yields and selectivity.

These applications and case studies demonstrate the versatility and efficiency of transition metal-based homogeneous catalysis in enabling the synthesis of complex molecules across various industries. The ability to selectively functionalize substrates under mild conditions makes these catalytic systems invaluable tools for modern synthetic chemistry.

CHALLENGES AND OPPORTUNITIES

Catalyst Deactivation: Transition metal catalysts can be deactivated by various mechanisms, including ligand dissociation, metal leaching, and poisoning by reaction intermediates or impurities. Developing catalysts with improved stability and resistance to deactivation is a key challenge.

Substrate Scope and Selectivity: While transition metal catalysts are known for their ability to catalyze a wide range of reactions, there are limitations in terms of substrate scope and selectivity. Some reactions may not be compatible with certain functional groups, or the desired regio- or stereoselectivity may be difficult to achieve.

Environmental Impact: While transition metal catalysis is generally considered more environmentally friendly than traditional methods, there is still room for improvement. Issues such as the use of toxic or hazardous reagents, as well as the generation of waste, need to be addressed to minimize the environmental impact of these processes.

Opportunities:

Earth-Abundant Metal Catalysts: One of the most promising opportunities in homogeneous catalysis is the development of catalysts based on Earth-abundant metals, such as iron, copper, and nickel. These metals are more sustainable and cost-effective alternatives to precious metals like palladium and platinum.

Ligand Design and Catalyst Optimization: Continued research into ligand design and catalyst optimization can lead to the development of more efficient and selective catalysts. Rational design strategies, guided by computational modeling and mechanistic studies, can help identify ligands that enhance catalyst performance.



Integration of Catalytic Processes: Integrating catalytic processes into multi-step synthesis strategies can improve the efficiency and sustainability of chemical synthesis. Developing cascade reactions and tandem transformations can reduce the number of synthetic steps and overall waste generation.

Addressing the challenges and capitalizing on the opportunities in transition metal-based homogeneous catalysis will be crucial for advancing the field and enabling the development of more sustainable and efficient synthetic methodologies. By developing catalysts with improved stability, selectivity, and environmental performance, researchers can contribute to the broader goal of achieving greener and more sustainable chemical processes.

CONCLUSION

Transition metal-based homogeneous catalysis has emerged as a powerful tool in modern synthetic chemistry, enabling the efficient and selective synthesis of complex molecules. The field has witnessed significant advancements, driven by the development of novel catalysts, ligands, and reaction methodologies. Despite these advancements, several challenges remain, including catalyst deactivation, substrate scope limitations, and environmental concerns. However, these challenges also present opportunities for further research and innovation.

One of the most promising opportunities lies in the development of catalysts based on Earth-abundant metals, such as iron, copper, and nickel. These metals offer a more sustainable alternative to precious metals like palladium and platinum, potentially reducing the cost and environmental impact of catalytic processes. Additionally, continued research into ligand design and catalyst optimization can lead to the development of more efficient and selective catalysts, improving the overall performance of transition metal-based homogeneous catalysis.

Integrating catalytic processes into multi-step synthesis strategies represents another important opportunity. Cascade reactions and tandem transformations can streamline synthetic routes, reducing the number of synthetic steps and overall waste generation. This integration can significantly improve the efficiency and sustainability of chemical synthesis.

In conclusion, while there are challenges associated with transition metal-based homogeneous catalysis, there are also significant opportunities for future research and innovation. By addressing these challenges and capitalizing on these opportunities, researchers can advance the field and contribute to the development of greener and more sustainable chemical processes.

BIBLIOGRAPHY

1. Chianese, A. R., & Huffman, J. C. (2018). *Homogeneous Catalysis: Mechanisms and Industrial Applications*. CRC Press.
2. Cornella, J., Zarate, C., & Martin, R. (2019). Metal-Catalyzed Activation of Ethers via C-O Bond Cleavage: A New Strategy for Molecular Diversity. *Accounts of Chemical Research*, 52(3), 761-768.
3. Cramer, C. J., & Tolman, W. B. (Eds.). (2014). *The Organometallic Chemistry of the Transition Metals*. John Wiley & Sons.
4. Dorta, R., Egli, P., & Togni, A. (2002). Ruthenium-Catalyzed Asymmetric Transfer Hydrogenation of Ketones with Chiral Diphosphine Ligands. *Journal of the American Chemical Society*, 124(30), 8956-8957.
5. Grushin, V. V. (2007). *Ruthenium in Catalysis*. Springer Science & Business Media.
6. Hartwig, J. F. (2010). *Organotransition Metal Chemistry: From Bonding to Catalysis*. University Science Books.
7. Noyori, R., & Ikariya, T. (2001). Homogeneous Catalysts: The Key to Unlocking Renewable Resources. *Pure and Applied Chemistry*, 73(1), 161-168.
8. Periana, R. A., Taube, D. J., Evitt, E. R., Löffler, D. G., Wentrcek, P. R., Voss, G., & Masuda, T. (1993). Platinum Catalysts for the High-Yield Oxidation of Methane to a Methanol Derivative. *Science*, 259(5093), 340-343.
9. Periana, R. A., & Taube, D. J. (2005). Development of a Catalyst for Methane-to-Methanol Conversion: From Fundamental Studies to Commercialization. *Journal of Catalysis*, 234(1), 79-92.
10. van Leeuwen, P. W. (Ed.). (2013). *Homogeneous Catalysis: Understanding the Art*. Springer Science & Business Media.



A STUDY OF EMPLOYMENT PATTERN IN FOOD PROCESSING INDUSTRIES OF ASSAM

Mukunda Madhab Gogoi¹, Ashi Lama²

¹Research Scholar, Department of Economics, Rajiv Gandhi University, Itanagar, Arunachal Pradesh.

²Associate Professor, Department of Economics, Rajiv Gandhi University, Itanagar, Arunachal Pradesh.

ABSTRACT

Food processing industry plays an important role in economic development. It generates employment opportunities and income for the people and helps to improve their standard of living. It processes the agricultural products and helps to minimise wastage of food. It contributes to value addition and contributes to economic progress. Assam produces a large quantity of fruits and vegetables and grains. The study was undertaken to examine the value addition and employment pattern in food processing units in the State. The study was based on secondary and primary sources of data. The primary data were collected from randomly selected sample of 120 units of food processing units from three districts of Assam. The data were analysed using frequency, percentage, bar and pie diagram. The study found that maximum value addition and income was generated by dairy units. But grains and cereal units were found to generate more job opportunities compare to other units. It was found that fruits and vegetables units engaged higher proportion of female than the male workers. The analysis of nature of jobs of the workers showed that three-fourth of the workers in surveyed food processing units were temporary. The main problem faced by the food processing units was unskilled and untrained workers. The study implies that there is a need to promote cereals and grains as well as consumer food units to generate more employment opportunities. Fruits and vegetables units should be given impetus to generate employment for women workers. Dairy should be promoted to generate more value addition and income. Training and skill development programmes should be conducted to develop skilled workers for food processing units.

KEYWORDS: food processing industry, employment, value addition, nature job

INTRODUCTION

Food processing industry is one of the promissory industries in the contest of India. With an attractive average annual growth rate of 11.18 per cent during the last five years ending 2019-20, employment generation of 12.38 percent in registered factory sector in 2017-18 and FDI equity inflow of US\$ 4.99 billion in the last seven years ending 2021, the food processing industry plays an important role in the rural India. It coordinates among consumers, industry and agriculture. It is the India's fifth large industry in terms of production, consumption, exports and potential growth. The food processing industry of the state has key role in solving and reducing the existing unemployment situation. The state has a total of 1582 registered food processing units, as per the Annual Report of Ministry of Food Processing Industry, Government of India, 2022-23. On the other hand, the number of unincorporated enterprises manufacturing food and beverages as per 73rd round Survey of NSSO, 2015-16 was 65,997 in the state of Assam.

With a population of 31, 205,576, as per population census, 2011, Assam is the most populous state in the north eastern region of India. There were 18, 05, 441 educated unemployed in the state of Assam in 2021(Economic Survey of Assam, 2022-23). The State ranks third among the highest unemployment prone states of the country. However, there is a high potential for income and employment generation in the food processing sector in the State. In this background, the present study was carried with the basic objective of analyzing the income and employment generation in the State's food processing industry.

OBJECTIVES

The study was carried out with the following objectives.

1. To examine the value addition and employment pattern in food processing industries in Assam.
2. To investigate the problems related to employment in food processing industries in the State.



DATA SOURCE AND METHODOLOGY

The study is based on both primary and secondary data. The secondary data were collected from Economic Survey of Assam, Ministry of Food Processing Industry, Govt. of India and various District Industry Centre (DIC) of Assam. Primary data were collected through field survey of four categories of food processing activities out of six categories identified by the Ministry of Food Processing Industry, Govt. of India. The study applied stratified random sample technique to select the sample of food processing units. The study selected three representative districts of the Assam namely, Tinsukia district from upper Assam, Nagaon district from middle Assam and Dhubri district from lower Assam. The food processing industries were divided into four categories (Dairy, fruits and vegetables, grains and cereals and consumers food processing) and from each category, sample units were selected randomly. The total sample size was 120 food processing units. The sample size of the units from each district is presented in table 1 as follows.

Table 1: Sample of Food Processing Units in Assam.

Districts	Categories	Total	Proportionate (30% of each category) Sample Units
Tinsukia District (Upper Assam)	Dairy	5	2
	Fruits & Vegetables	14	5
	Grains and cereals	173	52
	consumer food	54	17
	(A)Total Units	246	
Nagaon District (Middle Assam)	Dairy	2	1
	Fruits & Vegetables	5	2
	Grains and cereals	89	27
	Consumer Food	27	9
	(B)Total Units	123	
Dhubri District (Lower Assam)	Dairy	-	-
	Fruits & Vegetables	2	1
	Grains and cereals	13	4
	Consumer Food	-	-
	(C)Total Units	15	
Total Population(A+B+C)		384	120

Source: DIC of Tinsukia, Nagaon and Dhubri

The data were analysed using frequency, percentage, bar diagram and descriptive statistical methods.

FINDINGS AND DISCUSSION

The study of income and employment pattern in food processing industries of Assam has been examined on the basis of three parameters namely, value addition, number of workers employed and number of units.

Value Addition: Value addition is the additional value added to the products by an industrial unit in the production process. It is the extra value added over the original value of a product. Annual Survey of Industries, Vol-1, 1976-77, defines 'value addition as that part of value added which is created in the factory. It is calculated as the aggregate market value of aggregate output of a production process minus market value of aggregate inputs and depreciation.' The value addition generated in the surveyed food processing units is given at table 2.

Table 2: Value addition by different categories of surveyed food processing units of Assam.

Category	Yearly value added per units		Yearly value added per worker	
	Rs	Percentage	Rs	Percentage
Dairy	5,74,951.99	85.65	2,87,475.99	87.31
Fruits & Vegetables	65,026.25	9.69	27,379.47	8.32
Grains & Cereals	8,981.72	1.34	3,654.32	1.1
Consumer Food	22,308.31	3.32	10,741.03	3.27
Total	6,71,268.27	100	3,29,250.81	100

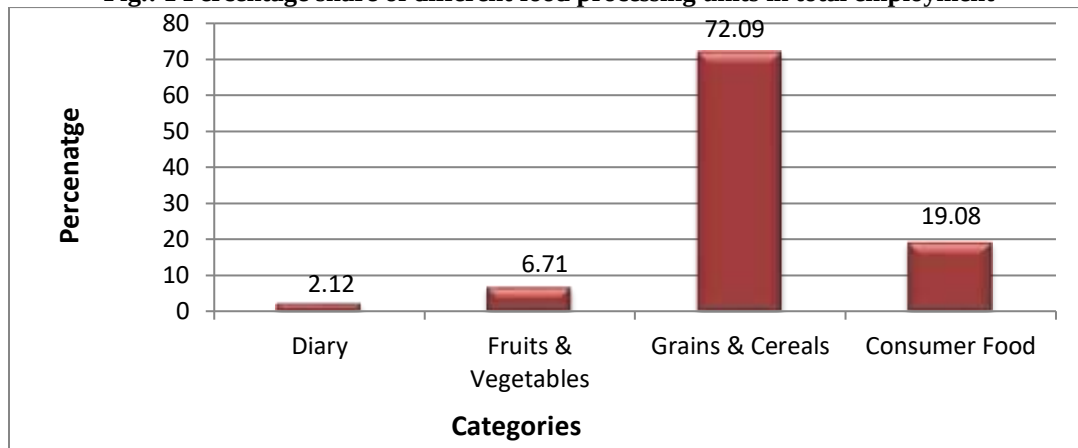
Source: Field Survey, 2022



The table 2 shows that the maximum yearly value addition per unit is done by dairy units (85.65 percent) and the minimum is done by grains and cereal units (1.34 percent). Yearly value addition per worker is also the maximum in case of dairy units (87.31 percent) and the minimum in case of grains and cereals (1.1 percent). It signifies the fact that dairy units of Assam are generating higher value addition as compared to other categories of food processing units.

Number of Workers: The number of workers employed of any industrial unit displays its employment status. The employment position of the food processing units of Assam is shown at Figure 1.

Fig.: 1 Percentage share of different food processing units in total employment

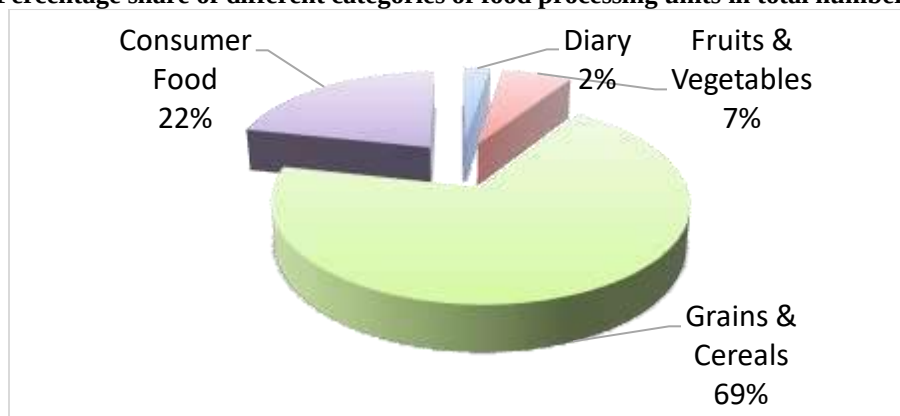


Source: Field Survey, 2022

The figure 1 shows that grains and cereal units accounted for maximum share in employment. It accounted for 72.09 per cent of the total workers employed in different categories of surveyed food processing units of Assam. It is followed by consumer food units with 19.08 per cent share of total workforce of food processing units is employed. Thus, in terms of employment, grains and cereals and consumer food units have the highest potential to generate employment opportunities. Therefore, the policy aimed at solving unemployment problem should focus on promoting grains and cereals as well as consumer food units in the State.

Number of Units: Number of industrial units under different categories is an important aspect of an industry that can give information about the employment position of the workers. The result of in relation to the number of units under four categories of food processing units of the State is depicted in Figure 2.

Fig. 2 Percentage share of different categories of food processing units in total number of units



Source: Field Survey, 2022

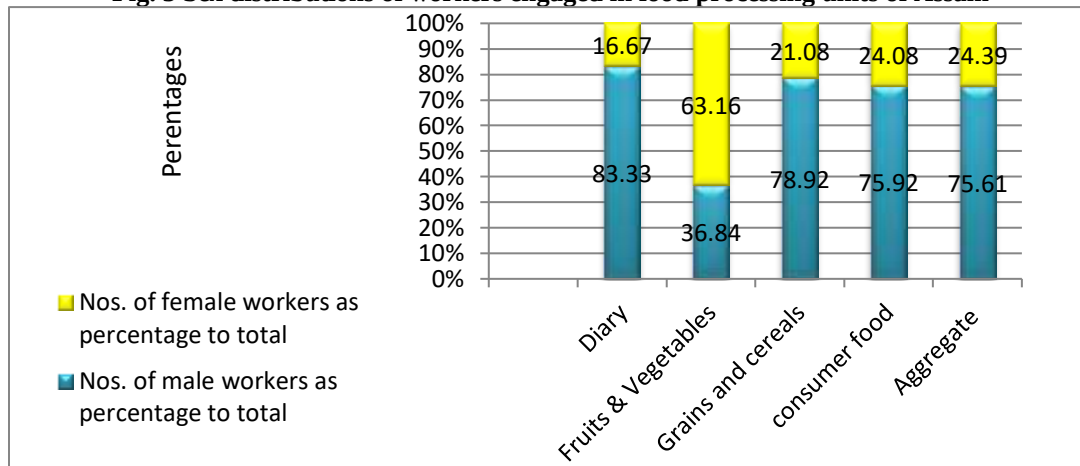
The figure 2 shows that grains and cereal units has the largest share (69.2 per cent) in the number of food processing units of Assam. It is followed by consumer food processing units that have a share of 21.6 per cent of the food processing industries.



Distribution of Workers

Sex distribution of workers: Sex distribution of workers gives the information about the share of male workers and that of female workers employed in food processing units. In other words, it provides knowledge about the gender distributions workforce in food processing activities. Figure 3 displays the sex distribution of workers in surveyed food processing units of Assam.

Fig. 3 Sex distributions of workers engaged in food processing units of Assam

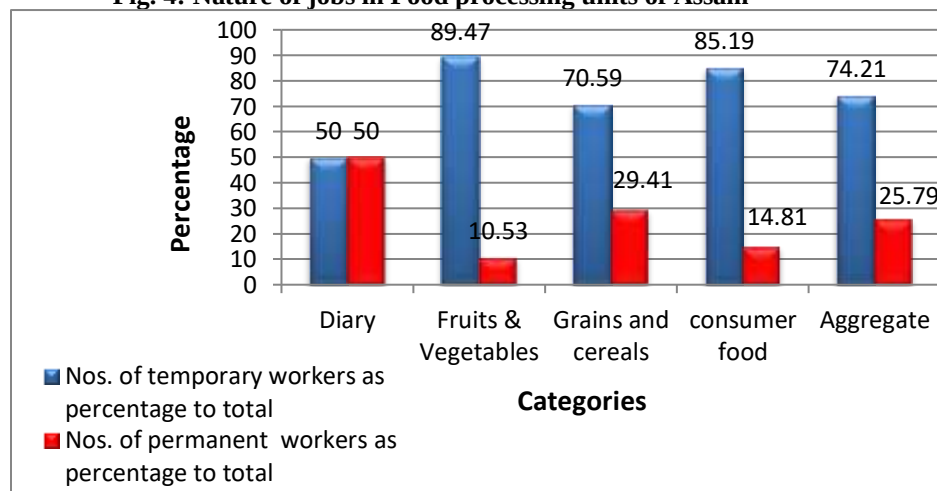


Source: Field Survey, 2022

It is found that, except fruits and vegetables units, in all the other categories of food processing units, percentage of male workers is more the female workers. It implies that food processing units require more of male workers than the female workers. In dairy units, 83 per cent of the workers were male followed by 78.92 per cent in grains and cereals and 75.92 per cent in consumer food units. In aggregate, 75.61 per cent (three-fourth) of the total workers in surveyed food processing units were male. Thus, it can be inferred that food processing units are biased towards male workforce. However, the female workers accounted for 63.16 per cent of the total workers employed in fruits and vegetables processing units. It indicates that the policy aimed at generating employment for women need to focus on giving incentives to promote fruits and vegetables processing units. Further, the women workers need to be provided training and skills to take up the job requirement in other food processing units. This will help to address the gender disparity in employment in food processing units in the State.

Nature of job: Employment of the workers can be either temporary or permanent nature. Temporary workers get jobs only for few days or months in a year. The nature of jobs is an important indicator of well-being of the workers. The nature of job of workers engaged in the surveyed food processing units of the State is shown in Figure 4.

Fig. 4: Nature of jobs in Food processing units of Assam



Source: Field survey, 2022



The figure 4 shows that except dairy category, in all the units of food processing activities, the share of temporary workers is more than permanent ones. As the food processing units collect raw materials mainly from the agriculture sector, which is seasonal in nature, majority of processing activities operate during the harvesting season and so the jobs in food processing units are observed to be temporary. The share of permanent job was the highest in dairy units (50 per cent) followed by grains and cereals (29.41 per cent). On the other hand, in fruits and vegetables units 89.47 per cent of the workers were temporary. In aggregate, the shares of the temporary and permanent jobs in processing units were 74.21 and 25.79 respectively. This implies that around three-fourth of the workers in food processing units were having temporary jobs.

Age Distribution of Workers: The workers were categorised into three age groups namely, tender age group (15 to 18 years) mature age group (18 to 60 years) and old age group (above 60 years). The table 3 highlights the age group wise distribution of workers.

Table 3: Age group of the workers in surveyed food processing units of Assam

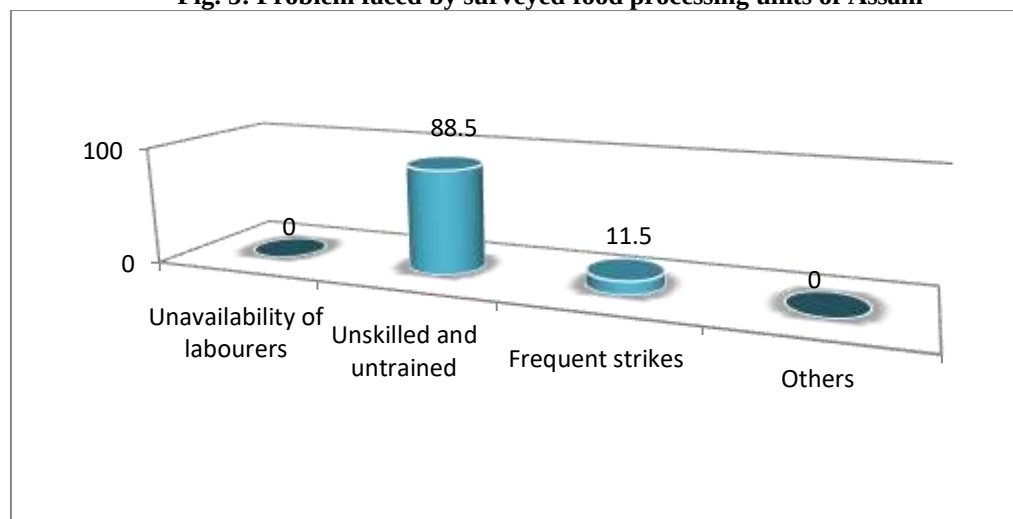
Age groups	Nos of workers	Percentage of total workers
15 to 18 years (tender workers)	9	3.18
18 to 60 years (Mature workers)	266	93.99
More than 60 years (Old workers)	8	2.83
Total	283	100

Source: Field survey, 2022

The table 3 shows that majority of the workers (94 per cent) belonged to mature age group (18 to 60 years). Only 3.18 per of the total workers were in the age group of 15 to 18 years (tender workers). It is to be noted that 2.83 per cent of the workers were in the age group of above 60 years (old workers). This shows that due to poor economic conditions and lack of care facilities, people at old age are compelled to engage themselves in wage work at food processing units.

Problems faced by food processing units: The study also explored the employment related problems being faced by the surveyed food processing units. It was found that only, 21.7 per cent of the surveyed food processing units faced employment related problem and the rest 78.3 per cent did not face such problem. Regarding the nature of problem, most of the units were facing the problem of unskilled and untrained labour. The details are presented in the figure 5.

Fig. 5: Problem faced by surveyed food processing units of Assam



Source: Field Survey, 2022

It was found that out of the units facing employment related problem, 88.5 per cent of them were facing the problem of unskilled and untrained workers and 11.5 per cent of them faced the problem of frequent strikes.

CONCLUSIONS

The study shows that food processing units have high potential to generate income and employment opportunities in Assam. It was found that out of six categories, four categories of food processing units mainly operate in the State and most of the surveyed food processing units were grains and cereal units and consumer food units. It was found that among the four categories, dairy units generate maximum value addition and income in the State. However, in terms of share in employment, grains and cereals occupy the top most



position followed by consumer food. Thus, grains and cereals units have the capacity to generate higher employment opportunities. The sex distribution of work force revealed that the fruits and vegetable units employ more female workers than male workers as compared to other units. The analysis of nature of job in food processing units indicated that around three-fourth of the workers were engaged as temporary workers. The distribution of workers by age group showed that most of the workers were in age group of 18 to 60 years. But around 3 per cent of them were old workers (above 60 years). The analysis of employment related problem faced by the food processing units showed that 21 per cent of the surveyed units faced such problems. Most of those units faced the problem of unskilled labour.

The findings of the study lead to the following policy implications; the policy should focus on promoting food processing units to generate income and employment. Dairy units should be promoted as it generates higher value addition. It should give more emphasis on grains and cereals units and consumer units for employment generation; to generate employment for women, policy should promote fruits and vegetables units; the policy should focus on skill development as the food processing unit requires skilled labour.

REFERENCES

1. Bishnu Bhattacharyya, 'Problems and Prospects of Fruits and Vegetables Processing Industry: A Study in Kamrup District of Assam', *Asian Resonance*, 2013, 2 (4), 38-44.
2. Dhanya V, Avdhesh Kumar Shukla and Rishabh Kumar, 'Food Processing Industry in India: Challenges and Potential', *RBI Bulletin*, March, 2000, 27-41.
3. Government of Assam, 'Statistical Handbook', 2018, Directorate of Economics and Statistics, Assam
4. Government of Assam, 'Economic Survey of Assam, 2022-23, Directorate of Economics and Statistics, Assam
5. Government of India, 'Annual Report of Ministry of Food Processing Industries', 2021-2022.
6. Government of India, 'Indian Food Processing Sector Trends and Opportunities', August, 2019', Ministry of Food Processing of India
7. Government of India, 'Population Census, 2011,' Ministry of Home Affairs.
8. Ms. Shelly and Dr. Kuldip Kaur, 'Impacts of Food Processing Industry on Economic Growth, FDI and Exports of India', *Pacific Business Review International*, 2015, 7 (12), 63-72.
9. Surendra P. Singh, Fisseha Tegegne and Enefiok Ekenem, 'The Food Processing Industry in India: Challenges and Opportunities', *Journal of Food Distribution Research*, 2012, 43 (1), 81-89.



ISSUES OF STUDYING MEDICAL TERMINOLOGY IN UZBEK LINGUISTICS

Akbarkhodzhaeva Feruza Abduganievna

Senior Lecturer at the Department of Uzbek Language and Literature of the Tashkent Pediatric Medical Institute. Doctor Philosophy (PhD) in Philological Sciences

ABSTRACT

This article talks about the history of medical terminology in Uzbek linguistics. Scientific works, textbooks, articles, scientific works and dictionaries, which are the basis for the formation of a modern terminological system, have been studied.

KEY WORDS: *medicine, medical term, Avesto, Canon of medicine, Dorush-shifo, Language and terminology Committee, Central Committee of the new alphabet and terminology.*

ЎЗБЕК ТИЛШУНОСЛИГИДА ТИББИЙ ТЕРМИНОЛОГИЯНИНГ ЎРГАНИЛИШИ МАСАЛАЛАРИ

Акбарходжаева Феруза Абдуганиевна

Старший преподаватель кафедры Узбекского языка и литературы Ташкентского педиатрического медицинского института. Доктор философии (PhD) по филологическим наукам

Аннотация

В данной статье идёт речь об истории медицинской терминологии в узбекском языкознании. Исследованы научные труды, учебные пособия, статьи, научные труды и словари, которые являются основой для формирования современной терминологической системы.

Ключевые слова: *медицина, медицинский термин, Авесто, Канон медицины, Доруш-шифо, комитет по Языку и терминологии, Центральный комитет нового алфавита и терминологии.*

Сегодня, в век прогресса науки, культуры и техники, в лексике каждого языка отмечаются огромные изменения. Ведь новаторство во всех областях изначально выражается в лексической системе языка, через термины. Поскольку область медицины продолжает быстро развиваться, растёт и потребность в медицинской терминологии. Известно, что лексический пласт считается наиболее изменчивой частью языка и подвергается закономерным историческим влияниям. В результате в лексическую систему современного языка входят различные термины. Их исследование является одной из важных задач лингвистов.

Прежде чем говорить об изучении медицинских терминов в узбекском языкознании, необходимо уточнить суть понятия медицины. В толковом словаре узбекского языка слово «медицина» объясняется так: «совокупность знаний о сохранении и укреплении здоровья человека, продлении жизни, профилактике и лечении заболеваний, а также комплекс практических мероприятий в этой области». [1, 81].

Как писал Гиппократ, основатель западной медицины: «Сама жизнь заставляла людей искать и открывать искусство медицины» [2, 16].

Из вышеизложенного становится ясно, что желание людей жить стало причиной открытия этого месторождения и до сих пор является движущей силой его развития.



Внимание к медицинской сфере было сильным с древних времен. Первые письменные сведения о медицине народов, проживавших на территории Узбекистана в древности, мы находим в зороастрийской священной книге «Авеста». В 8 главах его первой книги «Вендидат» можно найти важные сведения о сохранении здоровья [2, 38].

Также среди ученых восточной медицины Абу Бакр Мухаммад ибн Закария Рази, Абу Мансур Хасан ибн Нух Камари, Абу Али ибн Сина, Абу Райхан Беруни, Абу Абдулла Мухаммад ибн Юсуф Илаки, Абу Ибрагим Исмаил ибн Хасан Джурджани, Абдуррахман Марвази, Хаким Азраки, Мухаммад ибн Бахрам Каланаси Самарканди, Абу Хамид Мухаммад ибн Али ибн Умар Самарканди, Султанали Табиб Хурасани, Мухаммад ибн Юсуф Юсуф аль-Хирави, Убайдилло ибн Мухаммад Юсуф Кахаль, Джунаидилла ибн Исламшейх Хазик, Джафарходжа ибн Насриддинходжа аль-Хусайни Хазораспия, Яифани Хоканди, сын Басит-хана Захид-хан [3] и другие также могут найти много информации о медицине в письменных наследиях.

Из того, что в нашей истории упоминаются имена многих врачей и судей, можно заключить, что на Востоке существовал сильный интерес к медицине, точнее, к народной медицине. Можно сказать, что этому способствовал и медицинский центр «Доруш-шифа», построенный нашим великим поэтом Алишером Навои [4, 11]». Они создали тысячи терминов под влиянием существующего языка в соответствии с требованиями времени, в котором они жили. В результате в настоящее время большинство составляют медицинские термины, составленные на основе материалов греческого, латинского, арабского, персидско-таджикского, русского языков. Следует отметить, что по количеству в медицине преобладают термины, заимствованные из латинского языка.

Латынь была языком латинского племени в древние времена. Они жили в районе Лацио, расположенном на Апеннинском полуострове в современной Италии. В ходе завоевательных войн это племя передало свою власть племенам, населявшим всю Европу, северную часть Африки и Средиземное море. Он заставил принять свой собственный язык, т. е. латынь, в качестве государственного языка на оккупированных землях. Таким образом, влияние латинского языка отразилось на культуре и науке этих народов. Латинский язык использовался в науке и административной работе в европейских странах до 18 века. Но с образованием национальных государств латинский язык полностью утратил свое значение в области науки и культуры [5, 4].

Хотя латынь в настоящее время является мертвым языком, изучение и знание этого языка является очень важной необходимостью для всех врачей. Ведь латынь – язык медицины во всем мире. Тот факт, что большинство медицинских терминов написаны на этом языке и образуют международную систему, позволяет всем представителям медицинской науки в мире легко понимать друг- друга.

Хотя влияние латинского языка на мировую медицинскую сферу было очень велико, но, несмотря на это, вклад восточных ученых-медиков в эту науку также значителен. В каком-то смысле можно сказать, что термины, использованные в научных трудах вышеупомянутых восточных судей и врачей, послужили основой для формирования терминов узбекской народной медицины и современной медицинской терминологии [3, 236]. Например, Абу Али ибн Сина, основоположник восточной медицины, известный во всем мире под прозвищем «Авиценна», открыл множество медицинских терминов в своих «Законах медицины» в X веке. В подтверждение нашего мнения можно привести следующие примеры: шакика (мигрень), ибрида (импотенция), сарсом (менингит), хилфа (диарея), сакта (апоплексия), шаро (эшакем) и другие.

Мы можем назвать эти термины зеркалом истории. Ведь все события в истории человечества фиксируются в науке через них. Например, завоевания, пережитые в прошлом, и процесс глобализации также оказали большое влияние на науку, культуру, особенно терминологию. По этой причине сегодня в обращении находятся медицинские термины, заимствованные из разных языков.

Терминолог Г. О. Винокур пишет: «Термины не «появляются», а «придумываются», «создаются», когда ощущается потребность в них [6, 24]. Фактически, с развитием общества, эпохи и области медицины ощущалась потребность в терминах, выражающих эти изменения, и они были «созданы».

Даже сегодня этот процесс продолжается. По мере обнаружения новых заболеваний ведется поиск средств от них. Эти изменения отражаются не только в медицине, но и в области лингвистики, ономастологии и лексикографии, а также обогащают их.

По мнению лингвиста Р. Дониерова, «ни конкретной науки, ни техники вообще, поэтому их термины не являются творением конкретного народа. Они представляют собой совокупность объективного существования, собранную, познannую и изученную всеми народами мира» [7, 4]. Становление медицинской науки также является результатом усилий ученых-медиков всего мира. Медицинские термины являются «доказательствами» этого результата.

Медицинские термины — это слова и фразы, которые отражают номенклатуру медицинской области. Другими словами, это инструменты, раскрывающие все «границы» мира медицины. Лексика этой области представляет собой наиболее богатую и достаточно сложную терминологическую систему среди единиц научно-технической сферы. В него мы можем включить несколько сотен тысяч слов и фраз. Ведь в лексику этой области входят термины, используемые в таких областях, как биология, химия, микробиология, ботаника, зоология, анатомия, антропология, палеопатология, палеобиология, генетика, которые являются непосредственно частью медицинских наук. В результате лингвистическое исследование и



унификация (регулирование) этих терминов во всех языках, в том числе и в узбекском языкознании, остается актуальной проблемой.

Большую роль в становлении и развитии узбекской научной литературы сыграли Комитет языка и терминологии при Наркомпросе Узбекистана (1929-1933 гг.) и Центральный комитет нового алфавита и терминологии при ЦИК Узбекистана (1933-1938 гг.). терминология [3, 78]. Следует отметить, что в рамках деятельности этих комитетов были предприняты предварительные шаги по изучению вопросов терминологии. Например, в этот период издавались методические пособия и словари по терминологии той или иной области.

В узбекском языкознании первые исследования по вопросам медицинской терминологии начались в 1960-е годы. С этого периода были изданы первые словари медицинских терминов. В частности, ученый Ёлкин Торакулов одним из первых составил словарь этой области. Его двухтомный «Русско-узбекский медицинский словарь» охватывает множество терминов, используемых во всех разделах медицины [8].

Следует отметить, что в этой области проведено еще немало лексикографических работ. Например, «Русско-латинско-узбекский медицинский словарь» (Якубова С., Толаганов Ф. – Т., 1978), «Замечательный медицинский словарь: Русско-узбекский словарь медицинских терминов» (Усмонходжаев А., Наджмиддинов О., Муродова М. - Т., 1992) и другие. Следует отметить, что наличие и обилие словарей этой области в Узбекистане является большим достижением области лексикографии. Также можно сказать, что наличие статей и сборников в этой области внесло большой вклад в формирование нашей национальной терминологической системы. Однако в узбекском языкознании медицинские термины изучаются в меньшинстве. В частности, А.Хусанова «Название болезней и их симптом в узбекском языке» [9], А.Касимова «Фармацевтическая терминология в современном узбекском языке» [10]] и Д.Можно перечислить диссертации А.Хайдаровой на тему «Сравнительное изучение медицинских терминов в узбекском и английском языках» [11]. А.Хусанов и А.Касимов в своих исследованиях проводили исследования в терминах определенной области медицины в рамках традиционного языкознания. Например, А.Хусанов проанализировал названия болезней и симптомов, А.Касимов проанализировал названия лекарств.

Диссертационную работу Д. А. Хайдаровой можно назвать первой научной работой по медицинской терминологии, выполненной в рамках кросс-лингвистики. Ведь здесь сравниваются медицинские термины разных языковых систем, в том числе узбекской и английской, и выявляются их сходства и различия. Однако в данной работе недостаточно раскрыты лингвокультурные и коммуникативно-прагматические характеристики медицинских терминов.

Словом, медицина прижилась в нашей стране с древнейших времен, и многие наши предки упорно трудились для ее развития. Несколько завоеваний, пережитых в истории, сильно повредили нашу национальную терминологическую систему. В годы независимости принятые в нашей стране приказы и постановления обуславливают необходимость уделять этому направлению большое внимание. Похвально, что в истории узбекского языкознания проделана значительная работа по медицинской терминологии, особенно по созданию словарей медицинских терминов. Однако по мере развития медицины спрос на термины, отражающие ее изменения, постоянно возрастает. В результате область медицинской терминологии должна идти в ногу с медициной. В дальнейшем углубленное исследование медицинских терминов, научное обоснование, их унификация и разработка соответствующих рекомендаций, формирование «узбекской медицинской терминологической системы» являются одними из важнейших задач.

Литература

1. Толковый словарь узбекского языка / Мадвалиев А. под ред./ Ташкент: Национальная энциклопедия Узбекистана, 2006. – 627 с.
2. Рустамова Х.Э., Стожарова Н.К., Нурмаматова К.Ч., Абдурашидова Ш.А. История медицины. – Т., 2014. – 206 с.
3. Мадвалиев А. Вопросы узбекской терминологии и лексикографии. – Т.: Национальная энциклопедия Узбекистана, 2017. – 379 с.
4. Мадиев Ж., Хакимов И. Медицина и духовность в интерпретации Навои. – Т.: Тафаккур, 2018. – 38 с.
5. Болиев М.Н. Латинский язык и медицинская терминология. – Т.: Национальная энциклопедия Узбекистана, 2013. – 301 с.
6. Винокур Г.О. О некоторых явлениях словообразования и русской технической терминологии // Труды МИФ. Т.5. Сборник статей по языковедению. – Москва, 1939 г.
7. Дониерров Р. Из истории научно-технических терминов узбекского языка. – Т.: Наука, 1973 – 115 с.
8. Торакулов Й. Русско-узбекский медицинский словарь. Том 1. Ташкент, 1962.- 366 с.; Том 2. – Т., 1970. – 456 с.
9. Хусанов А. Название болезней и их симптомов на узбекском языке: Дис.канд.филол.наук. – Т., 1982 г.
10. Касимов А. Фармацевтическая терминология в современном узбекском языке: Дис.канд.филол.наук. Т., 1982 г.
11. Хайдарова Д.А. Сравнительное изучение медицинских терминов на узбекском и английском языках: Диссер.кан.фил.наук. – Т., 2007 г.



PROBLEMS OF STUDYING MEDICAL TERMS IN UZBEK AND ENGLISH

Khamrokulova Munira Rasulovna

*Senior Lecturer at the Department of Uzbek Language and Literature of the Tashkent Pediatric
Medical Institute. Uzbekistan*

ANNOTATION

This article deals with the study of Uzbek and English terms within the framework of linguistics, and the article also expresses the opinions of scientists and their theoretical research on medical terms.

KEYWORDS: *diagnosis, term, lexicography, affix, linguocultural, morphology, semantics.*

ПРОБЛЕМЫ ИЗУЧЕНИЯ МЕДИЦИНСКИХ ТЕРМИНОВ НА УЗБЕКСКОМ И АНГЛИЙСКОМ ЯЗЫКАХ

Хамрокулова Мунира Расуловна -

*Старший преподаватель кафедры Узбекского
языка и литературы Ташкентского педиатрического
медицинского института. Узбекистан*

Аннотация

В данной статье идёт речь об изучении узбекских и английских терминов в рамках языкознания, а также в статье выражены мнения ученых и их теоретические исследования по поводу медицинских терминов.

Ключевые слова: *диагностика, термин, лексикография, аффикс, лингвокультурология, морфология, семантика*

Мы знаем, что медицина – это практическая деятельность, целью которой является лечение пациентов, профилактика заболеваний и достижение долголетия, сохраняя при этом здоровое функционирование человеческого общества. Особенно с точки зрения науки медицина представляет собой систему научных знаний о сохранении и укреплении здоровья человека. В настоящее время человеческое общество и развитие технологий оказывают большое влияние на здоровье и мировоззрение людей.

Все это начало менять представления о происхождении болезней, их лечении и профилактике. Медицина связана с несколькими науками, например, важную роль в развитии наук играют анатомия, физиология, микробиология, философия, химия, физика, экономика, математика.

Исследователи имеют ряд научных работ и статей, посвященных связи медицины и лингвистики. В настоящее время в жизни независимого Узбекистана появились такие понятия, как взаимосвязь лингвистики и медицины в современной науке, изменения в них, а также появление в нашей речи английских медицинских терминов, актуальные темы, отвечающие мировым требованиям, современная литература по медицине, Информация и приобретение этих знаний сегодня важны для ученых и исследователей, были в центре внимания и высказали несколько своих теоретических мнений по этому поводу.



Научно-техническая революция и связанные с ней разработки, появление высоких технологий, внедрение современных технологий в нашу жизнь, создание новых методов диагностики и лечения заболеваний настолько обогатили медицину, что, как следствие, медицинские в нашу речь стали входить термины, относящиеся к английскому языку.

Сегодняшнее внимание к медицине показывает, что в древние времена врачи пытались обнаружить болезнь на ранних стадиях, найти ее причину, а лучше всего предотвратить болезнь путем проведения профилактических мероприятий и изменения образа жизни. В ходе таких процессов из одного языка в другой стали поступать новые слова. Это привело к обогащению речи носителей языка и появлению новых слов в лингвистике.

Изучение истории становления и развития медицины помогает не только расширить уровень владения, но и связать систему современных знаний с древней исторической системой, заглянуть в будущее, используя в некотором смысле законы диалектики и обогатить лексикографию.

Изучая историю медицины, язык занимает главное место в культурном, эстетическом, этическом и профессиональном развитии современных врачей. Потому что в результате развития языка в нашей речи появляются новые слова, понятия и термины. В результате развития медицины в науку стали входить новые термины. История медицины является неотъемлемой частью общей истории человечества.

Каждая эпоха формирует и определяет уровень медицины и здравоохранения. В медицине, религиозных науках отношение человека к себе и к другим выражается как в зеркале и в то же время показывает, что медицина в своем становлении связана с языкознанием. Ученые условно разделяют историю медицины на три периода ее развития как науки.

Эти периоды связаны со сбором информации в медицинском мире, и это самый длительный период, который не был завершен со времен Гиппократов. В те времена считалось важным собирать информацию о медицине и анализировать понятия и термины, связанные с медициной.

История терминологической лексики, сформировавшейся на основе закономерностей лексики узбекского литературного языка, периодизирована в стиле древнетюркского языка, старотурецкого языка, староузбекского литературного языка, терминологии узбекского языка советский период и терминология узбекского языка в период независимости, основанная на экстралингвистических и внутрилингвистических факторах в терминологической лексической системе, позволяет понять происходившие процессы.

В наше время медицинские термины, используемые в нашей речи, относятся к числу синонимов. Например, можно привести несколько примеров: “Yig’iq”, “kasallik, illat”, “og’riq”, “bemor, kasal”, “yo’tal” и т.д.

Исследования Р.И.Турабова посвящены образованию медицинских терминов в английском языке, причем наиболее активными способами словообразования являются аффиксация (inhaler, unstable, disconnection), сложные слова (thromboembolism), конверсия (acid), аббревиатуры (сокращенные) (Adverse Event (AE) подробнее. Он отмечает, что собственными словами часто являются названия заболеваний, синдромов и симптомов (parkinsonism, albinism) [2].

В своей научной работе И.Т. Гришин и Ф.А. Романова изучили английские, французские и русские медицинские термины-эпонимы. Они отметили повышение степени абстракции потенциала родственных существительных в медицинских терминах при участии эпонимов в процессе синонимии [1].

Существуют также исследования, посвященные определенному жанру научной медицины. В научной деятельности Р.Х.Шайманова наблюдается интеграция (соединение) жанрово-профессиональных, официально-деловых и научных методов в медицинской карте стационарного больного. Задачу этого жанра автор определяет как информационно-накопительную, а в текстах медицинских карт стационарных больных - медицинскую терминологию и терминологические



предложения научного стиля (черепно-мозговая травма, перелом проксимальной фаланги первого пальца левой руки без смещение, благоприятный прогноз (предсказание)), сокращения (аббревиатуры) (СДВГ, РТЧ), пассивные конструкции [3]

В нашей стране медицина – область, развивавшаяся с древнейших времен, а деятельность Ибн Сины (Авицина) в медицине на несколько столетий сделала его имя тесно связанным с этой областью науки. Большая заслуга учёного в развитии медицины состоит в том, что он рассортировал информацию, собранную в области медицинской науки разными людьми, проходившими до него на протяжении веков, привел её в определённый порядок и, обогатив собственным опытом, обобщил его на основе определенных теорий и правил. Благодаря таким работам и медицинским процессам в нашей речи появляются новые термины, что способствует обогащению родного языка.

Воспользованные литературы

1. **И.Т. Гришин и Ф.А.Романова.** Структурно-семантические особенности медицинских терминов в английском и французском языках и проблемы их перевода на русский язык (краткое сообщение) // Вестник новых медицинских технологий. №4. Москва, 2014.
2. **Р.И.Турабов.** Особенности перевода терминов в клинических исследованиях // Вестник СамГУ. 2016. №22. – С. 89-93.
3. **Р.Х.Шайманов** Жанрово-стилевая специфика медицинского документа (на матле медицинской карты стационарного больного) // Мир науки, культуры, образования. 2014. №3(38). – С. 127-131.



CURRENT ISSUES OF TEACHING RUSSIAN AS A SECOND FOREIGN LANGUAGE IN SECONDARY SPECIALTY MEDICAL EDUCATIONAL INSTITUTIONS OF UZBEKISTAN

Chakhieva Rabia Vakhidovna

*Teacher of Russian Language Siab College of Public Health named after
Avicyn. Samarkand, Uzbekistan.*

ABSTRACT

The article discusses the main tasks of teaching the Russian language in a medical college. The need to revise the existing education system in favor of a professionally oriented, sociocultural approach is emphasized

KEY WORDS: *Russian language, method, pedagogical technologies, medicine*

АКТУАЛЬНЫЕ ВОПРОСЫ ПРЕПОДАВАНИЯ РУССКОГО ЯЗЫКА КАК ВТОРОГО ИНОСТРАННОГО В СРЕДНЕСПЕЦИАЛЬНЫХ МЕДИЦИНСКИХ УЧЕБНЫХ ЗАВЕДЕНИЯХ УЗБЕКИСТАНА

Чахиева Рабия Вахидовна

*Преподаватель Русского языка Сиабского
Техникума Общественного здоровья имени
Авицины. г.Самарканд.Узбекистан.*

Аннотация

В статье рассмотрены основные задачи преподавания русского языка в медицинском техникуме. Подчеркивается необходимость пересмотра существующей системы образования в пользу профессионально ориентированного, социокультурного подхода.

Ключевые слова: *Русский язык, метод, педагогические технологии, медицина.*

Modern Russian medical terminology has developed as a result of “centuries-long development of world and Russian healing and medical science” [1. P. 410]. Special vocabulary was replenished with the work of medical scientists from many countries around the world. The international experience of doctors and scientists from different eras and cultures was reflected in the development and structure of the medical terminology system. Modern medical terminology has reached the greatest degree of orderliness compared to the terminology of other branches of knowledge. International nomenclatures adopted in most countries of the world contribute to the further improvement of the medical terminology system and its internationalization.

The emergence of Russian medical vocabulary is rooted in the common Indo-European and common Slavic language-base, on the basis of which in the 7th-8th centuries. The Old Russian language arose. It is possible that the original custodians of medical knowledge were the magician priests. The common Slavic word Doctor, which has a common root with the words “grumble”, “speak”, originally meant a sorcerer, sorcerer, fortune-teller, soothsayer, who heals with charms, incantations and incantations.

Here are examples of ancient Slavic medical terminology: - “bebekhi” (kidneys); “blonka semiprecious” (iris, iris); “howl” (food, hunger, appetite); “peeper” (pupil); “goose” (diaphragm); “spiritual vein” (trachea, windpipe); “hiding” (chewing food); “kutyr”



(stomach). In medical texts there were also now forgotten terms derived from Greek words: “chalk” (bile, from the Greek “melan”); “all-meat gland” (pancreas, from the Greek “pan” - general, whole and “creas” - meat). The latter term is reminiscent of the modern word “pancreatitis”. The sense organs were called “many different minds”, the tongue was called “the speaking tongue”, the neck was intended to protect the head from “falling from spinning”. Modern terminology includes such ancient names as nuchal ligament [6], duodenum, epigastrium (the Church Slavonic and Old Russian word “neck” referred to the neck, and the Church Slavonic words “finger” and “belly” meant “finger” and “stomach” respectively “).

Studying the Russian language course has a purely professional goal - to prepare a terminologically competent doctor. Studying words is one of the most important components of Russian language classes. It is Russian vocabulary that will help in further work with medical terminology. In addition to medical terminology, the classes also pay attention to Russian aphorisms, knowledge of which helps students not only learn centuries-old wisdom, but also better remember Russian words.

The main point of theoretical and practical research on the intensification of teaching the Russian language is the so-called conscious comparative method. The essence of this method is that the comparison of the native and Russian languages in methodological and linguistic terms at certain stages of the development of methodological and linguistic thought of students not only effectively correlate, but also stimulate each other. At the same time, the native language is the basis of the conscious-comparative teaching method.

The method of teaching the Russian language is not similar to the method of teaching science and humanities; Teaching this subject requires a special approach because no one speaks this language today. First of all, it is necessary to interest students in this discipline, discover new features of this subject day after day, and talk about the important place it occupies in their future profession. In this case, the correct spelling of each part of the face comes first.

The essence of this method is that the comparison of native and foreign languages in a methodological language plan at certain stages of students’ linguistic thinking not only effectively correlates, but also stimulates each other. At the same time, the native language is the basis of the conscious-comparative teaching method.

Among all the subjects taught in higher medical schools, the Russian language is of particular importance. Since in medical educational institutions it is a separate part of the normal and topographic human anatomy, and in this regard, the discipline of the Russian language occupies a special place among the physiological and anatomical sciences.

To achieve the desired result, a teaching methodology for this subject is necessary. Based on my many years of experience in this field, I will share simple skills and practice. One of the urgent tasks of developing students’ language abilities is the development of intensive forms of education. The main point of theoretical and practical research on the intensification of teaching foreign languages and the Russian language is the so-called conscious-comparative method.

Studying the Russian language in a medical educational institution involves studying vocabulary, grammar, and terminological elements.

One of the urgent tasks of developing students’ language abilities is the development of intensive forms of education. Students are introduced to the basics of medical terminology to successfully continue their education in medical specialties. Russian language teachers at our technical school have extensive experience working with Uzbek students, who studied Russian in secondary schools.

The main objective of the Russian language teaching methodology is to develop students’ professional competence in medical terminology, master the basics of the Russian language, allowing them to read, write and translate correctly, as well as explain the essence of the text. In the process of teaching the Russian language, interdisciplinary teaching methods are used to improve students’ perception and memorization of medical terms. This comprehensive method of teaching the Russian language fulfills both general educational and educational tasks.

As you know, general educational objectives include enriching the vocabulary of Greek-Latin origin, expanding horizons in the field of medical terminology, developing logical thinking and, of course, improving the medical culture of students. Of all of the above, from the point of view of perception and understanding of the lexical material of the Russian language, students who speak the language have practically no problems. Students also do not experience great difficulties when studying clinical terminology. The vocabulary of the Russian language contains a huge number of borrowings from Russian to Latin.

Russian medical terminology has been enriched with internationalisms throughout the 20th century. Often their Russian equivalents or tracings act as synonyms. A large number of Greek and Latinisms are borrowed through Western European languages: English,



French or German. Many terms that have received the status of internationalisms initially come in the linguistic design of an intermediary language, and then their secondary formal Latinization occurs. However, this process is ambivalent: often a term that is Latin in form goes through the reverse path of adaptation to its national counterpart. A process of hybridization of terms often occurs when Greek affixes are combined with a Latin base. Greek-Russian hybrid special words are also relevant. Such a derivation is quite natural for medical scientific terminology, since it reflects the historical process of formation of this branch of knowledge as a whole.

Written monuments have brought to our time such original Russian medical terms as: bebeh (kidneys), semi-precious blonde (iris, iris of the eye), howl (food, hunger, appetite), peeper (pupil), gusachina (diaphragm), spirit vein (trachea, windpipe), hiding (chewing food), kutyr (stomach). In medical texts there were also now forgotten terms derived from Greek words: melas (bile, from the Greek melan); all-meat gland (pancreas, from the Greek pan - general, whole and kreas - meat). The latter term is reminiscent of the modern word pancreatitis. The sense organs were called manifold intelligences, the tongue was called a verbal bratsal, the neck was intended to protect the head from falling and spinning.[7]

The general Slavic layer of medical terminology includes the following terms: thorn, side, eyebrow, hair, inflammation (smallpox), head, throat, chest, hernia, lip, tooth, face, forehead, urine, nose, nail, fetus, kidney, cancer, hand, spleen, heart, crown, ear, etc. We can consider Old Russian words common to the Church Slavonic and Old Russian languages, as well as words that belonged to one of them, but have steadily entered the Russian literary language, for example: pregnant, infertility, twins, illness, pain, sick, pus, lower leg, larynx, thirst, stomach, bile, conception, health, vision, intestine, skin, bone, medicine, medicinal, treatment, treat, brain, callus, muscle, nostril, smell, touch, swelling, poisoning, groin, liver, hymen, shoulder, sole, lower back, navel, erysipelas, mouth, cramp, body, jaw, skull, neck, ulcer, etc.”[8]

In the methodology of teaching the language of a specialty in Russian lessons, it is important to know and understand all the features of medical terminology.

Work when teaching professional vocabulary goes through the same stages as any other:

- 1) presentation of new vocabulary;
- 2) automation of lexical skills;
- 3) organization of repetition of vocabulary acquired by students and quality control of what has been learned [9, p. 115].

Teaching medical students the language of their specialty involves enriching them with new scientific, terminological vocabulary, syntactic and grammatical structures, speech norms inherent in the scientific style, applying the acquired skills and abilities when performing various types of tasks, the ability to extract and transmit information from educational texts orally and in writing, as well as the development of acquired knowledge in various types of speech activity.[10]

Studying the structure of motivated words is aimed at ensuring that the student can not only predict the meaning of a word, but also correctly form the necessary motivated word to express a certain concept [6].

Medical terms in Russian often have a common root with Latin terms; they largely coincide in sound and graphic design. Difficulties in the process of teaching students of national groups arise when mastering the word-formation system of the Russian language. Therefore, when studying the word-formation elements of the Russian language, you should pay attention to the most regular prefixes and suffixes of Greek-Latin origin. A key indicator of the development of refined skills and abilities in the process of mastering Russian and Latin medical terminology is the active use of practical exercises and test tasks.

BIBLIOGRAPHY

1. **Grigoryan N.M.** A brief outline of the history and problems of streamlining medical terminology // *Encyclopedic Dictionary of Medical Terms: in 3 volumes* / ed. B.V. Petrovsky. M.: Sov. Encyclopedia, 1984. T. 3. P. 411-425.
2. **Grishin A.D.** *Pedagogical technology in the context of educational technology*. M.: Public education; 2001.
3. **Shevchenko V.Z.** *Modern educational technologies: textbook*. M.: Public education; 1998.
4. **Yuldashev A.E.** *Latin language and basics of medical terminology*. - M.: JSC "Shiko", 2011.
5. *Encyclopedia of drugs*. - M.: RLS, 2011.
6. *The language of medicine. All-Russian interuniversity collection of scientific works. Problem. 2.* - Samara, 2007.
7. **Rakhimova G.O.** *History of the formation and development of Russian medical terminology* / Yu. T. Saburova, Z. M. Rakhimova, G. O. Tangriberganova. — Text: immediate // *Young scientist*. - 2015. - No. 9 (89). - WITH.
8. **Batirova K.Kh.** *Current state of medical terminology*. In: Fedorina, T. A. (ed.) *The language of medicine: All-Russian interuniversity collection of scientific papers*. Samara: SSMU, 2007.
9. **Bogoyavlensky, N. A.** *Domestic anatomy and physiology in the distant past*. Moscow: Medicine Publishing House, 1970.



SJIF Impact Factor (2024): 8.675 | ISI I.F. Value: 1.241 | Journal DOI: 10.36713/epra2016 ISSN: 2455-7838(Online)

EPRA International Journal of Research and Development (IJRD)

Volume: 9 | Issue: 3 | March 2024

- Peer Reviewed Journal

10. *Practical methods of teaching Russian as a foreign language / ed. A.N. Shchukin. M.: Rus. lang., 2003. 304 p.*
11. **Passov E.I.** *Problems of implementing a dialogue of cultures in the process of foreign language education // Kopelev's readings - 2002. Russia and Germany: dialogue of cultures. Lipetsk, 2002. pp. 67-75.*



METHODOLOGY FOR TEACHING RUSSIAN AS A FOREIGN LANGUAGE TO AN UZBEK-SPEAKING AUDIENCE (BASED ON THE MATERIAL OF THE AUDIO-LINGUAL METHOD)

Ruzmetova Nargiza Akhmedovna

Senior Teacher of Russian Language KIMYO International University

ANNOTATION

The article discusses that the audiolingual method in an Uzbek-speaking audience leads to rapid mastery of speaking and listening skills. The audiolinguistics method trains students in the use of grammatical sentence patterns. When this method was developed, it was believed that the way to acquire second language sentence patterns was to form habits or to help students respond correctly to stimuli through shaping and reinforcement, and was especially considered a highly effective method for teaching Russian to non-philology students.

KEYWORDS. *Teaching method, audiolinguistic method (ALM), Russian as a foreign language, methodology.*

МЕТОДИКА ПРЕПОДАВАНИЯ РУССКОГО ЯЗЫКА КАК ИНОСТРАННОГО В УЗБЕКСКОЯЗЫЧНОЙ АУДИТОРИИ (НА МАТЕРИАЛЕ АУДИОЛИНГВАЛЬНОГО МЕТОДА)

Рузметова Наргиза Ахмедовна

Старший преподаватель русского языка
Международного университета КИМЕ

Аннотация

В статье рассматривается что аудиолингвальный метод в узбекоязычной аудитории приводит к быстрому овладению навыками разговора и восприятия на слух. Метод аудиолингвистики тренирует студентов в использовании грамматических образцов предложений. Когда этот метод был разработан, считалось, что путь к усвоению образцов предложений второго языка заключается в формировании привычек или в помощи учащимся правильно реагировать на стимулы с помощью формирования и подкрепления, особенно считается высоко-эффективным методом при обучении русскому среди студентов-нефилологов.

Ключевые слова. *Метод обучения, аудиолингвистический метод (АЛМ), русский язык как иностранный, методология.*

Введение. Преподавание становится процессом помощи в совершенствовании навыков, а не контроля и тестирования. В то время как преподавание – это процесс стимулирования студентов к производству или практике материала и его выражению, на самом деле, материал, передаваемый от учителя к студентам, должен соответствовать учебному плану конкретного высшего образования, чтобы студенты могли его усвоить и быть способными общаться на целевом языке. Большинство студентов из узбекоязычной аудитории всё ещё испытывают трудности в использовании русского языка для общения. Это обусловлено множеством факторов, включая ограниченный словарный запас студентов и знание грамматики, а также методы, используемые



учителем при обучении русскому языку как иностранный. Другие факторы, которые могут влиять на уровень умения студентов в общении, – это недостаточное использование неродного языка в их повседневной жизни из-за того, что большинство их друзей говорят на родном языке (узбекском), и не все члены семьи могут быть образцом в овладении целевым языком, поэтому студенты не могут говорить по-русски спонтанно, бегло и всесторонне, так как они боятся ошибок и риска. Одним из методов, которым обычно пользуется учитель, является метод аудиовизуального обучения. Применение этого метода на уроках русского языка представляет собой вызов. [1]

Литературный обзор

Согласно академическим исследованиям, лингвисты продемонстрировали, что не существует единого наилучшего метода для всех во всех контекстах и что ни один метод обучения не является бесспорно превосходящим остальные. Также не всегда возможно или целесообразно применять одну и ту же методологию ко всем учащимся, у которых разные цели, окружение и потребности в обучении. Опытный преподаватель языка всегда придерживается принципа элективности, выбирая наиболее подходящие техники и применяя наиболее соответствующую методологию для конкретных целей, стиля обучения и контекста ученика. [2]

Наилучший метод обучения русскому языку

Методы преподавания русского языка развивались быстро, особенно в последние 40 лет. Как изучающему язык, менеджеру по обучению или учителю важно понимать различные методы и техники, чтобы иметь возможность ориентироваться на рынке, принимать обоснованные решения и повышать удовлетворение от изучения языка. Каждый метод основан на определенном видении понимания языка или процесса обучения, часто используя конкретные техники и материалы в установленной последовательности. Наиболее распространенные методы имеют ссылку на отдельную страницу с более подробным описанием и объяснением их работы, включая наиболее распространенный в настоящее время метод – метод обучения коммуникативному языку.

Современные методы преподавания

Как упомянуто выше, современный языковой преподаватель не придерживается одного строгого метода, а применяет принцип элективности – приспосабливает метод к ученику, а не наоборот. Это означает выбор техник и активностей, соответствующих конкретной задаче, контексту и студенту, с акцентом на мотивацию и помощь учащимся становиться самостоятельными и вдохновленными для дальнейшего обучения. Объяснение принципа элективности также включает полезное десяти-пунктовое руководство для учителей и студентов по лучшим методам преподавания и обучения. [3]

Методология

Метод аудиолингвистики

В 1950-х и 1960-х годах аудиолингвальный метод занимал важное место в образовании, особенно в обучении иностранным языкам. Этот метод акцентировал внимание на развитии аудиолингвальных навыков, в ущерб чтению и письму, предлагая обширные практические упражнения. Он включал систему тренировок, где студенты, используя слух и оральные навыки, изучали язык через повторение и имитацию диалогов повседневных ситуаций.

Аудиолингвальный метод, представленный Чарльзом Фрайсом, был ориентирован на слухо-оральный подход, с акцентом на интенсивных устных упражнениях по базовым моделям. Этот метод отдавал большое значение правильному произношению и интонации, что делало его схожим с прямым методом. Оба метода были предложены в противоположность грамматическому переводу, отказываясь от использования родного языка и



подчеркивая развитие разговорных навыков перед навыками чтения и письма. В то время как аудиолингвальный метод акцентировал грамматические упражнения, прямой метод фокусировался на расширении словарного запаса. [4]

Метод аудиолингвистики все еще используется сегодня, хотя обычно в рамках отдельных уроков, а не как основа курса. Такие уроки могут быть популярными, так как они относительно просты с точки зрения преподавателя, и учащийся всегда знает, чего ожидать. Некоторые из самых известных сторонников этого метода были Джорджио Шенкер, который продвигал направленное самостоятельное обучение методом Шенкера в Италии, и Робин Каллан, создавший метод Каллан.

Основанный на теории поведенческого психолога Скиннера, предполагал, что человека можно обучить с использованием системы подкрепления. Правильное поведение получает положительную обратную связь, в то время как ошибки получают отрицательную обратную связь. Этот подход к обучению аналогичен прямому методу, поскольку урок проходит исключительно на целевом языке. Упор делается на освоение структур общения в повседневном диалоге. [5]

Метод аудиолингвистики, подобно прямому методу, также является устным методом. Однако он существенно отличается тем, что вместо акцента на усвоение словарного запаса через его использование в различных ситуациях, метод аудиолингвистики обучает студентов использованию грамматических структур предложений (Ларсен-Фримен, 2000). Отмечается, что считалось, что способность усвоения структур предложений целевого языка достигается через условные реакции, помогая учащимся правильно реагировать на стимулы с помощью формирования и укрепления.

Таким образом, метод аудиолингвистики относится к методу, который сжимается в цепные упражнения для овладения целевым языком путем запоминания и повторения, при этом избегая ошибок в разговоре. В аудиолингвистических занятиях представлены не только упражнения по коротким образцам, но также различные диалоги, которые студенты должны слушать, повторять и запоминать. Диалоги предоставляют студентам структуру и идею о том, как использовать определенные типы структур в определенных ситуациях. Обычно диалоги иллюстрируют социокультурные ситуации целевого языка, такие как приветствия, обмен мнениями, предпочтения или антипатии, обсуждение стандартных тем (погода, хобби и так далее), что помогает студентам запомнить, какое высказывание подходит для каждой ситуации. Путем повторения и запоминания целых диалогов или их конкретных частей учащиеся должны акцентировать правильное произношение, интонацию, ударение и ритм использования. Браун утверждал, что метод аудиолингвистики твердо утвержден в лингвистической и психологической теории. Он добавил, что метод поддерживает модели условного реагирования и формирования привычек в обучении, которые идеально сочетаются с упражнениями по мимикрии и практикой образцов методологии аудиолингвистики. [6]

Результаты

Метод аудиолингвистики – это подход, который акцентирует внимание на словарном запасе и обучает грамматическим структурам предложений на основе контекста и без ошибок. Считалось, что многократная практика диалогов разовьет устное владение языком или основано на способности к говорению. Ларсен-Фриман предоставляет расширенные описания нескольких распространенных или типичных методов, тесно связанных с методом аудиолингвистики.

- *Меморизация диалогов*: Студенты запоминают начальный диалог, используя мимикрию и ролевые игры.



- *Обратное построение (расширенное упражнение)*: Учитель разбивает фразу на несколько частей; студенты повторяют каждую часть, начиная с конца предложения и "расширяя" его назад через предложение, добавляя каждую часть последовательно.

Упражнение повторения: Студенты повторяют модель учителя как можно быстрее и точнее.

Цепное упражнение: Студенты задают и отвечают друг другу поочередно в кругу вокруг класса.

Упражнение по замене в одной ячейке: Учитель проговаривает фразу из диалога, а затем использует слово или фразу в качестве "подсказки", которую студенты, повторяя фразу, должны заменить в правильном месте.

Упражнение трансформации: Преподаватель предоставляет предложение, которое должно быть преобразовано в что-то другое, например, вопрос, который должен быть преобразован в утверждение, активное предложение, которое должно быть преобразовано в отрицание и так далее.

Использование минимальных пар анализа: Педагог выбирает пару слов, звучащих идентично, за исключением одного звука, который обычно вызывает трудности для учащихся – студентам предстоит произнести и различить два слова.

Завершение диалога: Выбранные слова стираются из строки в диалоге, студенты должны их найти и вставить.

Грамматические игры: Различные игры, разработанные для практики грамматического аспекта в контексте с использованием множества повторений. [7]

Метод аудиолингвистики можно свести к следующему перечню:

- новый материал представлен в форме диалога
- существует зависимость от мимики, запоминания фиксированных фраз и переучивания.
- структуры упорядочиваются с использованием контрастного анализа и преподаются поочередно.
- структурные образцы преподаются с использованием повторяющихся упражнений.
- мало или вовсе нет грамматических объяснений. Грамматика преподается через индуктивную аналогию, а не через дедуктивное объяснение.
- широко используются магнитофоны, языковые лаборатории и визуальные пособия.
- большое внимание уделяется произношению.
- учителю практически не разрешено использование родного языка.
- большое усилие направлено на создание учащихся бессодержательных высказываний. [8]

В методе аудиолингвистики атмосфера в классе является основным действующим лицом. Создание расслабленной классной, не угрожающей обучающей среды является важным условием для достижения успешного обучения. Цель заключается в том, чтобы студенты усвоили содержание уроков, не испытывая стресса или скуки. Классы оборудованы удобными сидениями и превращены в комфортное место для обучения. Исходя из вышеизложенного объяснения, ясно, что техники преподавания говорения с использованием метода аудиолингвистики эффективны. Существует три наиболее распространенных метода, используемых учителем для обучения разговорному языку через метод аудиолингвистики, такие как меморизация диалогов, повторение и завершение диалога. Эффективность метода проявляется в улучшении навыков разговорной речи у студентов, индекс производительности может быть проверен, важна аутентичность диалога или текста. Однако достижение требуется как со стороны учителя, так и со стороны студентов. [9]

Обсуждение

В цепных тренировках и когда студенты принимают различные роли в диалогах, существует взаимодействие между студентами, но это взаимодействие направлено учителем. Большая часть взаимодействия происходит между преподавателем и студентами, но инициируется учителем. Учитель подобен дирижеру оркестра,



направляющему и контролирующему языковое поведение своих студентов. Он несет ответственность за предоставление своим студентам хорошего образца для имитации. Студенты являются имитаторами модели учителя или записей, которые он предоставляет от модельных дикторов. Они следуют указаниям учителя и реагируют так точно и быстро, как это возможно. [10]

Закключение

Основной целью включения диалогов и упражнений в аудиолингвальный метод среди узбекоязычных студентов является развитие коммуникативной компетентности учащихся. Практика диалогов и упражнений способствует формированию у студентов навыков произношения, необходимых для успешного обучения русскому языку. Регулярное повторение диалогов и упражнений в устной форме обучения помогает учащимся реагировать точно и оперативно. Эта теория обладает прочной теоретической базой, что является ключевым фактором ее широкого признания. Аудиолингвальный метод стал первым подходом к изучению языка, акцентирующим внимание на развитии коммуникативных навыков у учащихся. Несмотря на ограниченный успех этой теории в практике из-за научных ограничений, ее влияние сохраняется и применяется в методологии преподавания языков в определенном контексте.

Литература

1. **Лейк, В.** (2013). Аудиолингвальный метод обучения английскому языку [Электронная версия]. Получено 2 ноября 2014 г. с <http://blog.about-esl.com/audio-lingual-method-teaching-english/>.
2. **Шриартни.** (2013). Аудио-лингвальный метод [Электронная версия]. Получено 2 ноября 2014 г. с <http://sriartini46.wordpress.com/2013/06/29/audio-lingual-method/>.
3. **Моход. Али, Лида.** 1989. Краткий обзор некоторых методов ESL. Журнал для учителей английского языка, том. XVIII, <http://www.melta.org.my/ET/1989/main2.html>
4. **Мора, Джилл Кернер.** 2008. Методы преподавания второго языка; принципы и процедуры. <http://edweb.sdsu.edu/people/jmora/almmethods.htm>
5. **Брукс. Н** 1964. Язык и изучение языков: теория и практика, 2-е изд. Нью-Йорк: Харкорт Брейс.
6. **Хомский С.** 1966. Лингвистическая теория. Перепечатано в J. P. B. Allen и P. Van Buren (ред.), Хомский: Избранные чтения, стр. 152-9. Лондон: Оксфорд Издательство университета.
7. **Фрис, К. К., 2-й А. К. Фрис.** 1961 Основы преподавания английского языка в Токио: Кенкюша.
8. **Ричардс, Дж.К. и Т.С. Роджерс** (1987). Аудиолингвистический метод. Подходы и методы в преподавании языков (стр. 44-63). Рейно Юнидо: Издательство Кембриджского университета.
9. **Риверс У. М.** 1964. Психолог и преподаватель иностранного языка. Чикаго. Издательство Чикагского университета.
10. **Фонсека-Гребер, Б.** 2010. Социальные препятствия на пути к межкультурной компетентности в классах американского языка. В: Труды CIRCLE Intercultural Competence. Конференция. CERCLL, Тусон, Аризона, стр. 102-123.



CURRENT ISSUES OF THE THEORETICAL BASIS FOR THE RESEARCH OF LITERARY LANGUAGE

Ismailova Saodat Rikhsibaevna, Bedilova Aziza Melsovnna.

*Senior Russian Language Teachers Center for Teaching Uzbek and Foreign Languages
Tashkent State University of Economics. Uzbekistan.*

ABSTRACT

In the article “Linguistic poetics” - “linguistic poetics” is considered as an area of study of the manifestation of the aesthetic function of the language of artistic linguistics, and its expression is also reflected on the basis of theoretical knowledge in linguistics.

KEYWORDS: *Language, art, style, poetic language, stylistics, linguistics, linguistic poetics.*

АКТУАЛЬНЫЕ ВОПРОСЫ ТЕОРЕТИЧЕСКОЙ ОСНОВЫ ИССЛЕДОВАНИЯ ХУДОЖЕСТВЕННОГО ЯЗЫКА

**Исмаилова Саодат Рихсибаевна,
Бедилова Азиза Мэлсовна.**

*Старшие преподаватели русского языка
центра обучения узбекскому и иностранным языкам
Ташкентского государственного
экономического университета. Узбекистан.*

Аннотация

В статье «Лингвистическая поэтика» - “лингвопоэтика” рассматривается в качестве области изучения проявления эстетической функции языка художественной лингвистики, а также отражается его выражение на основе теоретических знаний в лингвистике.

Ключевые слова: *Язык, искусство, стиль, поэтический язык, стилистика, лингвистика, лингвопоэтика.*

Понятие художественного мастерства — это владение языком и художественным стилем. Изучение языка художественного произведения связано с изучением художественного мастерства писателя. Потому что искусство писателя выбирать и использовать слова, его уровень владения изобразительными средствами является основой изучения языка художественного произведения.

Внимание к изучению языка художественных произведений возросло с 30-х годов 20 века.

В 1926 по инициативе В. Матезиуса и Р. О. Якобсона был образован Пражский лингвистический кружок, одним из главных вопросов кружка стал функциональный подход к языку. Исследования Чехолима Б. Гавренека, В. Матезиуса, Я. Мукарёвского посвящены изучению литературного языка в искусстве, художественного языка и поэтического языка, языковых и стилистических вопросов.[1]

В мировом и российском языкознании И.В. Арнольд, И.Р. Гальперин, Ш. Балли, В.В. Виноградов, Г.О. Винокур, А.И. Ефимова, А.В. Степанова, Н.П. Потоцкой, Л.В. Щербы и других ученых, посвященных изучению



языка художественных произведений, в масштабных исследованиях выявлены интересные представления о теоретических основах изучения языка художественных произведений и его специфических особенностях. ученые Л. Долейель и К. Гаузенблас считают, что «ядром литературной стилистики является лингвистическая стилистика, изучающая языковой стиль литературной литературы».[2]

Наука изучения языка художественного произведения в русском языкознании напрямую связано с именем академика В. Виноградова, который заявил, что «Изучение языка литературной литературы есть лингвистика и близок к литературоведению, но отделен от них обоих должно быть предметом специальной филологической науки».

Также «анализ языка художественного произведения с идеей произведения лингвистические средства выражения родственного эмоционального содержания».

В. Арнольд признает необходимость изучения языка художественной литературы как отдельной дисциплины, такой как литературная стилистика и лингвистическая стилистика.[5]

Н.П.Потоцкая считает, что «поскольку эстетическая функция языка художественной литературы и функция выразительно-стилистических средств языка принципиально неразличимы, нецелесообразно разделять науку, изучающую язык художественной литературы».[7]

А. В. Степанов пришел к выводу, что «характер проблем стилистики литературной литературы требует совместных действий лингвистов и литературоведов или объединения в одном анализе навыков как языкознания, так и литературоведения, а также искусствоведения»[2].

В. А. Аврорин подчеркивает необходимость различать коммуникативную (средство, средство общения), экспрессивную (выражение мыслей), конструктивную (формирование мыслей), накопительную (сбор и хранение социального опыта и знаний) функции языка.[6]

В узбекском языкознании появилось много интересных идей.

И. Кочкортеев писал: «При изучении языка художественной литературы как чисто литературной проблемы возникает опасность отделения содержания от формы, образа от формы, а при изучении языка художественной литературы как чисто лингвистической проблемы». Существует опасность отделения формы от содержания, языка от образа».[8]

Х.Дониеров и С.Мирзаев подчеркивают необходимость изучения языка художественной литературы в двух аспектах: лингвистическом аспекте и стилистическом аспекте: «Научные работы, написанные в лингвистическом аспекте, обычно ставят перед собой задачу изучения только языковых категорий и языкового роста- изменения».[9]

К вопросу об эстетической функции языка относятся теория литературы, история литературы, поэтика и языковая стилистика, история языка, лексикология, семасиология, этимология и грамматика. Методологическим аспектом изучения языка художественного произведения является исследование эстетической задачи. Если объектом изучения эстетической функции языка является также текст художественного произведения, то изучать эти особенности только с точки зрения языкознания или только с точки зрения литературоведения будет некорректно. Потому что в работах, анализирующих язык художественного произведения, используются такие термины, как поэтическая функция языка, художественная функция языка, эстетическая функция языка, экспрессивная функция языка. Эстетическая функция языка включает в себя коммуникативную функцию языка и находит отражение в художественной речи.

«Лингвистическая поэтика» - «лингвопоэтика», область, изучающая язык художественного произведения как проявление эстетической функции языка, стала более устойчивой в филологической науке, и создано множество исследований, посвященных выяснению места «лингвистической поэтики» как отдельной самостоятельной науки в системе филологических наук. В этом смысле изучение языка художественного произведения в «стилистическом аспекте» уместно назвать и трактовать как «лингвопоэтическое изучение языка художественного произведения».[10]



В лингвистике опубликовано множество научных работ по изучению языка художественных произведений. Исследования, проведенные в этом направлении, особенно в европейском и, в частности, в русском языкознании, весьма значительны. С удовлетворением отмечая, что в области тюркологии и узбекского языкознания проделаны определенные научные работы, необходимо признать, что расширение масштабов исследований в этом направлении является одной из актуальных проблем современности.

Изучение языка художественного произведения означает выявление уникальных художественных инструментов художника, его художественного мастерства, его неповторимого стиля. В то же время изучение языка художественного произведения служит и для оценки отношения того или иного творца к языку в целом, в какой степени он знает художественные возможности и богатство языка.

Без анализа художественного мастерства, языка и стиля художника трудно определить эстетическую ценность, идейное содержание, средства художественного изображения и жанровые характеристики художественного произведения. Ведь средства художественного языка и творческий, индивидуальный стиль писателей в каждой литературе совершенно различны. Также это позволяет определить творческое своеобразие автора, в чем выражаются лингвистические описания.

На наш взгляд, целесообразно методично изучать язык художественного произведения. Ведь инструмент художественного языка не только выражает основную идею и концепцию произведения, но и обеспечивает образность художественного произведения. Также целесообразно изучение языка и стиля художественного произведения в лингвопоэтическом направлении, т.е. как с точки зрения языкознания, так и с точки зрения литературоведения.

Изучение языка художественного произведения также во все периоды важные и актуальные лингвистика и литературоведение проблем. В то же время во второй половине XIX в.

В XX веке внимание к пятому веку еще больше возрастет. В мировой лингвистике, особенно в европейском и русском языкознании проведены исследовательские работы.

В лингвистике в последнее время проведено много исследований. независимо от бытия, он серьезно относится к изучению искусства

Это соответствует цели укрепления.

Воспользованные литературы

1. Пражский лингвистический кружок. -М.: Прогресс.1967.
2. Степанов А.В. Основные понятия стилистики. -М.: МГУ,1966. -с.21.
3. Виноградов.В. О языке художественной литературы. М. Гослитиздат, 1957. -с 4.
4. Виноградов.В.Наука о языке художественной литературы и её задачи. -М.: АН СССР, 1958.-с.5.
5. Арнольд И. В.Стилистика современного английского языка.-Л. Просвещение, 1981.
6. Аврорин В.А. Проблемы изучения функциональной стороны языка.-Л.,1975,с-44
7. Н.П.Потоцкая.Проблема изучения теоритическую основу лингвистики. М.1989.
8. Кўчқортюев И. Бадий нутқ стилистикаси. -Т.: ТошДУ,1975. 8-б.
9. Дониёров Х., Мирзаев С. Сўз санъати. -Т.: Ўздавнашр, 1962. 173-б.
10. Йўлдошев М. Бадий матн ва унинг лингвопоэтик тахлили асослари.-Т.: "Фан" 2006.5-б.



YOUTH OF NEW UZBEKISTAN IS NEW POWER AND NEW OPPORTUNITIES

Usmanova Umida Samatovna

Senior Lecturer of the Department "Humanities and Law" Tashkent State Agrarian University. Uzbekistan.

ANNOTATION

This article discusses the youth policy pursued in Uzbekistan by the government of the republic, the successes of this policy and the role of youth in the republic.

KEY WORDS: *youth, politics, government, economics and business, education, social packages, social development.*

МОЛОДЕЖЬ НОВОГО УЗБЕКИСТАНА – ЭТО НОВАЯ СИЛА И НОВЫЕ ВОЗМОЖНОСТИ

Усманова Умида Саматовна

*Старший преподаватель кафедры
«Гуманитарные науки и право» Ташкентского
Государственного аграрного университета.
Узбекистан.*

Аннотация

В данной статье идет речь о молодёжной политике, проводимая в Узбекистане правительством республики, об успехах этой политики и роль молодёжи в республике.

Ключевые слова: *молодёжь, политика, правительство, экономика и бизнес, образование, социальные пакеты, развитие общества.*

In the last five years, in the conditions of the rapid changes implemented in our country, a state policy with a completely new meaning and essence was formed, carried out, and most importantly, these activities quickly showed their results, to support the youth, to form them as a new force, and to turn them into the main source of reforms.

Under the main attention and care of President Shavkat Mirziyoyev, today's youth of our country have been formed as a special powerful force, and are emerging as real creators, sources of inspiration, important participants and builders of the economic, social, cultural, political and spiritual life of Uzbekistan. We can see that at the root of this rational policy, which is aimed at providing the youth with their dreams, honor and dignity, a decent future, and all the opportunities created for them to be the owners of our tomorrow, is the trust factor of the youth, that the head of the country strongly believes in them and relies on them.

Keeping in mind that five years is a historically short period, equal to one minute, we must specially acknowledge that the founder of today's achievements, rapid and effective reforms, the enthusiastic reformer Shavkat Mirziyoyev, who is recognized in the international arena, has been in tune with the youth since the first days of his administration in the country. , it is no secret to any of us that he strongly believed in them, that he widely involved young people in the fields of politics, art, economy, production, etc., from state and community management.

In particular, the President, who was able to see the youth as the key link in giving new meaning and momentum to major reforms at the state level, recommended a large number of young people to important state positions, appointed them to important jobs - proved that he conducted a policy with a completely new conceptual basis in this regard. . Also, in Uzbekistan, where more than 70 percent of the country's population is made up of young people, the head of the country, realizing the need to conduct a specific social policy for this group, decided to completely renew and effectively reform this sector.



The activity of the "Kamolot" youth social movement was assessed as unsatisfactory, and the Youth Union was established in its place, and in order to support the activities of this organization, on July 5, 2017, the President of the Republic of Uzbekistan "On improving the effectiveness of the state policy on youth and supporting the activities of the Youth Union of Uzbekistan" Decree No. PF-5106 of the President of the Republic, Decision No. PQ-3138 "On comprehensive measures to improve the activities of the Youth Union of Uzbekistan" was announced on July 18, 2017. Adoption of this decision meant the beginning of effective changes and radical reforms in the country's youth policy.

Determining the real problems of young people and finding their solution was raised to the level of state policy among strategic tasks that cannot be postponed. Among the most important things are the adoption of the Law of the Republic of Uzbekistan "On State Policy Regarding Youth" on September 14, 2016, and the Decree of the President of the Republic of Uzbekistan on June 30, 2020 "On Measures to Fundamentally Reform and Bring State Policy Regarding Youth to a New Level in the Republic of Uzbekistan" The adoption of the decree and the tasks arising from this law, as well as June 30 - "Youth Day" were announced in Uzbekistan. In order to encourage our dedicated young people who are achieving high results and achievements in various fields, we should note that the "Brave Boy" state award and the "Builder of the Future" medals were established. It is known that Uzbekistan is literally a country of youth. Based on the fact that the majority of the country's population is made up of young people, the President of Uzbekistan signed the Decree on the State Program "Youth - our future" on June 27, 2018. With this Decree, which is an important document aimed at increasing the efficiency of work in this regard, the "Youth is our future" fund was first established. Preferential loans with a 7 percent interest rate and opportunities to lease property were provided. According to the decree, the tasks of comprehensive development of entrepreneurial skills and initiative among young people were defined.

In turn, fundamental reforms are being carried out in the educational system, which is the basis of all changes in Uzbekistan. At the same time, the amount of expenses for education, including the social sphere, is more than half of the total cost of the state budget. Naturally, not every country can bear such huge expenses, but no matter how heavy it is, it is necessary for this

Five important initiatives are being implemented, including the tasks of widely involving young people in culture, art, physical education and sports, increasing their literacy in information technologies, promoting reading among young people, and ensuring employment of women.

At the same time, a number of problems remain in terms of forming modern entrepreneurial skills in young people and ensuring their employment through the creation of new jobs, effective prevention of delinquency and crime among minors, prevention of family disputes, formation of strong patriotism in the young generation and a strong civic stance. .

In order to bring the state policy regarding youth to a new level in Uzbekistan, to develop effective solutions to problems in the field of youth, to effectively organize and coordinate the activities of competent bodies, as well as to implement the tasks set at the meeting of the President of the Republic of Uzbekistan with the youth of the country on December 27, 2019:

Especially in the past short period of time, ensuring the employment of young people, caring for the meaningful organization of their free time, providing employment to unemployed youth has become one of the main and strategic directions of the country's economic and social policy. In particular, the designation of 2021 as the "Year of Youth Support and Public Health Promotion" has determined the important tasks ahead of us in terms of the effectiveness of work in the field of youth policy and the improvement of the efficiency of working with young people.

First of all, measures were taken to support them at the level of state policy in order for them to study and get an education, to take an important place in the social life of the country, to have their proper place in life, and to master the secrets of their profession. In accordance with the decision of the President of Uzbekistan dated October 13, 2020 "On additional measures to improve the system of attracting the population to entrepreneurship and development of entrepreneurship", unemployed youth who do not have a diploma for any activity, but have practical skills in production or a certain profession, a system of providing training and necessary certificates was introduced in the qualification assessment centers.

Most importantly, such reforms have begun to bear fruit. Today, one of the main ways of ensuring youth employment is their specialization in certain professions. So far, unemployed population groups, especially young people, and job vacancies have been considered in harmony.

For example, there was a question of including unemployed youth in all regions of our country, as well as those in need of social protection, in the "Youth register" organized by the personal initiative of the head of the country. It should be noted that the "Youth register" is a database for identifying, eliminating and monitoring the problems of unemployed youth who have a need and desire for social, economic, legal, psychological support, education and professional learning, and this is a part of Uzbekistan's social



policy. has become the most important factor and today provides solutions to problems in this regard. It is determined that young people who have reached the age of 18 and are under the age of 30 will be included in this register.

Meetings of the head of the country with young people, studying and analyzing their problems, and discussing the tasks of further improving the state policy to ensure a bright future for young people are also becoming an important process. On January 27 of this year, under the chairmanship of the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, a video selector meeting was held to discuss measures to ensure youth employment and meaningful organization of their free time. important tasks were given in connection with insurance payment assistance.

Also, on February 26, 2023, an extended video selector meeting was held under the leadership of the President of the Republic of Uzbekistan, dedicated to the issues of solving women's problems and increasing the responsibility of state bodies in their social support. identifying problems in their conditions, improving their way of life and increasing their social activity by working individually, as well as providing comprehensive and targeted solutions to the identified problems, ensuring the execution of the tasks assigned to determine the procedure for the accountability and performance of officials, as well as providing material and social support to young people In order to support the policy, on April 28 of this year, we should also note the adoption of the decision of the Cabinet of Ministers of the Republic of Uzbekistan "On additional measures to support families, women and youth in need of financial assistance and social support".

Another important issue that should be noted is that fundamental reforms are being carried out in the education system, which is the basis of all changes in the country, and billions of funds are being spent for this purpose from the state budget. At the same time, the amount of expenses for education, including the social sphere, is more than half of the total cost of the state budget, which requires large expenses.

The biggest investment made by the leader of Uzbekistan for the future is the investment made in knowledge and education, and it can be assessed as a rational and well-thought-out policy that he sees as a factor that ensures the country's prospects for the future and determines the country's destiny.

For this purpose, the ministries, organizations and agencies, inspectorates, centers established in the country show that the state is conducting a very important and effective state policy in this regard. It should be noted that new higher educational institutions, scientific and creative centers are being established in all regions of our country, and they are serving the young generation to become worthy owners of our future. As our President always emphasizes, youth are the main support and support of our nation. Young people are becoming a decisive force in the effective implementation of large-scale reforms in our country. Today, teaching young people to think in a new way, boldly present new ideas and implement them, to solve problems based on creative and non-standard approaches remains one of our main tasks.

The number of universities in our country has increased to more than 200 with a number of initiatives of the President directly for the purpose of training personnel with deep knowledge, thinking, and modern scientific achievements. About 30 of them are branches of prestigious foreign higher education institutions. In 2016, this indicator on the scale of the republic was only half of the number indicated above. It is not a secret to any of us that this has caused young people to go to other countries of the world in search of knowledge. We should never forget that our achievements today are an important step towards increasing the intellectual potential of our youth, acquiring modern knowledge and skills. At the same time, the admission quota of higher education has been increased three times over the last five years. It should be noted that the President of the Republic of Azerbaijan has specially acknowledged in his speeches that the opportunity to become a student has been created for more than one million young people this year, which has reached 55% of the total coverage.

In short, the state policy on youth in Uzbekistan is being pursued consistently, based on step-by-step, complex measures, with specific goals in mind, and it is proving its effectiveness and efficiency.

In general, over the past four years, the youth policy of the Republic of Uzbekistan has gained new horizons and has the support of the younger generation. All of the above reforms serve as a great lever and motivation for them to achieve certain goals in life.

LITERATURES

1. <https://lex.uz/docs/3026250/ZRU-406-son, 09/14/2016>.
2. <https://www.gazeta.uz/ru/2017/06/30/kamolot/> "Kamolot" was transformed into the Youth Union of Uzbekistan, 07/05/2017.
3. <https://www.uzdaily.uz/ru/post/38154/Uzbekistan-has-adopted-the-state-program-Yoshlar-kelajagimiz>.
4. <https://www.univ-silkroad.uz/ru/news/novosti-universiteta/item/408-the-five-initiatives/Five-important-initiatives-in-action>.
5. <https://lex.uz/ru/docs/4880123/PP-4768-son 06/30/2023>.



EFFECTIVENESS OF USING COMMUNICATION MEANS IN RUSSIAN LANGUAGE LESSONS IN A PRIVATE UNIVERSITY

Sarimsakova Gulchekhra Muratovna

*Senior Teacher of Russian Language Departments of Pedagogy and Psychology
Tashkent Social Innovation University, Uzbekistan.*

ANNOTATION

This article discusses issues related to the use of cell phones in the Russian language lesson for the development of oral and written speech among students at a private university.

KEY WORDS: *telephone, vocabulary, exercise, pronunciation, grammar, tasks.*

ЭФФЕКТИВНОСТИ ИСПОЛЬЗОВАНИЕ СРЕДСТВА КОММУНИКАЦИИ НА УРОКАХ РУССКОГО ЯЗЫКА В ЧАСТНОМ ВУЗЕ

Саримсакова Гулчехра Муратовна-

Старший преподаватель Русского языка

Кафедры Педагогики и психологии

*Ташкентского социального инновационного
университета. Узбекистан.*

Аннотация

В данной статье рассматриваются вопросы, связанные с использованием сотовых телефонов на уроке русского языка для развития устной и письменной речи студентов частного вуза.

Ключевые слова: *телефон, словарный запас, упражнение, произношение, грамматика, задания.*

Изучение иностранных языков является государственной политикой Узбекистана. С этой целью была разработана специальная образовательная программа. В развитии изучения данного процесса значительную роль играют и лингвистики.

Целенаправленное использование студентами мобильных телефонов на уроках русского языка в частном вузе положительно влияет на эффективность урока. Я показал это в своих собственных экспериментах.

Это простое занятие, которое вы можете использовать в качестве разминки. Студенты достают свои мобильные телефоны и в группах по три человека обсуждают любимые функции своих телефонов. Это может быть все, что они используют регулярно или что им действительно нравится.

Они говорят о том, почему им нравится эта функция и для чего они ее используют. Студенты, у которых нет смартфона, могут описать функцию, которую они хотели бы иметь в своём телефоне. Воспользуйтесь этой возможностью, чтобы студенты попрактиковались в использовании описательного языка, подкреплении своих мнений или сравнении различных телефонов и их функций. Альтернативно, предложите студентам рассказать о наименее полезной функции или приложении на своем телефоне. Они могли бы обсудить, почему им это не нравится, почему они им не пользуются и как они могли бы его изменить, если бы смогли разработать телефон.

Ниже приведен пример языка, который студенты могут использовать в этом упражнении.



- Мой телефон _____. (размер)
- Его _____. (цвет)
- Мой экран _____. (яркость и размер)
- Я могу слушать _____. (аудио функции)
- Мне нравится/не нравится _____ телефон. (размер, цвет, характеристики)
- Мой телефон _____. (бренд)
- Я могу/не могу (фотографировать) на свой телефон. (возможности)
- В вашем телефоне есть (камера), а в моем нет. (сравнения)
- На моем следующем телефоне я бы хотел _____. (желания)
- Моя любимая/нелюбимая функция моего телефона — _____, потому что _____. (мнение о функции с использованием «потому что»)

Во многих случаях учителям не хватает материала для практики аудирования. У мобильных телефонов есть потенциал изменить это. У вас может не быть доступа к записям «носителей языка», но вы можете создавать свои собственные короткие клипы для прослушивания для студентов. Вот несколько способов максимально эффективно использовать функцию записи голоса на мобильных телефонах:

Запишите на телефон заголовок газеты или короткое стихотворение. Отправьте это студентам в текстовом виде.

- или через Bluetooth, затем предложите им прослушать его и попытаться воссоздать, записав на свой телефон. Альтернативно, подключите динамик в аудиторию, проиграйте запись несколько раз и предложите студентам попытаться имитировать ее и записать на свои телефоны. Создание видеословарей. Студенты используют свои телефоны для записи списка словарных слов.

- Показывать изображение каждого предмета и одновременно произносить название предмета. Цель состоит в том, чтобы помочь сохранить слово для будущего использования. Ряд проектов поощряют чтение на мобильных телефонах. Уэст и Чу (2014) описывают чтение на мобильных устройствах в развивающихся странах и предполагают, что сотовые телефоны можно использовать для повышения грамотности. В регионах, где не хватает ресурсов, люди обычно владеют простыми мобильными телефонами с ограниченным доступом к данным и склонны использовать функции разговора и текстовых сообщений чаще, чем приложения. Ниже приведены описания двух действий, которые позволяют использовать основные функции телефона. Словарная деятельность. Отправляйте SMS-сообщения учащимся с пятью словарными запасами слов в неделю или в день и предложите им найти определения и/или попрактиковаться в использовании слов в контексте.

Диктантовое занятие. Следующие предложения требуют, чтобы мобильный телефон имел функцию записи.

- Отправьте учащимся короткий записанный отрывок (максимум 60 секунд), предложите им прослушать его и записать то, что они слышат. Для устной практики попросите учащихся записать отрывок (максимум 60 секунд) и позволить другим его послушать.

- к нему и запишите его. Позже они могут сравнить написанное с оригинальным отрывком, а учитель при необходимости может сосредоточиться на произношении.

Это занятие по цифровому рассказыванию историй было адаптировано на основе инструментов цифрового повествования, которые учат студентов создавать видеоролики с помощью камер и компьютерного программного обеспечения.

Цифровое повествование — полезный инструмент для изучения русского языка, и я хотел сделать что-то подобное, не полагаясь на использование компьютера для редактирования, необходимого для цифрового рассказа. Использование мобильного телефона позволило моим студентам сразу записывать и просматривать свою работу, а также выполнять редактирование в режиме реального времени. Такое редактирование в реальном времени способствует естественному повторению и пересмотру, что включает в себя запись студентами, а затем перезапись конкретных структур или фраз и словарного запаса целевого языка,



необходимых им для выполнения задания. Преподаватель может дать студентам вопросы по произношению или грамматике, на которых они смогут сосредоточиться при прослушивании своих записей. Это задание можно выполнять как начинающим, так и продвинутым студентам. Ниже я описываю шестиэтапный процесс создания истории о мобильном телефоне за 90 минут.

Пусть история будет короткой и целенаправленной. Сообщите студентам, что они собираются создать историю с определенной целью и аудиторией. Рассказ должен длиться от полутора до двух минут.

В приведенном ниже списке приведены предложения по темам статей и потенциальной аудитории. Помните, что определение цели и аудитории делает создание историй более содержательным.

- Представление посетителя вашей группы или дома (группам низкого уровня) Рассказ истории о важном или забавном событии в вашей жизни (другу)
- Объяснение культурной традиции (туристу)
- Иллюстрирую, как приготовить семейный рецепт (от известного шеф-повара).
- Создание и реклама вашего города (для привлечения туристов)
- Объяснение того, как помочь однокурснику, над которым издеваются .
- Предоставление предложений о том, как провести эффективную презентацию (для выступающего, впервые выступающего на мероприятии).
- конференция) Объяснение того, как работает система или изобретение (студентам инженерных специальностей)
- Публикация публичного объявления о действии, которое вы хотите, чтобы город или сообщество предприняли (совету директоров города или местного сообщества).

В заключение, работа со студентами, использующими свои мобильные телефоны на уроках английского языка, принесет новые инновационные идеи, которые послужат уникальной основой для того, чтобы студенты могли свободно говорить по-английски в будущем.

Литература

1. **Алматов Ч.А.** Проблема применение технических средств на уроке иностранных языков.//ФарДУ хабарлари. № 4.2008.
2. **Болтобоев Х.Т.** Роль игр на уроках иностранных языков.// УзМУ хабарлари, 1998.№ 2/1.
3. **Хамдамова С.Х.** Развитие педагогических технологий в деятельности преподавателей иностранных языков.//Методическое пособие.Наманган, 2022.
4. **Юсупов А.Л.** Русский язык для начинающих. Ташкент, 2024.



EXPLORING THE EFFICACY OF RAKTAMOKSHANA THERAPY IN VARICOSE VEIN TREATMENT: A CASE REPORT AND REVIEW

**Dr. Pragyan Paramita Behera¹, Prof Dr Ranjan Kumar Kasta²,
Dr Tapan Kumar Nayak**

¹M.S Scholar, Dept. of Shalya Tantra, Gopabandhu Ayurveda Mahavidyalaya, Puri, Odisha

²H.O.D, P.G Dept of Shalya Tantra, GAM, Puri

³Lecturer, P.G Dept of Shalya Tantra, GAM

ABSTRACT

Varicose veins pose significant challenges due to their prevalence and adverse impact on patients' quality of life. This review explores the management of varicose veins, focusing on Raktamokshana therapy. Varicose veins, characterized by dilated, twisted veins primarily in the lower limbs, result from venous insufficiency influenced by various factors such as heredity, valve incompetence, and weakened vascular walls. Management involves lifestyle modifications, hydrotherapy, and surgical interventions. This paper delves into the risk factors, symptoms, conservative and surgical management, complications, and prevention strategies associated with varicose veins.

A 47-year-old female presented with symptoms of itching, swelling, and aching pain in her right lower limb for five years. Ayurvedic examination and diagnostic procedures led to the decision to administer Raktamokshana therapy through Siravyadha. This therapy demonstrated significant improvement in symptoms over three sessions conducted at 15-day intervals.

Raktamokshana, particularly Siravyadha, facilitates the drainage of stagnant blood, reducing RBC breakdown, pigmentation, and itching. The therapy targets vitiated Vata in the blood vessels, alleviating pain by removing accumulated substances causing discomfort. This approach underscores the significance of blood purification in managing varicose veins, offering relief from symptoms and improving overall well-being.

In conclusion, Raktamokshana holds promise as a therapeutic modality in varicose vein management. Further large-scale clinical studies are warranted to evaluate its long-term benefits and efficacy. This abstract provides insights into the comprehensive management of varicose veins, emphasizing the role of traditional therapies like Raktamokshana in modern medical practice.

KEYWORDS: Varicose veins, Raktamokshana therapy, Siravyadha, Venous insufficiency, Bloodletting therapy.

INTRODUCTION

Varicose veins represent a prevalent vascular condition affecting individuals globally, often leading to a decline in quality of life. Despite their widespread occurrence, access to appropriate care for varicose veins varies, posing challenges in effective management. These dilated, enlarged, and twisted veins primarily afflict the lower limbs, manifesting symptoms such as bulging leg veins, pain, swelling, and ulceration. Varicose veins result from venous insufficiency, influenced by various factors including heredity, valve incompetence, and weakened vascular walls. Management necessitates a comprehensive approach aimed at symptom alleviation, enhancing quality of life, and preventing complications.

Understanding the multifactorial etiology of varicose veins is crucial for devising effective treatment strategies. Venous valve dysfunction, age, gender, family history, obesity, and pregnancy are among the myriad factors contributing to their development. Lifestyle modifications, including regular exercise and avoidance of prolonged periods of inactivity, play a pivotal role in managing this condition by improving blood circulation and reducing venous stasis.

This introduction sets the stage for exploring the intricate landscape of varicose vein management, emphasizing the importance of a holistic approach to address the diverse needs of patients. By delving into the risk factors, symptoms, conservative and surgical management, complications, and prevention strategies associated with varicose veins, this paper aims to provide valuable insights into optimizing patient care and improving treatment outcomes.

CASE REPORT

A 47-year-old female, residing in Jajpur District, Odisha, presented to the Outpatient Department (O.P.D) of Shalya Tantra at Gopabandhu Ayurveda Mahavidyalaya (G.A.M), Puri, with complaints of mildly pruritic swelling and aching pain in her right lower limb persisting for five years. Upon examination, engorged veins were observed along the medial aspect of the right lower limb below



the knee, tracing the course of the great saphenous vein. Additionally, mild discoloration was noted in the lower one-third of the right lower limb, accompanied by mild edema around the right ankle region.

The patient underwent a thorough assessment incorporating both Ayurvedic and modern diagnostic principles to ascertain the underlying pathology. Essential investigations were performed to corroborate the clinical findings and guide the treatment approach. Based on the diagnosis, it was decided to initiate therapeutic intervention employing Raktamokshanatherapy through the method of Siravyadha.

Siravyadha, a form of bloodletting therapy, involves vein puncture following preparatory procedures such as snehana (oleation therapy), swedana (sudation therapy), and snigdha virechana (mild purgation therapy). The patient received four sessions of Siravyadha at an interval of 15 days, targeting the varicosities present in the right lower limb.

The rationale behind employing Siravyadha lies in its ability to facilitate the drainage of stagnant blood, thereby reducing the breakdown of red blood cells (RBCs), pigmentation, and pruritus associated with varicose veins. By addressing the vitiated Vata dosha (biohumor) in the blood vessels, Siravyadha aims to alleviate pain by eliminating accumulated substances that contribute to discomfort.

Throughout the treatment course, the patient adhered to a prescribed dietary regimen comprising Yavagu (gruel) or Laghu bhojana (light meals) following snehana with moorchhitaila (medicated sesame oil) and nadi swedana (localized sudation).

The progression of symptoms and therapeutic response were closely monitored during each session of Siravyadha. Remarkable improvements were noted in the reduction of pain, swelling, and dilated veins over the course of three sessions spanning 45 days.

This case report underscores the efficacy of Raktamokshana therapy, particularly Siravyadha, in the management of varicose veins. It highlights the significance of integrating traditional Ayurvedic principles with modern diagnostic techniques to formulate personalized treatment strategies tailored to individual patient needs. Further research and clinical trials are warranted to elucidate the long-term efficacy and safety profile of Raktamokshana therapy in varicose vein management.



DISCUSSION

The therapeutic approach employed in this case report, focusing on Raktamokshana therapy through Siravyadha, offers valuable insights into the management of varicose veins. Varicose veins, characterized by venous insufficiency and manifested by dilated, twisted veins primarily in the lower limbs, present a complex clinical challenge. The discussion elucidates the rationale behind employing Siravyadha and examines its efficacy in alleviating symptoms and improving patient outcomes.

Raktamokshana, a subset of Panchakarma therapy in Ayurveda, aims at blood purification and removal of vitiated doshas (biohumors) from the body. Siravyadha, a form of bloodletting therapy, involves vein puncture to drain stagnant blood, thereby mitigating the adverse effects associated with varicose veins. By reducing the breakdown of red blood cells (RBCs), pigmentation, and pruritus, Siravyadha addresses the underlying pathology of varicose veins, which involves vitiated Vata dosha in the blood vessels.

The observed improvements in symptoms, including pain reduction, swelling, and diminished prominence of dilated veins,



underscore the therapeutic efficacy of Siravyadha. By targeting the root cause of varicose veins and promoting blood circulation, Siravyadha facilitates symptom relief and enhances overall well-being. The integration of traditional Ayurvedic principles with modern diagnostic techniques allows for a comprehensive understanding of the disease pathology and facilitates personalized treatment strategies tailored to individual patient needs.

Moreover, the holistic approach to varicose vein management encompasses dietary modifications, lifestyle interventions, and adjunctive therapies to optimize treatment outcomes. Dietary recommendations such as Yavagu (gruel) or Laghu bhojana (light meals) following snehana (oleation therapy) and localized sudation contribute to the therapeutic efficacy of Raktamokshana therapy. Lifestyle modifications, including regular exercise and avoidance of prolonged periods of inactivity, complement the treatment regimen by improving blood circulation and reducing venous stasis.

The findings of this case report underscore the potential of Raktamokshana therapy, particularly Siravyadha, as a promising modality in the management of varicose veins. Further research and clinical trials are warranted to elucidate the long-term efficacy, safety profile, and mechanisms of action underlying Raktamokshana therapy. By integrating traditional Ayurvedic therapies with modern medical practice, clinicians can offer holistic care to patients with varicose veins, thereby improving treatment outcomes and enhancing quality of life.

CONCLUSION

In conclusion, the case report highlights the therapeutic efficacy of Raktamokshana therapy, specifically Siravyadha, in the management of varicose veins. Varicose veins, characterized by dilated, twisted veins primarily in the lower limbs, present a significant clinical challenge, impacting patients' quality of life. The integration of traditional Ayurvedic principles with modern diagnostic techniques offers a holistic approach to varicose vein management, addressing the underlying pathology and promoting symptom relief.

The observed improvements in pain reduction, swelling, and diminished prominence of dilated veins following Siravyadha therapy underscore its therapeutic efficacy. By facilitating blood purification and drainage of stagnant blood, Siravyadha targets the root cause of varicose veins, thereby improving overall well-being. The complementary dietary and lifestyle modifications further enhance treatment outcomes, emphasizing the importance of a comprehensive approach to patient care.

Further research and clinical trials are warranted to elucidate the long-term efficacy, safety profile, and mechanisms of action underlying Raktamokshana therapy. By fostering collaboration between traditional and modern medical practices, clinicians can offer personalized treatment strategies tailored to individual patient needs, thereby optimizing varicose vein management and enhancing patient outcomes. The findings of this case report contribute to the growing body of evidence supporting the therapeutic potential of Raktamokshana therapy in varicose vein management, paving the way for its integration into mainstream medical practice.

REFERENCES

1. Sharma PV. *Sushrut Samhita*. Varanasi: Choukhamba Vishvabharati Academy.
2. Gupta KA. *Vagabhata Astanga Sangrah*. Varanasi: Krishnadas Academy.
3. Das S. *A concise Textbook of Surgery*. Calcutta: S Das Publication.
4. Srikanthamurthy KR. *Sharangdhara Samhita*. Varanasi: Chowkhamba.
5. Murthy. *Vagabhata Astang Hridayam*. Varanasi.



RULINGS ON WOMEN'S USE OF PRECIOUS STONES (BASED ON MOVAROUNNAHR FIQH SOURCES)

Ro'zimukhammad Tukhtasinov

Doctoral Student of the International Islamic Academy of Uzbekistan,

Teacher of Mir Arab Higher madrasah.

ABSTRACT

This article analyzes rulings on men's and women's use of jewelry and expensive jewelry based on Movarounnahr fiqh sources. Issues related to the use of precious stones as jewelry are usually mentioned in the context of the rulings on dress and clothing in furuul fiqh sources. From this it can be concluded that the permissions and prohibitions regarding the consumption of minerals as jewelry determine the dressing culture of Muslim people. Regarding each ruling, the jurists of Mowarounnahr provide evidence from verses and hadiths, ijma or qiyas. It is also considered that in Islamic Sharia, women are allowed to use jewelry more than men. Aspects such as quantity, time, space, and appearance of adornment for both men and women have been determined. In mastering these issues, works such as "Hidaya", "Badoe'us-sanoe", "Muhit", "Fatavoi Qazikhan" from Movarounnahr fiqh sources are of particular importance.

KEYWORDS: *Women's adornments, jewelry; use of gold and silver; apparent adornments.*

The most honorable of Allah's creations is a human being, who is of two sexes: male and female. Both need each other, it is difficult for them to live without each other. Unlike men, women are created to be gentle, beautiful and loving beauty. Allah has created for women all the necessary conditions to adorn, beautify their appearance, taking into account their nature and taste. Therefore, a woman satisfies her need to adorn, beautify herself using things created by Allah.

Taking these factors into account, it is allowed for women to adorn themselves in Islamic Shariah as well.

Allah says the following about the blessings that he gave to his slaves, which make their appearance beautiful: O ye Children of Adam! We have bestowed raiment upon you to cover your shame, as well as to be an adornment to you. But the raiment of righteousness, - that is the best. Such are among the Signs of Allah, that they may receive admonition!¹

The Sunnah of the Messenger of Allah (peace and blessings of Allah be upon him) also encourages Muslims to be beautiful, be they men or women. One of his sermons is expressed in the following words:

"Whoever has hair, let him honor it"².

In this hadith, the Messenger of Allah (peace and blessings of Allah be upon him) advises to take care for hair. Since hair is a part of the body that makes a person look beautiful.

"Undoubtedly, Allah is beautiful and loves beauty"³.

In this hadith also the Messenger of Allah (peace and blessings of Allah be upon him) emphasizes that Allah loves beauty. It is a motivation for Muslims and Muslim women to pay attention to beautifying their appearance.

This means that according to Sharia, women are allowed and desirable to adorn themselves. The pertinent question arises: "How do they decorate, and for whom do they decorate, and should they decorate?" We will discuss in detail the answers to these questions below.

¹ The Meaning of the Glorious Quran, Text, Translation & Commentary by Abdullah Yusuf Ali, page 93, 7/26

² Sunani Abu Dawud. Suleiman ibn Ashas. - Dorul fikr. Beyrut. Hair brushing book. Haircare section. 4/76.

³ It is also part of a hadith narrated by Imam Muslim. Sahih Muslim Bisharhin Nawawi. Yahya ibn Sharaf. - Dorul fikr. Beirut - 1973 Book of Iman. The chapter on the prohibition of kibr. 2/89.



For whom can women adorn themselves?

One of the reasons for the happiness in this world created by Allah for mankind is pure adornment that makes it look beautiful. A woman loves to be beautiful. The husband wants to attract the attention of his wife to himself. Therefore, he always tries to look his best.

Taking into account these reasons, it is permissible for women in Islamic Shariah to adorn themselves for their husbands.

Moreover, the emergence of love, friendship between a husband and wife, or embellishing herself for her husband to strengthen these relations is mustahab (recommended)⁴

It is also said that women, in addition to their husbands, can show their adornment only to their mahrams and a certain category of people mentioned in the ayats.

Burkhaniddin Margnani R.A. In his "Hidoya" mentions that this action is permissible and permissible amal. However, the reason for this permission was mentioned, the absence of mutual sexual views between the mahrams, and the fact that they usually gathered together in the same house, and women at home dressed more easily⁵. Therefore, in their relationship with each other, it is necessary to give an easier solution, in contrast to the relationship between non-mahrams. This lightness is determined by the fact that, unlike non-mahrams, it's permitted to show parts of the body that can be decorated with jewelry - ears, neck, wrists, and jewelry that can be worn on these parts of the body.

Because if women are instructed not to show their mahrams other parts besides faces and palms, similar to non-mahrams, it will be like that they are entrusted with very hard work. So the reason for this permission is to remove adversity and create relief. Hence, there is a difference between how women adorn themselves for their husbands and adorn themselves for their mahrams. Although adorning themselves for a husband is mustahab amal, it is jayiz, permissible amal, to show one's jewelry to mahram. The person to whom a woman can show her jewelry is described in the following ayat:

And say to the believing women that they should lower their gaze and guard their modesty; that they should not display their beauty and ornaments except what (must ordinarily) appear thereof; that they should draw their veils over their bosoms and not display their beauty except to their husbands, their fathers, their husband's fathers, their sons, their husbands' sons, their brothers or their brothers' sons, or their sisters' sons, or their women, or the slaves whom their right hands possess, or male servants free of physical needs, or small children who have no sense of the shame of sex; and that they should not strike their feet in order to draw attention to their hidden ornaments. And O ye Believers! turn ye all together towards Allah, that ye may attain Bliss⁶.

This means that women can dress up, put on makeup, moreover, it is a mustahab amal. However, while the Shariah stipulates that dressing up, applying makeup is intended to be done specifically for the husband, just like this is also allowed for certain categories of people, i.e. mahram.

For whom it is forbidden for a woman to adorn herself?

To answer this question, we need to look at the beginning of the ayat below. At the beginning of the ayat it says:

And say to the believing women that they should lower their gaze and guard their modesty; that they should not display their beauty and ornaments except what (must ordinarily) appear thereof .

This ayat shows that women are forbidden to show their jewelry to strangers, to adorn themselves for them, but it is allowed to show zahir jewelry that is involuntarily visible.

This means that women should not show their jewelry to anyone other than the men mentioned in the ayat as an exception. But this does not mean that it's forbidden for women to show any place. For the ayat mentions that there is an exception. And these are the zahir decorations (involuntarily visible). But the mufasssirs, the fuqaha, told different opinions about what is meant in the ayat by zahir an involuntarily visible decoration.

⁴ Mustahab is one of the sentences (rules) of the Sharia, according to which if a person does something, he will be rewarded, and if he does not, then there will be no sin. (Mulla Jiyvan Siddiqi. Nurul Yakin. - Tashkent: "Movarounnahr", 2017. 2/243)

⁵ Burkhaniddin Marghinoni. Hidoya. - Pakistan, Karachi: Maktabatul Bushro, 2020. 4/104

⁶ The Qur'an. 24/31, page 237, Text, Translation & Commentary by Abdullah Yusuf Ali



From the Tabeins Ata ibn Abu Rabah (27-114 AH, 647-732 m), Mahul (d. 112 AH) (ra), from the mufasssirs Ibn Kathir (701-774 AH), Kurtubi (671 AH), Yassos Razi (d. 370 hours) (ra), as well as the followers of the Hanafi and Shafi'i schools said that the zahir adornment in this ayat is the face and palms. Accordingly, although the woman's face and two palms are adornment, she is allowed to show them, since it is very difficult to hide them all the time. But, in cases where there is a likelihood of fitnah, it will be desirable not to show them and to protect yourself⁷.

In the book "Hidoya" it is mentioned that a man who suspects that he might be tempted when he sees them, then he should not look at them⁸.

As proof, they cite the work of Ibn 'Abbas (may Allah be pleased with him) where it says: "mentioned in the ayat " those that are Zahir "means a face and two palms"⁹

What kind of jewelry can women use to adorn themselves?

From the above, it was concluded that women can adorn themselves. There are many different ways, styles, and jewels that women can use to adorn themselves with. Below we will dwell on valuable jewelry with which woman can adorn themselves.

A woman should adorn herself with jewelry in the following order:

1. One of the most important rules and guidelines for the use of jewelry is to avoid waste and grandeur. For a Muslim should not allow wastefulness in everything he does. On this occasion, the Messenger of Allah (peace and blessings of Allah be upon him) said:

"Eat, drink, give charity, and wear clothes without extravagance or pride"¹⁰.

2. According to the unification of all citizens, women can use jewelry made from gold, silver, rubies, and from precious stones such as emeralds¹¹.

From the words of the Messenger of Allah (peace and blessings of Allah be upon him) it is narrated that:

According to Abu Musa, it is narrated that the Messenger of Allah (peace and blessings of Allah be upon him) said: "Gold and silk are allowed for the women of my Ummah. And for men it is haram"¹²

There are many aspects¹³ to this hadith, and some scholars¹⁴ call it consensus¹⁵.

Precious stones such as chrysolites, emeralds, rubies also have the status of gold and silver, and a woman can use them as jewelry.

3. Sources of Hanafi fiqh assert that it's forbidden a woman to wear jewelry made of cheap metals such as iron, copper, aluminum, lead or plastic. The following hadiths of the Messenger of Allah (peace and blessings of Allaah be upon him) are cited as evidence of this:

According to Buraydah Ibn Hasib, it is narrated that One man came to the Prophet (peace and blessings be upon him) and he had worn a copper ring, and the Messenger of Allah (peace and blessings be upon him) said: " did I smell idols odor from you? " then this man took it off and threw it away, and next time he came with a gold ring, this time the Prophet (peace and blessings be upon him) said: "You are wearing the adornment of the inhabitants of Hell!", he again took off the ring and said: "Oh, messenger

⁷ Abdullah ibn Muhammad. *Musannaf ibn Abu Shayba*. - Beirut: Dorul Qutubul Ilmiyya, 2008. Marriage Book. Section "Allah- (Women) Do not show your jewelry". 3/541. Abul Fado Ismail ibn Kasir. *Tafsirul Koran Azim*. - Beirut: "Dar al-Koran", 1981. 5/89. *Tafsiri Kurtuby*. 12/228. Ahmad ibn Ali Yassos. *Ahkamul Quran*. - Beirut: "Dorul Kitabul Arabiyya", 1992. 3/315. Muhammad ibn Umar Razi. *Tafsirul Kabir*. - Tehran: "Dorul Qutubul Ilmiya", 1981. 23/205. Shamsiddin Saraksy. *Al-Mabsut*. - Beirut: Dorul Marifa, 1989.10 / 152-153. Kosoniy. *Badoe*. 5/121. Navaviy. *Majmoo*. 3/167.

⁸ Burkhaniddin Marginoni. *Hidoya*. - Pakistan, Karachi: Maktabatul Bushro, 2020. 4/100.

⁹ *The words and deeds of the Companions are called a work from the point of view of the hadith*. Dr. Mahmoud Tohkhon. *Taysiru Mustalahul hadith*. Riyadh: Maktabatul Maorif, 1996. - P. 19.

¹⁰ Dzhaloliddin Suyutiy. *Durrul Mansur fit Tafsiri bilma'sur*. Dorul ma'rifa. Byrut. 3/80.

¹¹ Ubaydullah ibn Masud. *Mukhtasarul wikoya fi masailil hidoya*. Kazan. Eremova's edition - 1911. - P. 130. Burkhaniddin Marginoni. *Commentary on the manual - bidayat al-mubtadi*. (Together with the commentary by Abdulhai Laknawi). 7 / 178-187. Abul Hussein Ahmad ibn Muhammad Kuduri. In short. Byrut. Regional edition-2005. - P. 592.

¹² Abu Isa Termizi. *Sunani at-Tirmizi* (commentary by Tuhfat al-Ahwazi). 3 / 132.

¹³ In hadith science, Mustalahul calls the path of hadith "the path from the Companions to the narrator of the hadith." Dr. Mahmoud Tohkhon. *Taysiru Mustalahul hadith*. Maktabatul maorif. Riyadh - 1996. - P. 19.

¹⁴ The hadith is divided into two parts in terms of how it came down to us. 1. Mutavotir. 2. Ohod. Mutavotir in the dictionary means "sequential". Hadith Term: "This is a hadith narrated by many narrators, and the fact that there are so many of them usually indicates that they did not agree with the lie." See Dr. Mahmoud Tohan. *Taysiru Mustalahul hadith*. - B. 19.

¹⁵ At-Tirmidhi quoted this hadith in his books and said: "Hadith hasan sahih." It is transmitted from Abu Musa al-Ash'ari. In this chapter, Umar, Ali, Uqba ibn Amir, Anas, Khudhaifa, Umm Hani, Abdullah ibn Umar, Imran ibn Hussein, Jabir, Abu Raikhan, Abdullah ibn Amr and Wasilah talked about this. ibn Aska. Abu al-Faiz al-Qattani also narrated the hadiths of Arqam, Ibn Abbas and Bara ibn Azib. See: *Nazmul mutanosir min hadith Mutawatir* (Poetry (shoda) of scattered (hadith), compiled from hadith mutawatir). Abul Faiz Cattony. Dorul kutubil ilmiya. Bayrut - 1980. - S. 298.



Allah! What metal should I take the ring from? " the Prophet (peace and blessings be upon him)replied: "Take it from silver, and so that it does not weigh more than a miskal¹⁶ (about 4 grams)" ¹⁷

Although this hadith is addressed to men, it is said that in terms of common cause, this ruling also applies to women¹⁸.

4. In sources, is paid attention not only to what metal the jewelry is made of, but also what form it is made of. The fiqh books say that jewelry should not have an image of a living being, or that the form of jewelry should not be that of a living being¹⁹. For example, there is jewelry made in the form of birds, wild animals, or embroidered with their images, and even if they are made of allowed metal, they are said to wear them will be non-halal. The reason for this is that in the hadiths it is forbidden to draw images of living beings and make statues out of them.

It is narrated from Ibn Abbas (may Allah be pleased with him) that the Prophet (peace and blessings of Allaah be upon Him) said:

"From the one who will make an image in this world, on the Day of Judgment, it will be said to them:" Revive what you created "and he will not be able to do it"

Based on this, it is preferable for a woman not to wear jewelry with the image of a living creature or its form.

In conclusion, we can say that women are given great opportunities to decorate themselves, which men do not have. Because the nature of men is not prone to jewelry. Also, when men dress up like women and wear jewelry, they lose their dignity.

Women will have to satisfy their need for jewelry in a halal way, without exceeding the norm, and show their jewelry only to those for whom it is permitted to.

Compliance with these guidelines by both men and women will contribute to peace in society and stability in the family.

SOURCES AND LITERATURE

1. Abdulaziz Mansurov. *Translation and Interpretation of Quranic Meanings* - T.: "Islamic University of Uzbekistan", 2018.
2. Sheikh Muhammad Sadiq Muhammad Yusuf. *Tafsiri Hilol. Translation of the meaning of the Holy Quran in Uzbek*. - T.: "Hilol", 2017.
3. Muhammad ibn Ismail Bukhari. *Sahih Bukhari*. Doru ibn Kasir, 2002.
4. Sheikh Muhammad Sadiq Muhammad Yusuf and a group of translators. *Golden chain*. - Tashkent: "Hilol", 2019.
5. Burhaniddin Marginoni. *The commentary on the guide is bidayat al-Muhtadi*. - Pakistan, Karachi: Maktabatul Bushro, 2020.
6. Alouddin Abu Bakr ibn Mas'ud Qasani. *Badoeus sanoe 'fi arrangement sharoe'*. - Beirut: "Dorul kutubul ilmiy", 2003.
7. Ubaydullah ibn Mas'ud. *Muxtasarul viqoya*. - Kazan: "V. Z. Yeremeva", 1911.
8. Muhammad ibn Ali Haskafi. *Durrul muxtor*. - Beirut. "Dorul kutubul ilmiyya", 2002.
9. Muhammad Amin ibn Obidin. *Roddul mukhtar alad durril mukhtar hoshiyatu ibn Obidin*. - Riyadh: "Doru olamil kutub", 2003.
10. Kuwait Ministry of Foundations and Islamic Charity. *Mawsuatul fiqh*. - Kuwait: Maktabatul Ol, 1983.
11. Sheikh Nizam and the Society of Indian Scholars. *Fatwa of India*. - Beirut: "Dorul fikr", 2009.
12. Uthman ibn Ali Zaylai. *Tabyinul haqoiq*. - Egypt. "Buloq", 2010.
13. Abdullah Yusuf Ali, *The Meaning of the Glorious Quran Text, Translation & Commentry*

¹⁶ This is a unit of measure for weight, which is 4.25 g.

¹⁷ Abu Isa Termizi. *Sunani Termizi. book of clothes*. 3/58. Suleiman ibn Ashas Sijistani. *Sunani Abu Daud. Ring book. The chapter of the hadith on the iron ring*. 3/90. Dzhaloliddin Suyuti. *Sunani Nasoi Bisharhi Suyuti. Book of jewels. section on the weight of the silver ring*. 8/172. Hafiz ibn Hajar. *Fathul boriy*. 10/323.

¹⁸ Kosoniy. *Badoe*. 5 / 133. *Fatavoi Hindiya*. 5 / 335. Kazizada Effendi Ahmad ibn Qadir. *Takmilatu fathul qodir*. - Egypt: "Matbaatu Mustafa Albobi Alkhalabiy", 2003. 22.10.

¹⁹ Hoshiyatu ibn Obidin. 1 / 647. Ibn Khumam. *Fathul codir*. 1 / 415.



EDUCATION, PERCEPTION, AND CHALLENGES: THE ERRATIC CASE OF TRIBAL LIFE IN WAYANAD, KERALA

Benoy KJ

Research Scholar, Department of Sociology, Sri Satya Sai University of Technology and Medical Sciences, Sehore

ABSTRACT

The uncertainty and irregularity of making the resources available to communities that are alienated from mainstream society have caused instability in providing necessary support to empower and uplift the existing situation of the tribal communities in the Wayanad district of Kerala. Though there have been continuous efforts post-independence of India to make available the resources to the tribal communities, the living conditions including the educational facilities have not undergone substantial improvement. The journey from exclusion to inclusion has made the lives of tribes challenging and involved struggles to equip them with the basic rights that the country provides its citizens. This research paper aims to delineate the perception and challenges of education made available to the tribal communities in Wayanad by examining the facilities, schemes, and development policies made available to the tribal communities. The conclusive findings showcase the lagging, irregular, and irresponsible attitude of authorities towards the tribal communities in Wayanad from the viewpoint of the education facilities provided to them.

KEYWORDS: Education, Kerala, Scheduled tribes, tribal communities, Wayanad

INTRODUCTION

Since the independence of India, there have been constant efforts from government and non-governmental agencies to provide sufficient support to enhance the situations, lifestyle, and existence of tribal communities in various parts of the country. Though many schemes and programmes are still being continued from such a perspective, there has been very less output satisfying the actual requirements and necessities of the communities. The discriminatory acts of mainstream society towards the backward classes and scheduled tribes hinder the overall efforts and policies made to uplift the living conditions of the scheduled tribes. The reach of opportunities proposed by various agencies extended to minorities and backward communities such as the tribes is still questionable (Isac, 2011, p. 2).

In such existing circumstances, the relevance and significance of education are high because it is very essential to improve the quality of life. The development, improvement, and transformation of an individual mainly depend on the education, orientation, and knowledge regarding the situations around them which is crucial in the case of tribal communities that are alienated from the mainstream community. At the core, the development of an individual or community can be interpreted as how they can satisfy their demand in daily life (Deshmukh, 2004). The tribal population's habitation regions make up a substantial portion of the country's undeveloped areas. The Scheduled Tribes are one of India's most economically disadvantaged and neglected communities. The Scheduled Tribes are one of India's most economically disadvantaged and neglected communities. Although Scheduled Tribes are a minority, they account for around 8.2% of India's overall population.

Indian Constitution's Article 46 provides the promotion of educational interests of the tribal people. Besides, Articles 330, 332, and 334 ensure reservation rights to the elective and non-elective bodies. Diversity, inclusion, and multicultural perspectives of the Indian society are appreciable, however, the applicability and practicality of reducing the challenges and struggles of tribal communities go in vain. Wayanad district in Kerala accounts for a majority of tribal communities in Kerala. This South West region has the green forestry of the Western Ghats exists as a hotspot of biodiversity in the world where the tribal communities safeguard and live utilising its resources. Wayanad has several tribal communities including the Adiyar, Kurichya, Kattunaikan, Kuruman, and the Paniya (Paul, 2013, p. 12) having great importance in the history of the land. This research paper aims to delineate the perception and challenges of education made available to the tribal communities in Wayanad by examining the facilities, schemes, and development policies made available to the tribal communities.

REVIEW OF LITERATURE

There have been various research and surveys conducted on the education provided to the tribal communities in Wayanad and its problems. Scholars have traced different aspects that hinder the proper implementation of the system referring to the available facts and figures. Asha (2020) concentrates on issues such as the low literacy level of tribal communities and concerns over their high



dropout rate. She finds the educational challenges faced by the tribal students as the major reason for the cause and suggests solutions to overcome them. The paper also points to the dawdling progress of policies aimed at the improvement of literacy rate, which has created a wide disparity between the literacy rates of the mainstream society and the scheduled tribes. Similarly, Swamy and Hema (2011) pointed out the dismal state of literacy among the Paniya tribal community in Wayanad along with the reasons for low literacy rates and educational attainment. The disadvantaged and backward classes had been excluded from basic education which projected the cause to lack of knowledge and connection with the mainstream community. This has been discussed as a complex socio-political process having multiple roots and causes.

Following the changes and updates, Joy and Srihari (2014) stated certain reasons such as negative attitude towards schooling, peer influence, alcoholism of parents, early responsibility, caste-related issues, and health issues as the primary reasons for dropout among the tribal communities. There have been certain initiatives such as Gothravelicham at the local level and the Breakfast project to reduce dropouts among the scheduled tribes in Wayanad which could find solutions to a limit.

Malith (2018) mentions that despite enormous resources provided by the government to support education, the results remain insufficient due to social situations, economic factors, inadequate infrastructure, lack of interest and lack of resourceful teachers. The paper states that

“In a tribal area in Wayanad there is no insecurity but owing to the many challenges tribal are encountering such as lack of land, lack permanent livelihoods, lack of conducive environment for tribal children at home which encourage children to drop out other and challenges floundering by tribal education in general.”

(Malith, 2018, p. 151)

EDUCATION, PERCEPTION AND CHALLENGES

The geographical, cultural, and social situation of the tribes in Wayanad does not allow them to be closely acquainted with the mainstream society by accessing the education facilities and infrastructure provided to them. Instead, the natural and socially made alienation of the tribal communities, mainly due to their lifestyle, struggles to pace with the speed of the mainstream society, and discriminatory attitudes of people outside their community, allows them to depend on the available resources provided by the governmental agencies and others.

Efforts in the form of schemes implemented by the Kerala state under the tribal sub-plan had proposed schemes for providing better educational facilities to bright ST students, repairs and maintenance of tribal hostels, and providing assistance to higher education. Dr. Nitheesh Kumar, district coordinator of the ‘Gothraprabha’ project initiated by the Kerala government says, “The higher education of tribal students in Wayanad is in shambles. Around 40% of the students who appeared for the Plus 2 examinations this year failed. Among the few students who clear higher secondary examinations, most don't continue the studies.” (Meethal, 2021). It was reported that the drop-out rate in 2013 of Adivasi Dalit students was 95% during the school period and 80% of the seats in other districts reserved for Scheduled Tribe students were illegally diverted to the General category. There was a protest at the Adi Sakthi Summer School, an Adivasi Dalit students’ collective against the casteist and racial discrimination that does not allow tribal students to get admission to higher educational institutions in Wayanad (Roy, 2020).

The recent COVID-19 situation and the sudden shift to utilising technology integrated online mode of education had also affected the education of students from tribal communities who did not have enough facilities, resources, and permanent solutions to overcome the challenge. Sumi Vishnudas, a social scientist says,

“The high school dropout rate is leading to the educational backwardness of these children. These children are away from any sort of communication from schools and other educational activities during the lockdown. Even in the normal course, the educational gap between the tribal children and children from the general category is widening. So the government must take steps to fill the gap.”

(Nandini, 2020)

Specifically, tribal colonies in the district of Wayanad have witnessed mainly offline classes due to the lack of infrastructure made available in the government schools that are located in remote areas. The pandemic situation affected the continuity of their studies while the mainstream society managed to equip them with basic infrastructure as part of several initiatives by the government such as broadcasting classroom lectures through the Kite Channel. A tribal activist, T. Krishnan notes the serious issue of the lack of infrastructure as,

“Many parents, especially in tribal communities such as the Paniya, Kattunayaka, and Adiya, are yet to understand the relevance of online classes. Forest hamlets such as Kurichiyad, Chettyalthur, Kumizhi, Pampunkolly, Manimunda, and Ponkuzhi lack even proper electricity supply, not to mention Internet connectivity.”

(Manoj, 2020)

If the literacy rate of tribes is compared to that of the mainstream community in Kerala, it is very low. It indicates the requirement for overarching support that integrates the health, living, and economic conditions of the people in the tribal colonies. The formal education, which has a strong inclination towards the dominant group as it is designed by the representatives of the mainstream



society, there has to be sufficient support to overcome the challenge of language, culture, and competency. The lack of mass media involvement, unofficial child labour, unsatisfactory living conditions, unstable financial background, insufficiency of healthy food, insecurity at various levels, casteism, lack of adequate attention and inadequate government aid at the required time, early marriage, and inferiority complex enforced by the mainstream community are some of the other factors that affect the education of tribal students in Wayanad.

For the purpose of tribal development, the Government of India had raised funds since the First Five Year Plan and brought several plans and schemes to implement at various tribal settlements. The Janshala Programme was such an initiative of the Government of India in collaboration with UNICEF and associated agencies. It provided primary education more accessible to the students of the tribal communities, backward classes, marginalised, and minority groups (Kabitakumarisahu, 2014). Following such initiatives, there were several other schemes such as Multi-Grade Learning Centres, Alternative Schooling, Girivikas, Gurukulam, The District Primary Education Programme, Model Residential Schools, Hostels for ST Girls and Boys, Scheme for the establishment of Ashram Schools in Tribal Sub-Plan areas, the Post-Matric Scholarship Scheme, Pre-Matric Scholarship for ST students, Vocational Training, special provisions for disabled students, single teacher schools, Saakshar Bharat Mission, Sarva Shiksha Abhiyan, Gothravelicham project, Navachedana, Samagra, Gothra Sarathy, Gothrathalam, Gothra Bandu, etc. The list goes on with renewed schemes every year spending crores of rupees.

However, the question remains prevalent on why has there been no substantial improvement since several decades of the continued provision of schemes and programmes by the various governments and non-governmental agencies. The issue exists in the adaptability of students of the tribal communities to the existing curriculum, language, and teaching methods. It would be better if the government appoints permanent, qualified, and interactive teaching staff from the tribal community itself to provide classes to the students from the tribal communities. The shortage of qualified teachers is a hindrance to quality education which also affects the education of students from the tribal communities. Temporary posts of such teachers have to be made permanent so as to provide an uninterrupted teaching-learning facility. Infrastructure has to be improved which is a challenge for the government even after several decades. In order to equip the students from tribal communities to compete with the students from mainstream society, they have to receive adequate infrastructural developments, economic assistance, and proper implementation of reservation. It would be better to teach the students of the tribal communities in their medium of language and gradually provide a strong base to make them learn English and other foreign languages. Foremost, it is important to give orientation to reduce their lack of confidence and the presence of an inferiority complex that is a result of the thought and ideology implemented in the society that the backward classes are culturally and socially lower than the mainstream society. Though sufficient legal aspects are pertinent in the country, the people in tribal communities lack knowledge and support to get the benefits of the rights provided to them.

CONCLUSION

It is not the remodelling and scrapping of their roots which is the agenda of education, but the soul interest has to make them equipped with the knowledge, competence, and resources to make themselves empowered. "The tribal school education and hostel training have to be re-looked at with adequate inputs on various aspects of their life and culture and redesigning training components of teachers appointed in a tribal setting. Tribal development plans and Tribal sub plan (TSP) have to include tribal education and make provisions for professionally trained personnel for ensuring their sustainable development." (Thangadurai, 2020, p. 2111). Though the primary responsibility to enhance and empower the tribal communities through education is for the government, it also requires the immense support of the mainstream society as well as the people of the tribal communities. The perception towards the tribal settlements, their lifestyle, and existence has to be positive in order to implement equality and inclusion within the diverse conditions of their cultural, social, and living conditions. Discrimination and exclusion would increase inferiority, making the tribes get further alienated from the mainstream resources and facilities. In the same way, the attitude and cooperation towards government policies and schemes should be positive from the side of the tribes which would help them to get empowered to face challenges in life.

REFERENCES

1. Asha, C.M. (2020). Education of Tribal Communities in Kerala. *International Journal of Social Science and Economic Research*, 5 (6), <https://doi.org/10.46609/IJSSER.2020.v05i06.001>
2. Deshmukh, B.A. (2004). *Tribal Education*. Sonali Publication, 35-40.
3. Isac, S. (2011). Education and Socio-Cultural Reproduction: Development of Tribal People in Wayanad, Kerala. *Rajagiri Journal of Social Development*, 3 (1-2), 1-30.
4. Kabitakumarisahu (2014). Challenging Issues of Tribal Education in India. *IOSR Journal of Economics and Finance*, 3 (2), 48-52.
5. Malith, W. C. (2018). Tribal education challenges the case of Wayanad in Kerala, India and Western Bahr el Ghazal, South Sudan. *International Journal of Academic Research and Development*, 3 (6), 146-152.
6. Manoj, E. M. (2020). In Wayanad, tribal students are off the online grid. *The Hindu*, <https://www.thehindu.com/news/national/kerala/in-wayanad-tribal-students-are-off-the-online-grid/article31725322.ece>



7. Meethal, A. (2021). Mentoring project 'Gothraprabha' helps 13 Wayanad tribal students join college. *The New Indian Express*, <https://www.newindianexpress.com/good-news/2021/sep/14/mentoring-project-gothraprabha-helps-13-wayanad-tribal-students-join-college-2358545.html>
8. Nandini (2020). Tribal students in Wayanad left out as education goes online amid lockdown. *Hindustan Times*, <https://www.hindustantimes.com/education/tribal-students-in-wayanad-left-out-as-education-goes-online-amid-lockdown/story-EXaj77hWGLGqkgvg0XWK nN.html>
9. Paul, B. P. (2013). *Income, Livelihood and Education of Tribal Communities in Kerala – Exploring Inner – Community Disparities* (No. 3617). Department of Applied Economics – Cochin University of Science and Technology.
10. Roy, S. (2020). In Wayanad Kerala, Adivasi Dalit students are on indefinite strike for better representation in higher education. *Two Circles.net*, <https://twocircles.net/2020oct07/439276.html>
11. Swamy, R. N. & Hema, S. (2011). Panchayat Raj and Tribal Education: The Case of Paniyas in Wayanad, *St. Francis Institute of Management & Research*, 6 (1). <http://sfimarresearchreview.org/index.php/srr/article/view/109191>
12. Thangadurai, L. P. (2020). Social Issues of School Children Belonging to Tribal Community in Attappady, Palakkad District, Kerala, *India. Journal of Emerging Technologies and Innovative Research*, 7 (10), 2093-2119. <https://www.jetir.org/papers/JETIR2010271.pdf>



A STUDY ON SOCIO ECONOMIC STATUS IN RELATION TO THEIR ACADEMIC ACHIEVEMENT AMONG HIGH SCHOOL STUDENTS

Dr.P. Rajendran¹, Dr.R. Selvaganapathy²

¹Principal, Indra Ganesan College of Education, Trichy- 12.

<https://orcid.org/0000-0002-6311-7383>

²Assistant Professor, Indra Ganesan College of Education, Trichy-12

Article DOI: <https://doi.org/10.36713/epra16115>

DOI No: 10.36713/epra16115

ABSTRACT

The main objective of this research is to study the level of socio-economic status of high school students in relation to their academic achievement. This study involves a survey method. The sample size of the study was 200 high school students who were selected through random sampling technique. The main hypotheses of the study are the level of socio-economic status among high school students in relation to their academic achievement. There is no significant difference between the mean score on the level of socio-economic status in relation to their academic achievement among high school students with respect to their demographic variables such as gender, school location, family types and birth order. The statistical procedures used in this study were; Mean, standard deviation, 't' test and F-test to analyze the data. Major findings of the study: i). The level of socio-economic status and academic achievement among high school students is above average. ii). Male high school students are significantly higher than female students in terms of socio-economic status and academic achievement. iii). Rural and urban high school students were found to be similar in level of socio-economic status in relation to their academic achievement. iv). Individual families of high school students have significantly higher socio-economic status relative to their academic achievement than joint families. v). Consequently, there is no significant difference in the level of socio-economic status among high school students with respect to their birth order in relation to their academic achievement. My conclusion is that the present study reveals that the level of socio-economic status and academic achievement among high school students is above average.

KEYWORDS: Socio-Economic Status, Health Status, Environment, Academic Achievement, High School Students.

INTRODUCTION

Socio-economic status is assessed as a combination of factors including income, education level, and occupation. It is a way of looking at how individuals or families fit into society using economic and social activities that have been shown to affect the health and well-being of individuals. Socio-economic status and health are closely related, and socio-economic status can often have profound effects on a person's health due to the inability to access health care, food, and other lifestyle choices associated with both finance and education. The socio-economic status of a family is based on family income, the educational status of the parents, the occupation of the parents, and the social status of the family. Families with high socio-economic status are often more successful in preparing their young children for school because they generally have access to a wider range of resources to enhance and support the development of young children. They can provide high-quality child care, books, and toys to their young children to motivate children in various learning activities at home. In addition, they can easily access information related to their children's health, and social, emotional, and cognitive development. In addition, families with high socioeconomic status often seek information that will help prepare their young children better for school. The home environment is a primary socializing agent and affects the child's interest in school and aspirations for the future. The home environment is a primary socializing agent and affects the child's interest in school and aspirations for the future. The factors of socio-economic status are classified into two factors below;

Health Status - is a definite measure of socio-economic status. Even if brought on by poor health, genetic predispositions, accidents, or lifestyle choices, it can still cause a person to stagnate. Prevention of disease progression can be based on education and employment preferences. Health status affects mobility and socialization ability, thereby controlling the social circle of numerous sick people.



The Environment does not have to determine socioeconomic status. In this instance, the living environment is not a factor in personal socio-economy. The concept of socio-economic status considers other influences on policy, availability of resources, and prestige of the primary occupation.

Academic Achievement

Academic achievement is the achievement of knowledge or skills acquired in school subjects or both, usually assigned by course marks or marks assigned by teachers, the highest level of study, or group instructional period of learning and quality. Academic achievement has been one of the foremost important goals of the education process. Academic performance is often associated with study habits. Education is of no use unless it aims to develop proper study habits within the students.

Need and Importance of the Study

It is important to note that parents are one of the most influential yet significantly under-related factors in their children's education and society should encourage more parental participation in public education, as has been highlighted by most researchers. In recent times, the students at the IX and X standards at the high school level belong to the age group of 13 to 15 years in the adolescent period. They undergo a great change in their thinking and therefore careful guidance is necessary, so there is a great need to understand their socio-economic status and achievement. Higher socio-economic status and high levels of education may enhance a parent's ability to become involved in their children's education and also enable parents to acquire and model social skills and problem-solving strategies conducive to children's school success. The study will help to change the mentality of the student above the social status, which helps to plan suitable programs and give counseling for the students at the school level. Therefore, the above problems need to be addressed and hence the researcher selected the topic **"STUDY ON SOCIO-ECONOMIC STATUS IN RELATION TO THEIR ACADEMIC ACHIEVEMENT AMONG HIGH SCHOOL STUDENTS"**.

Research Studies

Yoshida, Natsuho, (2023), the Socio-Economic Status and the impact of continuous assessment and improvement on primary education in Myanmar. This study explored the Continuous Assessment and Improvement System (CABS) as a function of the socio-economic status (SES) of households in terms of quality review and dropout rates. Participants attended five schools in urban Myanmar, and they were classified into three SES groups. The results showed unequal CAPS effects. The medium SES group benefited the most, with repeat and drop rates approaching zero post CAPS implementation. The high SES group was at ceiling pre and post CAPS so was unaffected. Results were mixed for the low SES group grade repetition was roughly halved but high dropout rates persisted. Thus CAPS effects were mitigated in severe socio-economic circumstances.

Shehu, Blerta Peroli, (2022), the research study is Peer Acceptance in Early childhood: Links to Socio-Economic Status and Social Competence. Social relationships and peer interactions play an important role in the healthy development of the child, and the opportunity for children to gain the necessary experience and maturity for the development of healthy relationships in the future. This study looks at factors associated with and predictive of peer acceptance and rejection in early childhood. The study participants included 130 children, their parents and teachers. Socio metric techniques, socio-demographic questionnaire, and the Vineland scale for adaptive behavior were used to collect the data. Results indicate that socioeconomic factors influence children's social standing in the group and higher scores in social and communication skills are positively correlated with peer acceptance.

Objectives of the Study

The objectives of the present investigation are as follow:

1. To measure the level of Socio-Economic Status in relation to their Academic Achievement among High School Students.
2. To find out the significant difference between the mean score on the level of Socio-Economic Status in relation to their Academic Achievement among High School Students with respect to their demographic variables such as Gender, Locality of the School, Types of Family, and Birth Order.

Hypotheses of the Study

The Followings hypotheses are framed by the researcher;

1. The level of Socio-Economic Status in relation to their Academic Achievement among High School Students in total.
2. There is no significant difference between the mean score on the level of Socio-Economic Status in relation to their Academic Achievement among High School Students with respect to their demographic variables such as Gender, Locality of the School, Types of Family, and Birth Order.

Methodology

The study belongs to a Survey Method, as it is intended to find out the level of Socio-Economic Status in relation to their Academic Achievement among High School Students.

**Selection and Size of the Sample**

The investigator had selected 200 High School Students as a sample by the Simple Random Sampling Techniques.

Tool Used for the Study**Tool for Socio-Economic Status among High School Students**

The selection of suitable research tools gives vital importance for the collection of data and to investigate the study successfully. The Tool was developed and standardized by S.Suguna and P.Anandhan (2015). The Reliability Coefficient was found to be $r=0.82$ measured by the split-half method.

Scoring Procedure for Socio-Economic Status

The study was scored as per the scoring procedures given in the manual. It consists of 35 questions among them positive questions 23 and negative questions 12. The score of the response was based on a four-point scale is selected. The tool has 4 alternative responses; Strongly Agree, Agree, Disagree, and Strongly Disagree. For Positive statements, the scoring of 4, 3, 2, 1, and negative items are scored in the reverse order.

Tool for Academic Achievement Test

For Academic Achievement test marks was collected half yearly from concern schools.

Collection of Data

The investigator got prior permission from the head of the school and approached IXth and Xth students for getting necessary co-operation. I am explain the purpose of the study titles as "Socio-Economic Status in relation to their Academic Achievement among High School Students". I am provided with the tool of Photocopies. The investigator explained the tool and the way of answering the questionnaire. The questionnaire was administered individually to all the students.

Data Analysis

The investigator followed Mean, Standard Deviation, 't' Test and F test for the analysis of the data. The results were presented in the following tables.

Hypothesis No: 1.

The level of Socio Economic Status in relation to their Academic Achievement among High School Students in total

Table 1
Showing Mean and SD on the level of Socio Economic Status in relation to their Academic Achievement among High School Students in total

S. No.	Variables		N	Socio-Economic Status		Achievement	
				Mean	SD	Mean	SD
01.	Total		200	76.48	7.53	60.28	5.20
02.	Gender	Male	69	78.33	7.42	61.62	5.41
		Female	131	75.50	7.43	59.58	4.96
03.	Locality of School	Rural	138	75.78	7.53	59.85	5.26
		Urban	62	78.03	7.35	61.25	4.96
04.	Types of Family	Nuclear family	150	74.81	6.58	59.05	4.49
		Joint Family	50	81.49	8.01	63.98	5.46
05.	Birth Order	1	80	76.04	7.03	60.26	5.05
		2	113	76.95	7.96	60.37	5.37
		3	7	73.84	5.61	59.07	4.49

From Table -1 The obtained Maximum and Minimum Mean and SD values of the Socio-Economic Status Scores were 81.49 and 73.84 and 8.01 and 5.61. The obtained Maximum and Minimum Mean and SD values of the Academic Achievement Scores were 63.98 and 59.05 and 5.46 and 4.49. Therefore the level of Socio-Economic Status and Academic Achievement among High School Students is above average.

Hypothesis No: 2.

There is no significant difference between the mean score on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Gender.

**Table -2 't' values between the mean scores on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Gender**

Variables	Gender	N	Mean	Std. Deviation	't' value
Socio Economic Status	Male	69	78.33	7.42	2.57*
	Female	131	75.50	7.43	
Academic Achievement	Male	69	61.62	5.41	2.69*
	Female	131	59.58	4.96	

*- Significant at 0.05 level

Table -2 shows that the 't' values, 2.57 and 2.69 are significant at 0.05 level. The results show that there is a significant difference among the Male and Female High School Students of Socio Economic Status in relation to their Academic Achievement. Male High School Students were significantly higher than the Female Students of Socio Economic Status and Academic Achievement. Therefore the framed hypothesis is rejected.

Hypothesis No: 3.

There is no significant difference between the mean values on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Locality of the School

Table -3 't' values between the mean scores on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Locality of the School

Variables	Locality of the School	N	Mean	Std. Deviation	't' value
Socio Economic Status	Rural	138	75.78	7.53	1.97**
	Urban	62	78.03	7.35	
Academic Achievement	Rural	138	59.85	5.26	1.78**
	Urban	62	61.25	4.96	

** - Not Significant at 0.05 level

It is clearly seen from the table -3 the 't' values, 1.97 and 1.78 are not significant at 0.05 level. The result reveals that there is no significant difference between the mean values on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Locality of the School. Rural and Urban High School Students were found to be similar on the level of Socio Economic Status in relation to their Academic Achievement. Therefore the framed hypothesis is accepted.

Hypothesis No: 4.

There is no significant difference between the mean values on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Types of Family

Table -4 't' values between the mean scores on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Types of Family

Variables	Types of Family	N	Mean	Std. Deviation	't' value
Socio Economic Status	Nuclear family	150	74.81	6.58	5.87*
	Joint Family	50	81.49	8.01	
Academic Achievement	Nuclear family	150	59.05	4.49	6.36*
	Joint Family	50	63.98	5.46	

* - Significant at 0.05 level

From the above the Table- 4 shows that the 't' values, 5.87 and 6.36 are significant at 0.05 level. It is understood from the results that there is a significant difference among Nuclear family and Joint Family of High School Students of Socio Economic Status in relation to their Academic Achievement. Nuclear family of High School Students was significantly higher than the Joint Family of Socio Economic Status in relation to their Academic Achievement. Therefore the framed hypothesis is rejected.

Hypothesis No: 5.

There is no significant difference between the mean values on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Birth Order.

**Table -5 Mean scores on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Birth Order**

Variables	Birth Order	N	Mean	Std. Deviation	F- value
Socio Economic Status	1	80	76.04	7.03	0.79**
	2	113	76.95	7.96	
	3	7	73.84	5.61	
Academic Achievement	1	80	60.26	5.05	0.21**
	2	113	60.37	5.37	
	3	7	59.07	4.49	

Table -6 significant differences between Mean scores on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Birth Order

Variables	Birth Order	Sum of Squares	df	Mean Square	F
Socio Economic Status	Between Groups	89.59	2	44.79	0.79**
	Within Groups	11186.33	197	56.78	
	Total	11275.92	199		
Academic Achievement	Between Groups	11.20	2	5.60	0.21**
	Within Groups	5359.59	197	27.21	
	Total	5370.79	199		

** - Not Significant at 0.05 level

It is seen from the Table - 6 that the calculated F value of Socio Economic Status is 0.79 and Academic Achievement is 0.21. It is understood from the result that there is no significant difference on the level of Socio Economic Status in relation to their Academic Achievement among High School Students with respect to their Birth Order. Hence, the framed hypothesis is found to be accepted.

Findings of the Study

The findings of the present study are presented below. They are as follows

- ❖ The level of Socio-Economic Status and Academic Achievement among High School Students is above average.
- ❖ Male High School Students were significantly higher than the Female Students of Socio-Economic Status and Academic Achievement.
- ❖ Rural and Urban High School Students were found to be similar on the level of Socio-Economic Status in relation to their Academic Achievement.
- ❖ The nuclear family of High School Students was significantly higher than the Joint Family of Socio-Economic Status in relation to their Academic Achievement.
- ❖ The result that there is no significant difference in the level of Socio-Economic Status in relation to their Academic Achievement among High School Students with respect to their Birth Order.

Recommendations of the Study

- ❖ Children with low Socio-Economic Status should be sent to school regularly by their parents.
- ❖ Intelligence is an inherent quality. Given the environment and exposure, children with low Socio-Economic Status can also achieve higher educational attainment.
- ❖ Government should make special attention to children belonging to low Socio-Economic Status.
- ❖ This Similar facility at par with the private schools must be introduced in government schools. It will raise the standard of the learning process.

Suggestions for Further Study

- ❖ The present study was confined to the high school students, whereas, a similar attempt could be made to study among students of all levels of education Such as; Arts and Science Students, Technical college Students, and Higher secondary school students.
- ❖ The present study is restricted to only the Trichy district of Tamil Nadu. It could be extended to state/ nationwide by taking samples from other Districts/states, also.



- ❖ A comparative study could be undertaken to study Socio-Economic Status in relation to their Academic Achievement among High School Students.
- ❖ Although the study is restricted to only a few variables such as Socio-Economic Status and Academic Achievement efforts could be made in relation to other psychological variables such as; learning, personality, intelligence, motivation, personality traits, aptitude, interest, etc.,

CONCLUSION

One of the biggest problems with children in today's society is youth apathy. Parental involvement in school can help solve this problem by emphasizing the importance of a good education and getting their children excited about learning. For most children to succeed in school, their parent interest in their learning is of paramount importance. A lot of research work has been done to enhance the academic achievement of the students. However, children from low socio-economic backgrounds actually face the challenge. Male High School Students were significantly higher than the Female Students of Socio-Economic Status and Academic Achievement. And also, the Nuclear family of High School Students was significantly higher than the Joint Family. There is a similar level of socioeconomic status and their achievement in the locality of the students. For this present study, the investigator selected the topic of Socio-Economic Status in relation to their Academic Achievement among High School. The level of Socio-Economic Status and Academic Achievement among High School Students is above average.

REFERENCES

1. **Agarwal, Archana.** (2002). some correlates of Academic Achievement. *Indian Journal of Educational Research*, 21 (2), 75-76
2. **Aggarwal, Y. P.** (2009). *Statistical Methods: Concepts, Applications and Computation*. Sterling Publishers.
3. **Anilkumar,** (2008). *Research Methodology of Education*, AlFa Publication.
4. **Barry, J.** (2006). *The effect of socio-economic status on academic achievement* (Doctoral dissertation, Wichita State University).
5. **Best, John W.,** (2009), *Research in Education*, PHI Learning Private Limited.
6. **Best, John. W, and James V. Kahn,** (1989) *Research in Education*, Prentice-Hall.
7. **Bornstein, M.C., & Bradley, R.H.** (2003) *Socio Economic Status, Parenting and Child Development*. Mahwah, NJ: Lawrence Erlbaum.
8. **Buch, M.B.** (2002). *Fifth Survey of Educational Research*, NCERT Publication.
9. **Chakrabarti, S.** (1988). *A Critical Study Intelligence, Socio-economic Background of the Family, and Quality of Schools in Children of Standard V, A Case Study of some Schools in and around Pune*, Ph.D. Edu.
10. **Chandra, Soti Shivendra, Rajendra K. Sharma,** (2007), *Research in Education*. Atlantic Publishers and Distributers .
11. **Charles E. Skinner.** (2004). *Educational psychology* Prentice Hall.
12. **Chauhan S.S.,** (2007), *Advanced Educational Psychology*, 7th Edition, Vikas publishing house.
13. **Ganguly, Malabika,** (1989) Socio economic status and scholastic achievement. *Indian Educational Review*, 24(1), pp 84-94
14. **Kaul, L.** (2005). *Educational Research*. Vikas Publishing House,
15. **Koul Lokesh,** (1984). *Methodology of Educational research*, Vikas Publishing House.
16. **Kothari, C.R.** (2009). *Research Methodology*, New Delhi: New Age International (P) Ltd, 16-17
17. **Mangal, S.K.** (2002). *Advanced Educational Psychology*, Prentice Hall .
18. **Ranjith Kumar,** (2013). *Research Methodology*, Sage Publication.
19. **Robinson, Francis P, Sidney I Pressey, John E Horrocks** (1967). *Psychology in Education*, Universal Bookstall.
20. **Salunke, R.B.** (1978-83). *A Study of Home Environment, Socio-Economic Status And Economic Management In Relation To The Academic Achievement of The First Year College Students Of M.S. University, Baroda*. Third Survey of Research in Education, p. 685.
21. **Sirin, S.R.** (2005) Socio Economic Status and Academic Achievement: A Meta-analytic Review of Research. *Review of Educational Research* 75(3), 417-453
22. **Sharma, R.A.** (2005). *Fundamental of educational Psychology*, Surya Publication.
23. **White K.R.** (1982). *The relationship between socio economic status and academic achievement*, *Psychological Bulletin*, 91(3), 461-481
24. **Zebun Nisa Khan** (2005), 'Scholastic Achievement of Higher Secondary students in Science stream', *India Journal of Social Science* (92), 84-87

WEB SOURCES

25. <http://www.ijser.org/paper/Influence-of-Socio-Economic-Status-On-Academic-Achievement.html>
26. <http://www.teachthought.com/culture/10-theories-on-the-relationship-between-socioeconomic-status-and-academic-achievement>.
27. <http://www.ijser.org/paper/Influence-of-Socio-Economic-Status-On-Academic-Achievement.html>
28. <https://www.scribd.com/doc/228635581/APA-Style-and-Research-Report-Writing>
29. <http://www.eric.ed.gov>
30. <http://www.iosrjournals.org>



A GEOGRAPHICAL STUDY OF HEALTH CARE INFRASTRUCTURE AND MEDICAL FACILITIES IN AHMEDNAGAR DISTRICT, MAHARASHTRA, INDIA

Deepak Janardhan Gadekar¹, Mr. C. M. Bansode², Mr. Vijay Rajendra Sonawane³

¹Assistant Professor, Department of Geography, Padmashri Vikhe Patil College of Arts Science & Commerce, Pravaranagar A/P- Ioni Tal- Rahata, District- Ahmednagar, Maharashtra, India, 413713. Affiliated to Savitribai Phule Pune University Pune. <https://orcid.org/0000-0001-5561-4737>

²Assistant Professor, Department of Geography, Arts, Science & Commerce College Rahata, AtPost- Pimplas (Rahata), District- Ahmednagar

³Assistant Professor, Department of Geography Shri Saibaba College Shirdi, Tal- Rahata, District- Ahmednagar, Maharashtra, India,

ABSTRACT

Health is considered an important component of social welfare and human resource development. The availability of health alone cannot be considered a component of human development as health facilities need to be put to good use and their distribution needs to be in the right form so that people can use them easily. Proper distribution of health facilities and accessibility is a must as well as allocation with sync to threshold population and range of goods. In this research paper, it is important to study the extent to which health facilities have been developed between 2014 and 2019, as well as the distribution of these facilities. It has also studied the changes that have taken place in health facilities during this period. These studies have been done according to the talukas in the district.

KEY WORD: Health, Medical, Infrastructure, Ahmednagar, qualitative and quantitative methods.

INTRODUCTION

Geographical, socio-political factors affect human health facilities as well as distribution. Also this distribution is greatly affected by the population distribution, population density, and growth rate and transport connectivity. The accessibility of health facility is one of the parameters of social well-being to improve the quality of life in the region, is considered as the best indicator for better Planning and development. In short, health facilities and distribution are considered to be the good components of human resource development. Beside the availability of the Healthcare facility are important measurement of social well-being their distributional pattern affected the overall development of the people^[2]. Government Health Organization provide health facility to the masses but there unplanned location due to socio economic, cultural and political factor causes regional imbalance and inequality. Health facilities are considered to be one of the important socio-economic factors in regional development. For this, the health condition of the people in a region can be seen from the health facilities and health distribution. Availability of Health Care amenities and facilities may not be regarded as a good indicators of human resource development until and unless their proper distribution^[22, 23]. As well as accessibility and allocation with reference to size of population of settlements and range of good. Literacy, human density, population growth rate and human health are considered important factors for human resource development^[4, 5, 6, 7]. That population is the most important factor affecting human health facilities. Health care is an active process through which human health and personal well-being are enhanced. Good human health is considered important for economic development and growth. All these processes depend on three factors, firstly the environment, secondly human quality of life and health care facilities^[17]. Healthcare is considered to be an important factor for economic development. In short, healthcare is considered to be one of the factors affecting economic development^[8]. Birth rate and mortality rate of health facilities are recurring^[25]. Therefore, in this research paper, the objective of study is to distribute human health facilities. It is important to study how health facilities are distributed in the tehsil wise. This study has been done on the basis of statistical information from 2014 to 2019 and this study has been done by tehsil wise in the Ahmednagar district.

Study Area

The present study Ahmednagar district has been selected as a study area. It extends between 18° 20' and 19° 59' north latitudes and 73° 40' to 75° 43' east longitudes (Map.1) located in part in the upper Godavari basin. The district is very dense in shape and length of 200



km. a width of 210 km. This study region is divided into there are three physical divisions namely, first Sahyadri moutons ranges i.e. Kalsubai, Adula, Baleshwar and Harishchandragad, second Plateau third plains area. The Godavari, Bhima River is the main rivers in this district with the major tributaries are Paravara, Mula, Sina, Dhora, Kukdi ect.



Aims and Objective

The main objective of this study is evaluate the distributional pattern of health care facilities and Infrastructure in this study area. Also to study the changes in health facilities from 2014 to 2019.

Methodology

The study is based on the secondary information, the health care facilities and Infrastructure data collected from Zila Arthik Samalochan from 2014 and 2019. Obtained data have been analyzed based on both qualitative and quantitate methods. The use of bar graphs to convert numerical information into qualitative information makes it easier for you to compare and also shows the difference between 2014 and 2019.

Result and Discussion

The distribution of hospital, clinics, Maternity Home, Available Beds in shown Table no 01 is between 2014 to 2019 years wise. The distribution of health facilities is shown by tehsil wise.

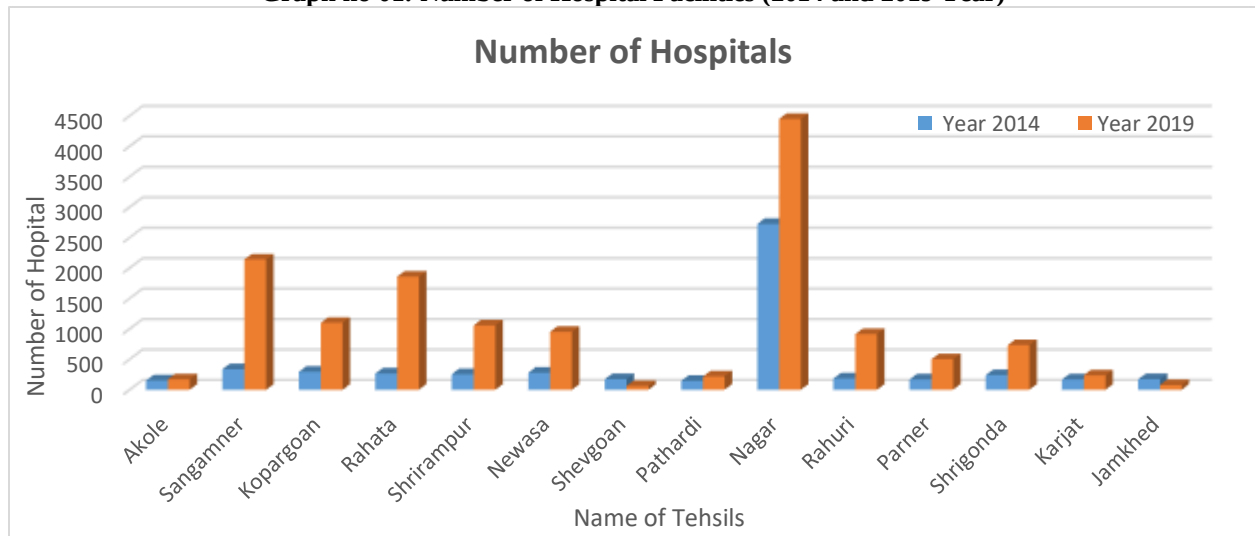
A) Hospital

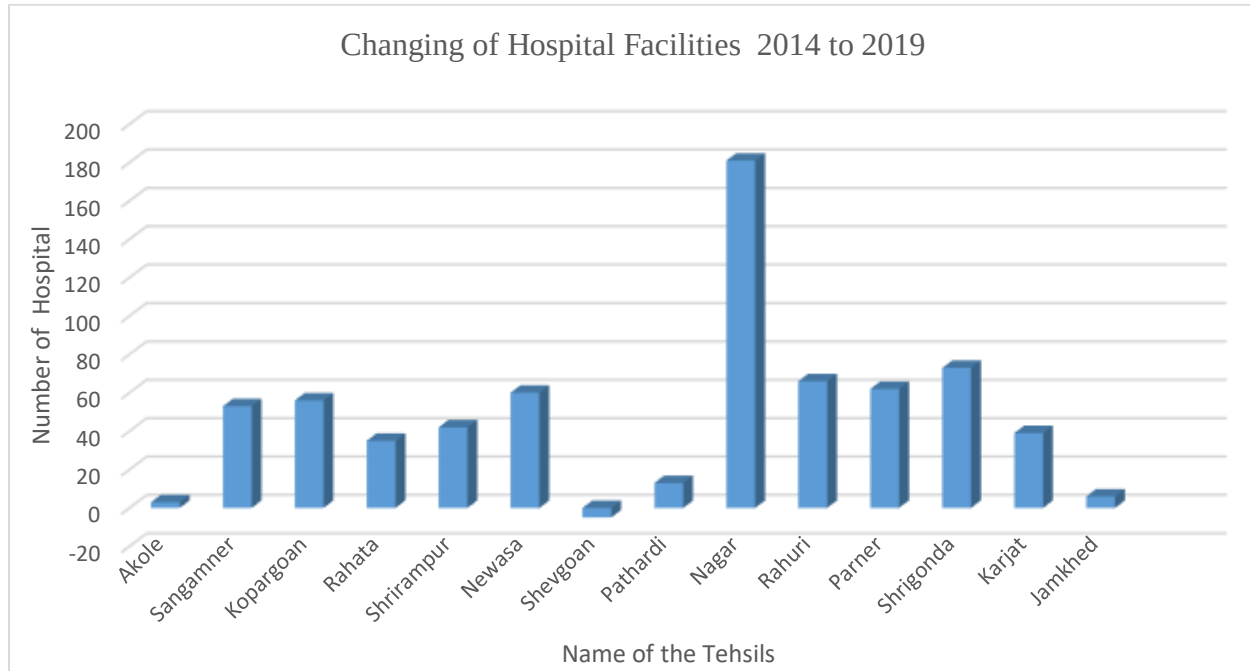
The number of hospitals in the entire Nagar district has increased from 390 in 2014 to 1074 in 2019 year. If you think about the whole tehsil wise, you can see that the number of hospitals has increased according to the tehsil wise. The observation of table no 01 and graph number 01, the number of hospitals in Nagar tehsil has increased the most in 2019, followed by Sangamner, Shrigonda, Kopargaon and Shrirampur tehsils. According to 2019 year, the lowest number of hospitals in Shevaga(13) as well as rank wise number of hospitals in Pathardi (24) Akole (24) and Jamkhed (26). From this it is clear that there is a relationship between the total population and the total availability of the hospital. In tehsil where the population is high, the number of hospital is more. For example, Nagar Tehsil is in urban area so the population is high and the number of hospitals is also high. The graph number two shows the change in the number of hospitals from 2014 to 2019. In Nagar tehsil of Ahmednagar district, you can see the highest increase in the number of hospitals in Nagar tehsil, followed by increase in the number of hospitals in Kopargaon tehsil, followed by positive change in Shrigonde and Karjat tehsils. The lowest positive change is in Akole, Akole, Pathardi, Jamkhed tehsils. Out of the remaining tehsil, the number of hospitals in these tehsils has increased less. Where there has been little change, it may not mean that the population has changed, or that large numbers of people may be moving to urban areas for health.

**Table no 01: Number of Health Facilities and Infrastructure**

Sr.no	Name the Tehsil	Number of health facilities and Infrastructure							
		Hospital		Clinics		Maternity Home		Available Beds	
		2014	2019	2014	2019	2014	2019	2014	2019
1	Akole	21	24	46	12	16	23	152	170
2	Sangamner	42	95	49	140	33	77	338	2140
3	Kopargoan	23	79	63	30	22	80	295	1099
4	Rahata	26	61	59	71	25	47	266	1859
5	Shrirampur	31	73	126	158	23	25	256	1056
6	Newasa	24	84	66	44	26	83	278	952
7	Shevgoan	18	13	67	04	16	13	173	61
8	Pathardi	11	24	49	54	11	24	146	218
9	Nagar	96	277	36	496	89	131	2723	4449
10	Rahuri	19	85	39	64	19	26	186	914
11	Parner	16	78	38	36	15	77	170	501
12	Shrigonda	24	97	36	46	25	84	241	733
13	Karjat	19	58	29	20	16	50	169	236
14	Jamkhed	20	26	28	07	18	26	173	76
15	Total	390	1074	1063	1182	354	766	5566	14464

Source: Zila Arthik Samalochan, 2014 and 2019

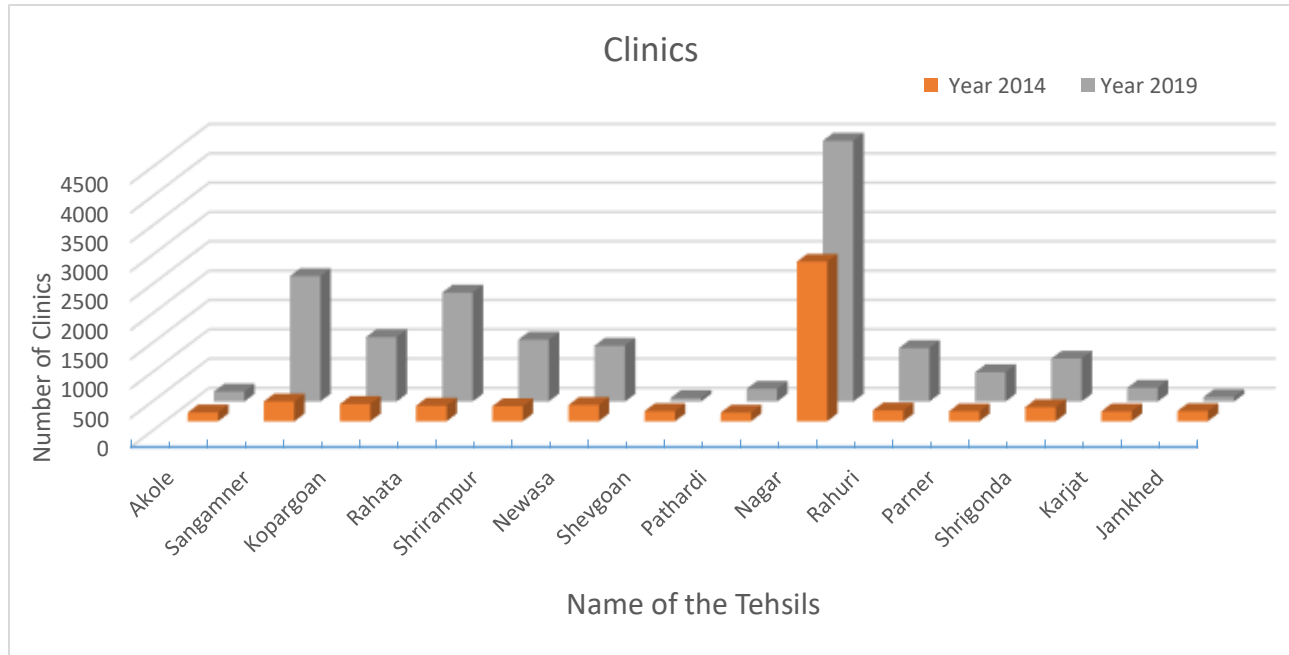
Graph no 01: Number of Hospital Facilities (2014 and 2019 Year)

**Graph no 02: Changing of Hospital Facilities (2014 -2019 Year)****B) Clinics:**

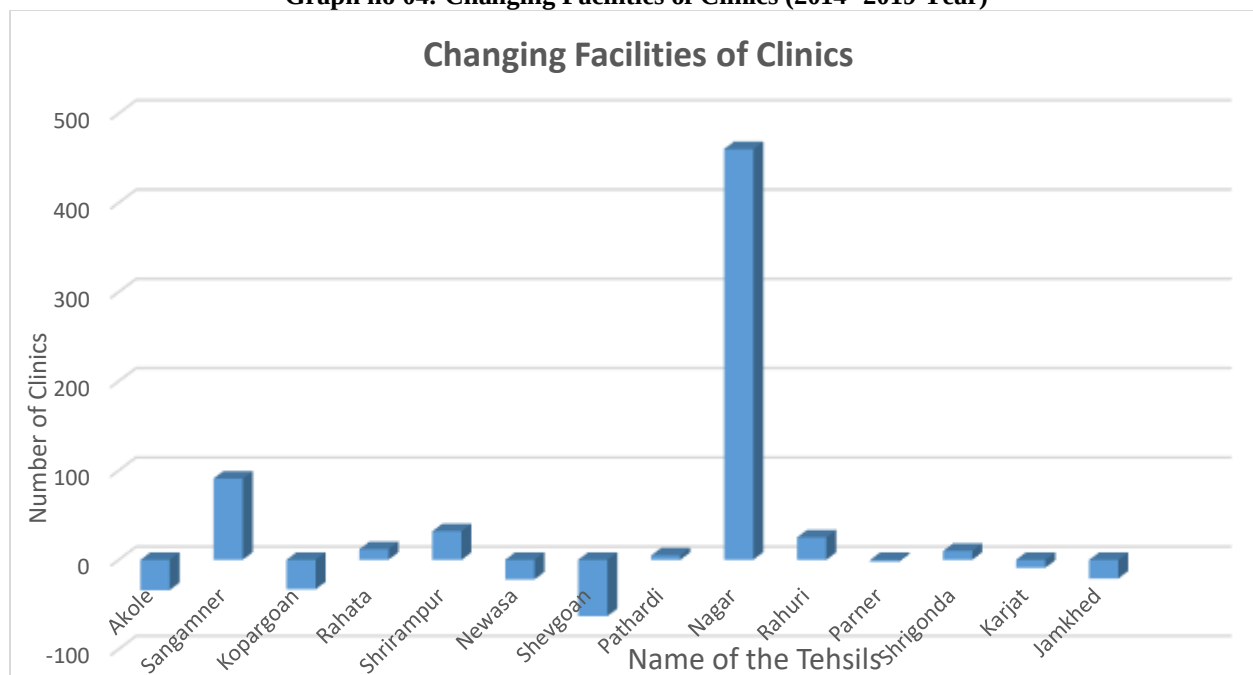
The government or co-operative clinics limitation to provide health facilities to the people, private clinics provide health facilities to a large number of people and play an important role in human resource development. In short, where there are difficulties in providing health services through government or semi-government hospitals, private hospitals contribute a lot or private hospitals provide services to the people. Table number one shows that Nagar tehsil has the largest number of clinics. The according to 2014 year shows that there were fewer healthcare services or fewer clinics in 2014 year than in 2019 year. In 2014 year, they said that the number was 1063 clinics, it was 2019 year, and it was 1182 clinics, which means that it has increased by 119 clinics dailies in 2019 year as compared to 2014 year. Graph No. 4 shows the study of the change of clinic from 2014 to 2019 years. Clinics decaling in Akole, Kopergaon, Shevgaon, Parner, Karjat and Jamkhed tehsils in 2019 than in 2014 year. Nagar tehsil has witnessed the most positive changes followed by Sangamner, Shrirampu,r Rahuri, Shrigonde tehsils. The number of clinics in these tehsils has increased by 2019. The most important reason is that in these tehsils the nature dispensaries should have different types of technology available so that people are attracted to these areas. You can see that the transport system as well as various geographical, socio-economic and political factors have affected the tehsils.



Graph no 03: Number of Clinics Facilities (2014 and 2019 Year)



Graph no 04: Changing Facilities of Clinics (2014- 2019 Year)

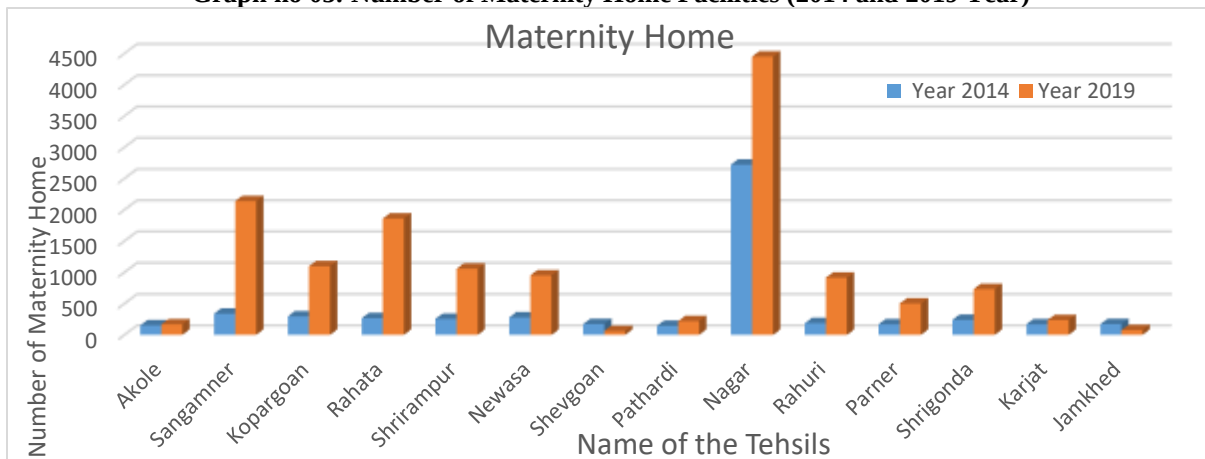
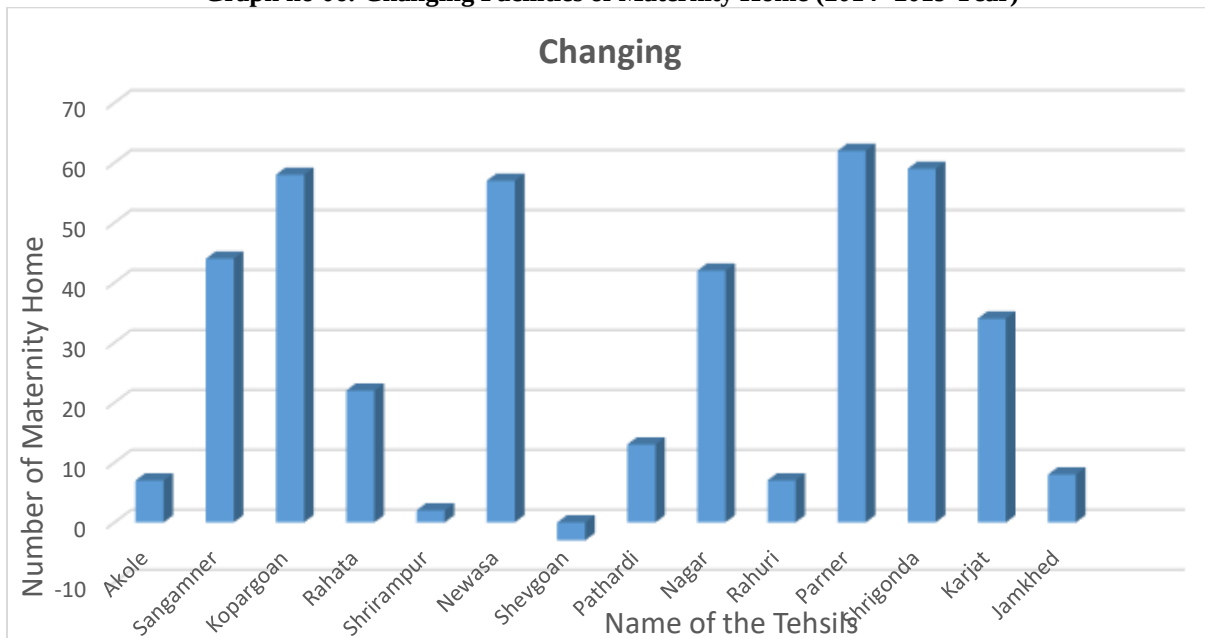


C) Maternity Home

Table number 01 and customer number 05 show the number of maternity home in the Nagar district. This shows that in 2014 year, Nagar tehsil (89) in Ahmednagar district had the highest number of maternity home facilities, followed by Sangamner (33), Nevasa

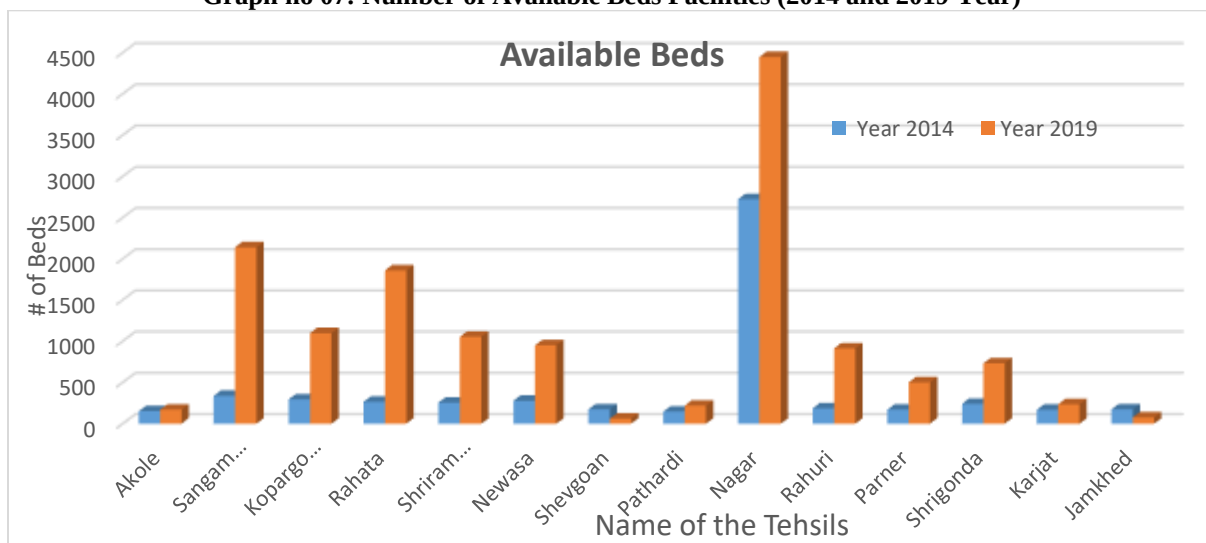
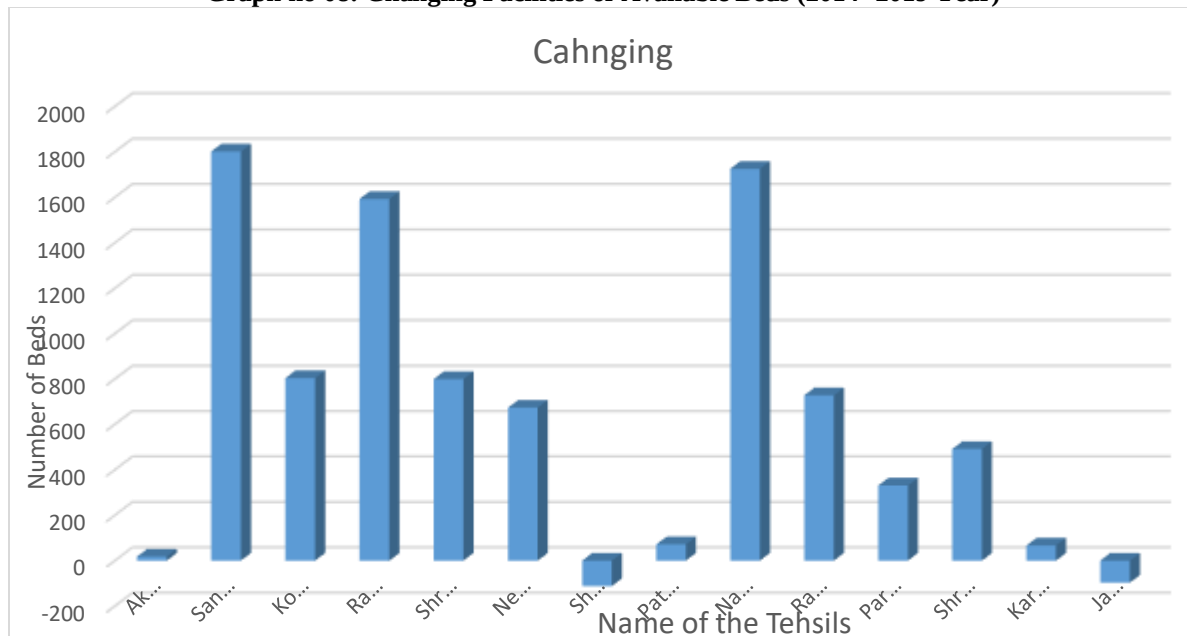


(26), Shrigonda (25) and Rahata (25). In the same year you see the lowest maternity home facilities in Pathardi (11) followed by Parner (15) and Akole (16) Shevgaon (16) Karjat (16) tehsils. But in 2019 year, you can see a huge increase in maternity home facilities in some tehsils. Considering the entire Ahmednagar district, in 2014 year there were 354 maternity home facilities and in 2019 year there were 766 maternity home, so you can see an increase of 412 maternity home. The highest number of maternity home are in Nagar tehsil (131) in the year 2019 year, followed by in Shrigonda (84), Nevasa (83) and Kopargaon (80). In the same year, the lowest maternity home facility is in Shevgaon tehsil (13) followed by, Akole (23) Pathardi (24), Shirampur (25) and Jamkhed (26). Graph number six shows the difference between maternity home between 2014 and 2019 years. You can see that the number of maternity home has increased in Parner tehsil in 2019 year. Then you can see that the number of maternity home has increased in Shrigonda, Kopargaon, Nevasa, Sangamner, Nagar and Karjat tehsils. But in 2019 year, it will be more than 50 maternity home facilities on average increasing in Kopargaon, Nevasa, Parner and Shrigonda tehsils. Also, Sangamner, Nagar, Karjat tehsils has increased the number of maternity home on 30 more than the average during the same period. But in maternity home, Shevgaon tehsil, you see less, in 2014 year, there are 16 facilities, and in 2019 year 13 maternity home, that is they appear to have three maternity home are decreased.

Graph no 05: Number of Maternity Home Facilities (2014 and 2019 Year)**Graph no 06: Changing Facilities of Maternity Home (2014- 2019 Year)**

**D) Available of Beds**

Table number 01 and graph number 07 show the number of beds available between 2014 and 2019 years. While there were 5566 beds in 2014 year, there are 14464 beds in 2019 year which means 8898 beds have been added in this entire districts. As per 2014 year, most time is available in the Nagar tehsil (2723), then you can see the number of beds available in all the Kopargaon (295) Shrigonda (241) and Sanganner(338) . In terms of population, you can see the lowest number of beds in Pathardi tehsil (146), followed by, Akole (152), Karjat (169) Parner (170) Shevgaon(173), Jamkhed(173) tehsils. As per 2019 year, the highest number of beds is in Nagar tehsil (4449), followed by Rahata (1859) Sanganner (2140), Shrirampur(1056) tehsil and Kopargaon (1099). Shevgaon tehsil (61) has the lowest availability of beds in terms of population, followed by Jamkhed (76) and Akole (170). Graph No. 08 shows the difference in the number of beds between 2014 and 2019 years. It is clear from this that you can see that the highest number of beds has increased in Sanganner tehsil followed by Rahata, Kopargaon, Shrirampur. The lowest increase of beds is in Akole Karjat and Pathardi tehsils. But in Shevgaon, Jamkhed and Karjat talukas, the number of beds seems to be less in 2019 than in 2014 year.

Graph no 07: Number of Available Beds Facilities (2014 and 2019 Year)**Graph no 08: Changing Facilities of Available Beds (2014- 2019 Year)**



CONCLUSION

2014 and 2019 years, this two years have been selected to study health facilities in Ahmednagar district. According to the statistics of 2014 and 2019 years, the health facilities in Ahmednagar district were less in 2014 but increased in 2019. However, you can see that all these facilities have increased in some tehsils. Considering the population, there are very few health facilities in Shevgaon, Jamkhed, Karjat, Shrigonda and Akole tehsils. You can find most of the health facilities in Ahmednagar district because of district place. Health facilities should be enhanced in Akole, Shevgaon, Karjat, Jamkhed, Pathardi and Parner areas so that development can take place in these tehsils.

REFERENCE

1. Ashok Hanjag, Priya Srihari and Rayamane, (2007) A Public Health Care Information System Using GIS and GPS: A Case Study of Shiggaon, GIS for Health and the Environment: Development in Asia Pacific Regions, 2 (7) Pp243-255 DOI: 10.1007/978-3-540-71318-0_18
2. Ateeque Ahmad and Md.Julfikar Ali (2010), Accessibility of Health Facilities in Malda District A Micro- Level Regional Planning, The Deccan Geographer 48(1) 9-17.
3. Devidas Dhondiram Dabhade (2022) Transport Network Analysis of Ahmednagar District, Maharashtra State, India International Journal of Food and Nutritional Sciences, 11(8) 2088- 2095.
4. Dibyendu Ghosh and Soumyananda Dinda (2017), Health Infrastructure and Economic Development in India, A volume in the Advances in Finance, Accounting, and Economics (AFAE) Book Series, Published in the United States of America by IGI Global, Pp 99-119.
5. Dighe Pradeep Machindra (2023) Physico-Chemical Parameter: An Indicator of Water Quality, Samdarshi 16 (4) 1155- 1160.
6. Gadekar Deepak J (2016), A Temporal Study of Human Resources Development in the Akole Tahasil", International Journal of Research, Vol. 3, Issue. 5, Pp 273-280., 2016.
7. Gadekar Deepak J (2017) Regional Disparities of Socio- Economic Development in Ahmednagar District, Maharashtra (India) , International Journal of Recent Research and Applied Studies 4 (5), 30-36
8. Gadekar Deepak J (2018), Level of Human Resources Development in the Akole Tahsil District- Ahmednagra Maharashtra". Unpublished Ph. D Thesis, Savitribai Phule Pune University.
9. Gadekar Deepak Janardhan (2016) Regional Disparities of Agricultural Development in Ahmednagar District, MS, India, International Journal of Research in Social Sciences, 6(8), 389-403.
10. Giri Sanjay Pralhad (2020), Level of Development In Tribal Area-A Case Study of Akole Tehsil, Ahmednagar District, Maharashtra State, India. Mukht Shabd Journal, Volume IX, Issue VIII Pp 297-306
11. Jabir Hasan Khan, Nisar Ahmed and Shamshad (2013), A geographical Analysis of Availability of Amenities in Scheduled caste Households in India, American International Journal of Research in Humanities, Arts and Social Sciences, 4(1) 56-65.
12. Jafar Aghajani (2017) Impact of geographical information system on public health sciences, Biomedical and Biotechnology Research Journal (BBRJ) | Published by Wolters Kluwer – Medknow 1(2) 94-100. DOI: 10.4103/bbrj.bbrj_34_17
13. Joseph Maina and Paul O. Ouma (2019) A spatial database of health facilities managed by the public health sector in sub Saharan Africa, Scientific Data 6 (134) Pp 1-8 doi .o rg/ 10 .10 38/s41597-019-0142-2
14. Kalpana Vamanrao Palghadmal (2022) Variation of Flora in Ahmednagar District, Maharashtra, India, International Journal of Food and Nutritional Sciences, 11(11) 73-78
15. Kharde M. N (2022) Agricultural area and Food Nutrition in Akole tehsil, Ahmednagar District of Maharashtra State, India, India International Journal of Food and Nutritional Sciences, 11 (11) 1067-1076
16. Koutelekos J., Geographic Information Analysis And Health Infrastructure, Health Science Journal, 3
17. M.E. Shejul (2020) Temporal Analysis of Human Resources Development (HRD) in Pathardi Tehsil of Ahmednagar District, Maharashtra State, India, International Journal of Scientific Research in Multidisciplinary Studies Vol.6, Issue.8, pp.34-38
18. Mulla I.A (2014), Health care infrastructure and medical facilities, A case study of Haveri District, Indian Streams Journal, 4(2) Pp 1-5.
19. P.H Mhaske et al.(2011), Land Use & Economic Activity in Shirdi. Rahata Taluka, District Ahemadnagar M.H, International Referred Research Journal, Research analysis and Evaluation, Vol. 2, Issue.18, pp.75-76,
20. Pandit Anand P , Aher A.B and karale M.R (2013), Analytical study of social amenities and Rural Development – A case study in Shrigonda Tahsil of Ahmednagar District (M.S.) Indian Streams Journal, 3(1) Pp 1-12
21. Rede H.N(2012), A study of spatial distribution of health care facilities Osmanabad District, Indian Streams Journal , 2(11) Pp 1-6.
22. Rounaq Basu and Arnab Jana (2016), A Health Care Facility Allocation Model for Expanding Cities in Developing Nations: Strategizing Urban Health Policy Implementation, Appl. Spatial Analysis, Springer Science+Business Media Dordrech. DOI 10.1007/s12061-016-9208-0
23. S.D Gulave (2020), "Use of Landsat ETM+ Data for Delineation of Vegetation Cover Area in Akole Thasil", International Research Journal of Engineering and Technology, Volume 7, Issue 2, pp.57-61.
24. Salunkhe J.B, Kalgapure and Salunkhe (2013), Medical Facilities in solapur District, Indian Streams Journal, 3(11) Pp 1-3.



25. Shanmathi Rekha et.al (2017) Accessibility Analysis of Health care facility using Geospatial Techniques, *Transportation Research Procedia* 27, 1163–1170
26. Shejul M. E et al., (2020) "A Geographical Study of Human Resources Development in Ahmednagar District, Maharashtra, India". *EPRA International Journal of Multidisciplinary Research*, vol., 6 Issue. 03 pp 86-93. doi.org/10.36713/epra4116
27. Shejul M. E, "Level of Human Resources Development - A Conceptual and Review Exposition", *International Journal for Research in Applied Science & Engineering Technology*, vol.8, Issue 03, pp.687-691. 2020.doi.org/10.22214/ijraset.2020.3130
28. Sonawane V. R. et.al.(2020), "A Geographical Study of Crop Combination in Tribal Area of Nashik District, Maharashtra, India". *Studies in Indian Place Names*, Vol., 40 Issue 3, pp.3915-3940.
29. Sonawane V. R. et.al.(2020), "Analysis of Chemical Properties of Soil under Sugarcane Crop: A Case Study of Khandala, Shrirampur, Ahmednagar District, Maharashtra State, India". *Our Heritage* Vol. 68, Issue, 30, Pp.6522-6547.
30. Vasudev S Salunke et.al. (2020) Application of Geographic Information System (GIS) for Demographic Approach of Sex Ratio in Maharashtra State, India, *International Journal for Research in Applied Science & Engineering Technology*, 8(11) Pp 259-275. [doi. Org /10.22214/ijraset.2020.31722](https://doi.org/10.22214/ijraset.2020.31722)



BIOGRAPHY AND SCIENTIFIC HERITAGE OF WAHBA ZUHAYLI

Sirojiddin SHODMONOV

Graduate Student, International Islamic Academy of Uzbekistan

ABSTRACT

The article provides information about the life of Syrian scholar Wahba Zuhayli, who was mujaddid of his time, sheikh, professor, and doctor. Also, the scholar's family, his discipline in learning, his parents and teachers who contributed immeasurably to the formation of his personality, the students he brought up, his scientific activities, his works on the Qur'an, fiqh, usul al-fiqh, aqeedah, the history of Islam, and scientific works covering modern issues were discussed.

KEYWORDS: *Damascus, Mustafa Zuhayli, Fatima bint Mustafa, Wahba Zuhayli, Lebanon, Zahlah, College of Sharia, Azhar, Ayn ash-Shams, Qur'an, hadith, fiqh, usul al-fiqh, Islamic history, international law, jurisprudence, metaphysics, coference.*

MAIN PART

Wahba Zuhayli was born in 1932 in Diyar Atiyya, Damascus (Hasanov Ulughbek, 2023:81; Dr. Jasim Mutawwi, 2012).

The origin of the nisbah "Zuhayli" in the name of Wahba Zuhaili also has its own history, which goes back to the famous city of "Zahlah" in Lebanon, where the great-grandfathers of the scholar used to live. (Dr. Jasim Mutawwi', 2012). Grandfathers of Wahba Zuhayli left that city and came to a town called Diyar Atiyya in Syria. The Zuhayli family was attributed to their homeland to (Dr. Jasim Mutawwi', 2012).

His father, Mustafa Zuhayli (may God have mercy on him), was engaged in farming and commercial work. In addition to Wahba Zuhayli, he had four more children, two older brothers of Zuhayli - Tawfiq and Mahmoud - died. He also has two brothers named Muhammad and Ahmad (Hasanov Ulughbek, 2023:81).

The scholar's mother, Fatima bint Mustafa, despite being an uneducated, was very loving, simple, virtuous woman who followed all the guidelines of the Sharia. (Sayyid Lahham, 2006:12).

It can be seen that Wahba Zuhayli started his first education in his homeland, in a traditional way, near his father's house, learning the Qur'an, and he finished memorized the Qur'an perfectly with tajwid (Hasanov Ulughbek, 2023:81).

Then, with his mother's interest, he started studying in high school. Before moving to Syria, he studied primary school here - in his hometown and finished school here (Hasanov Ulughbek, 2023:81; Sayyid Lahham, 2006:12; Dr. Jasim Mutawwi', 2012).

After graduating from school, he came to Damascus in 1946 and entered the "Theological Sciences" department of the madrasa called "Sharia College" in Damascus, which was considered the only official scientific school in Syria at that time (Sayyid Lahham, 2006:14). Then he continued his education here and his studies here will lasted six years (Dr. Jasim Mutawwi', 2012). After six years of study, Zuhayli graduated from the Sharia College in Damascus in 1952 (Hasanov Ulughbek, 2023:81).

After Wahba Zuhayli finished his studies in Damascus, in early 1953, he went to Al-Azhari University in Egypt, where he studied for five years. In addition to studying at Al-Azhar, Wahba Zuhaili was also studying law at Ayn ash-Shams University. (Hasanov Ulughbek, 2023:81; Dr. Jasim Mutawwi, 2012).

In 1956, he completed his studies at Al-Azhar with excellent grades and, along with the Al-Azhar diploma, he also received an Ijaza (license-certificate) for the specialty of teaching at the "Sharia and Arabic language" faculty of Azhar. In 1957, he received the diploma of the Ayn ash-Shams university in the field of "Law" (Sayyid Lahham, 2006:14; Hasanov Ulughbek, 2023:82; Dr. Jasim Mutawwi', 2012). Then, in 1959, he went to the Faculty of Law of Cairo University, where he studied for two years in the field of "Islamic Shari'a" and received a master's degree. After receiving diploma, in 1963, in the second month of the same year, he finished his doctoral dissertation on the comparison between eight sects (four Sunnis and four Shiites) (Sayyid Lahham, 2006:14; Dr. Jasim Mutawwi', 2012). In return for his steadfastness in fulfilling his commitments, he benefited greatly from Islamic Shari'a



and legal sciences, and wrote his doctoral dissertation on the basis of comparing and contrasting the knowledge he received from these three universities (Dr. Jasim Mutawwi', 2012).

On February 13, 1963, Wahba Zuhayli presented his doctoral dissertation to the Supreme Committee. After defending his doctoral dissertation under the scientific advice of famous scholars such as Muhammad Abu Zahra and Muhammad Hafiz Ghanim, he was awarded the academic title of "First degree" and it was decided that the doctoral diploma of Wahba Zuhayli would be transferred to other universities. (Dr. Jasim Mutawwi', 2012).

Wahba Zuhayli had the good fortune to be a student of the great scholars of Egypt in both Sharia and modern legal sciences. When he was a student after going to study in Egypt in early 1953, he witnessed all the terms of the unity agreement between Egypt and Syria, the many negative and positive situations that happened during the ten years after the separation (Dr. Jasim Mutawwi', 2012).

Wahba Zuhaili started his career after studying in Damascus. Researcher Ulughbek Hasanov states that he started his career as a teacher in Damascus in 1963, as an assistant teacher in 1969, and as a general teacher in 1975 (Hasanov Ulughbek, 2023:82).

Wahba Zuhaili started teaching at Damascus University in 1963, and in 1975 he received the degree of professor at this university. Because Wahba Zuhaili wanted to serve as much as possible, he spent sixteen hours a day teaching students, writing scientific works and serving the Islamic community (Doctor Wahba Mustafa Zuhayli islam.uz 03.05.2014). In addition to the University of Damascus, Wahba Zuhayli studied at the Faculty of Law of Benghazi University in Libya (1972-1974), and at the Faculty of Sharia Law of the United Arab Emirates University (1984-1989). He gave lectures as a professor at Riyadh Islamic University. Dr. Wahba Zuhayli also taught Islamic jurisprudence to researchers in Sudan, Pakistan and other countries.

The scholar worked in many other positions, and it is appropriate to briefly mention them below:

1. Chairman of the "Islamic jurisprudence and sects" department at the Faculty of Sharia of Damascus University;
2. Representative of the "Sharia" Faculty of Damascus University, then dean for four years (1967-1970);
3. Chairman of the "Sharia Monitoring" committee of Islamic banks in Arab institutions, member of the "Shariah Assembly" of Islamic banks;
4. Chairman of the "Islamic jurisprudence and sects" section;
5. Member of fiqh academies in Mecca, Jeddah, India, America, and Sudan;
6. Chairman of the "Islamic Sharia" department of the Faculty of "Sharia and Law" at the University of the Arab Emirates, then dean for a period of four years;
7. Founder of "Sharia and Law" journal at the University of the Arab Emirates;
8. Chairman of the "Manuscripts" board and the "Higher culture" board of the university in the Arab Emirates;
9. Member of the "Islamic Culture Research Center" academy at the "Aal al-Bait" institution in Jordan;
10. Supervision of more than seventy master's and doctoral dissertations in the cities of Damascus, Beirut, and Khurtum;
11. Leadership in the development of textbook programs in Syria and the Arab Emirates;
12. In 1988, the organizer of the journal "Sharia and Islamic knowledge" at Kuwait University;
13. The author of the broadcasts "Qur'an and Life" based on the interpretation of the Qur'an on Syrian radio (Hasanov Ulughbek, 2023:82-83);
14. Appearing on television channels of Damascus, Emirates, Kuwait, Saudi Arabia, and other countries and interviews in newspapers and magazines of these countries;
15. Member of the editorial board of the "Islamic Program" journal in Damascus;
16. Chairman of the Board of "Sheikh Abdulkadir School" office in Diyar Atiyya;
17. Imam Khatib of the "Uthman" mosque in Damascus and the "Iman" mosque in Diyar Atiyya;

Wahba Zuhayli wrote many scientific works. The number of works of the scholar is more than fifty (Sayyid Lahham, 2006:45).

Wahba Zuhaili had deep respect for the Arabic language and literature in his academic career, and wrote his works in Arabic. The scholar wrote many works in fiqh, hadith, tafsir, qira'at, usul-fiqh, kalam, mysticism, history, and other such fields.

Wahba Zuhaili's works are distinguished by their attractiveness, usefulness, easiness, simple language, and scientificity (Shawkani, 1909:89). The classification of the scholar's works on various sciences is given below:

The scholar's works related to Quranic sciences are the following:

1. *"Tafsir al-Munir fil-aqida wash-sharia wal-manhaj"*. This work consists of 32 volumes and was published in 16 volumes in 1991 by "Fikr" publishing house. This tafsir has been published seven times till date. It has been translated into several languages, including Turkish, Persian, Malay, Urdu, and French. The scholar is one of the few scholars who performed this type of service, as he has interpreted the Holy Qur'an on Syrian TV and radio channels for eight years based on this work. Also, this work was published under the names *"Tafsir al-wajiz"* in 1 volume and *"Tafsir al-wasit"* in 3 volumes (Dr. Wahba Mustafa Zuhayli islam.uz 03.05.2014; Hasanov Ulughbek, 2023:84-87).
2. *"Wajiz fi usul al-fiqh"*. This work was published in Libya in 1991. It was translated into Turkish.
3. *"Qissa al Qur'aniyya: hidaya wal-bayan"* was published in Libya in 1992 by "Khayr" publishing house.
4. *"al-Qur'an al-Karim: bunya tashri'i wa khasais hadariyya"*. This work has been translated into English and French. It was published in 1992 by "Fikr" publishing house.
5. *"Ilm al-I'jaz fil-Qur'an al-karim"* was



published in 1997 by "Maktaba" publishing house. 6. "Ayyamiyyat al-Qur'an al-Karim" was published in 2000. 7. "Qira'at muasira fil-hadis al-nabawi" was published in 2000 (Hasanov Ulughbek, 2023:84-87.; Dr. Jasim Mutawwi', 2012).

Some of the scholar's works on Fiqh science are as follows: 1. "Athar al-harb fil-fiqh al-islami". This book is considered a work of comparative analysis. It was translated into French. It was published in 1382/1963 in "Hadith" publishing house in Syria. This work has been published four times by "Fikr" publishing house. 2. "Wasit fi usul al-fiqh". It was published in 1966 in the publishing house of Syrian University. 3. "al-Fiqh al-Islami fi uslubih al-jadid". This two-volume work was published in 1966-1967 by "Hadith" publishing house in Syria. 4. "Al-alaqa ad-duwaliyya fil-Islam". In this treatise, Islamic rules are compared with state laws. It was published in Beirut in 1981 by "Risala" publishing house. 5. "al-Fiqh al-Islami wa adillatuhu" ("Islamic jurisprudence and its evidence"). This work was published in eight volumes in 1984 in "Fikr" publishing house in Syria. To date, it has been published twenty-four times. 6. "Usul al-fiqh al-islami". This work was published in two volumes in 1986 in "Fikr" publishing house in Syria. It has been published three times to date. 7. "Fiqh al-mawarith fi shariat al-islam". He wrote this work in co-authorship with Professor Muhammad Raf'at Uthmani and Professor Ramadan Sharanbashi. It was published in 1987 at the "Fikr" publishing house in Syria. 8. "Ahkam al-ibadat". This book was taught as a textbook in the "Sharia" faculty of the United Arab Emirates University. Published in 1988 by "Kalam" publishing house. 9. "Mu'amalat maliyya 'ala al-madhab al-malikiyya". It was published in 1991. 10. "al-Dawlat al-Islamiyya wa ghayr al-muslimin". It was published in 1995 by "Maktaba" publishing house. 11. "Ijtihad al-fiqh al-hadith". It was published in 1997 by "Maktaba" publishing house. 12. "Fiqh as-sunna an-nabawiyya". It was published in 1997. 13. "Manahij al-ijtihad fil-madhab al-mukhtalifa" was published in 1997. 14. "Ahkam al-harb fil-Islam wa khasaisuha al-insaniyya". It was published in 2000. This book has been translated into French.

Wahba Zuhaili was a regular participant of conferences and symposia. The scholar constantly participated in such events in order to reveal the essence of Islam in a deeper way. He himself told the audience about it: "Whether it is Washington, London or Paris, if I was invited, I did not miss a conference in any country, but tried to fulfill my obligation in that conference, to make people know that Sharia's rulings are the most correct rulings. I contributed to make them understand how to live with the rulings of Islamic Sharia" (Dr. Jasim Mutawwi', 2012).

Author of many books, treatises, and scientific works, prominent scholar of his time, Wahba Zuhayli died on August 8, 2015 in Damascus, Syria.

REFERENCES

1. Hasanov Ulughbek (2023). Wahba Zuhayliy ilmiy faoliyati va asarlarining tasnifi. "Islom ma'rifati" journal, Tashkent Islamic Institute named after Imam Bukhari. Tashkent: Muharrir. 2nd edition.
2. Imam Sadiq (1957). Al-Ahwal al-shakhsyya. Cairo: Dar al-Kutub.
3. Sayyid Lahham (2006). Al-Ulama wal-mufakkirun. Beirut: Dar al-Kutub. – P. 12.
4. Shawkani (1909). Badr al-tali'. Cairo: Dar al-Kutub al-Islami.
5. Shaykh Muhammad Sadiq Muhammad Yusuf (2015). Ulumul-Qur'on. Tashkent: Hilol Nashr.
6. Wahba Zuhayli (2006). Tafsir al-Wajiz 'ala Hamish al-Qur'an al-'Azim. Beirut: Dar al-Kutub.
7. Dr. Jasim Mutawwi's interview with Wahba Zuhayli in the "Hadis adh- dhikrayaat" ("Memory Conversations") program aimed at illuminating the life paths and scientific activities of "Ulama' al-mubdi'un" ("Creative scholars") (2012) – <https://youtube.com/@drajsemtv?si=vnUls5CKdJykVZGXN> حديث الزكريات وهبة الزحيلي.
8. <https://islommoliyasi.uz/uz/shayx-Wahba-mustafaz-zuhayliy-rohimahulloh/> 28.06.2021



A STUDY ON ROLE OF COMMERCIAL BANKS IN ECONOMIC DEVELOPMENT OF INDIA

Sanjeet Kumar Sah¹, Prof. (Dr.) Md. Mahmood Alam²

Research Scholar¹, Department of Economics, D. S. College, Aligarh, DBRAU, Agra, U.P.

Professor², Department of Economics, D. S. College, Aligarh, U.P.

ABSTRACT

A nation's economic development depends heavily on banks. The role that banks have historically played in the economics of the nation is significant. They have a significant impact on how the economy and trade grow. They serve not just as the nation's wealthy custodians but also as its resources, which are essential to a country's ability to flourish economically. Commercial banks' primary responsibility is to offer the general public and business with financial services that promote social and economic stability as well as steady economic growth. The State Bank of India (SBI) and its affiliates, nationalised banks, foreign banks, other scheduled commercial banks, regional rural banks, and non-scheduled commercial banks are all considered to be commercial banks in India. More than 50,000 commercial banks have locations nationwide, and there are about 8,000 regional rural banks that serve 280 districts. Small-scale businesses can sometimes receive medium-term financial help from commercial banks in addition to short-term loans. A nation's economic development depends heavily on banks. "They pool the dormant savings of individuals and provide avenues for investment. Furthermore, they create fresh demand deposits through lending and purchasing investment tools. The underlying data serve as the groundwork for a study exploring the role of commercial banks in fostering economic growth. The main focus of this research is to assess and analyse the influence of commercial banks on the development of India's economy. The study also illustrates how credit and loans impact India's GDP and, in turn, its rate of economic growth.

KEYWORD: *Commercial Bank, Development, Growth, GDP*

INTRODUCTION

A commercial bank is a type of bank that provides services such as accepting deposits, lending loans, and investing assets. The customer's short-term and long-term needs are met by a broad range of formal institutional organisations, including cooperative banks, regional rural banks, scheduled commercial banks, non-banking financial institutions, and self-help groups (SHGs), among others. If a country's banking system is functional, efficient, and conservative, commercial banks play a significant and active part in its economic development. Agrarian India is a nation. The foundation of each nation's economy, including India, is agriculture. Public and private banks are currently actively engaged in numerous manufacturing and agribusiness-related businesses. The banking sector's function has undergone notable transformation due to the liberalization, privatization, and globalization (LPG) policies. Since Independence, the operations of commercial banks in India have experienced rapid expansion. Both territorial and functional concepts exist. expansion of the bank's operations.

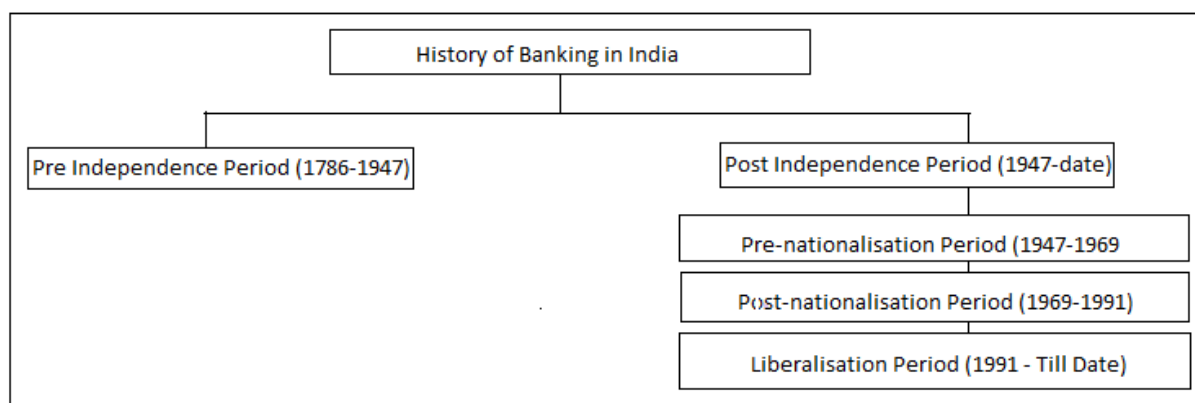
Traditional and conservative banks have emerged from their shells to take on the problems of planned economic growth. Commercial banks in India have recently begun to focus on non-traditional industries. Only by looking back at the position of commercial banks before nationalisation is it possible to gain a better grasp of the ramifications of financing the nonconventional sector by commercial banks. Before nationalisation, there was banking in India. "Commercial banks are entities that commonly accept deposits from customers and extend loans. In India, these institutions are regulated under the Banking Regulation Act of 1949 and are referred to as commercial banks. Commercial banks in India may be categorized as scheduled or unscheduled based on certain criteria."

According to the Reserve Banks of India Act of 1934, "A Scheduled Bank is that bank which has been included in the second schedule of the Reserve Bank," the Banking Regulation Act (BR Act), 1949 states in Section 5(c) that "a banking company is a company which transacts the business of banking in India." A commercial bank is a type of financial organisation that handles all transactions involving public money deposits and withdrawals, lending money for investments, and other similar activities. These banks are profit-driven entities that function exclusively to generate financial profits. Lending and borrowing are a commercial bank's two main qualities. The bank accepts deposits and disburses funds to various initiatives so that interest (profit) can be earned. The borrowing rate is the interest rate that a bank charges its depositors, whereas the lending rate is the interest rate at which a bank extends credit

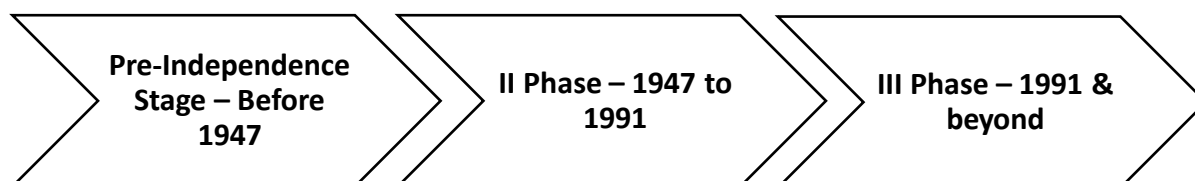


History of Banking in India

In the 18th and 19th centuries, several European and Indian banks were established, such as the Bank of Hindustan (1770), General Bank of India (1786), and Bank of Bengal (1806). These banks primarily catered to the needs of European traders and colonial administrators. "The 19th century saw a consolidation of banking activities with the founding of three presidency banks: the Bank of Bengal (1806), the Bank of Bombay (1840), and the Bank of Madras (1843). These banks played a vital role in facilitating trade and commerce in British India. The establishment of the Reserve Bank of India (RBI) in 1935 marked a significant milestone in India's banking history. As the central bank of the nation, the RBI was entrusted with regulating the banking sector and crafting monetary policies to ensure financial stability. Following independence, the Indian government nationalized major banks in two phases (in 1969 and 1980) to promote social welfare and economic development. This initiative aimed to expand banking services to rural and underserved regions, thereby promoting inclusive growth. As per the Banking Companies Act of 1949, Banking is defined as, A financial institution which accepts deposits for the purpose of lending or investment from the public, repayable on demand or otherwise and with drawable by cheque draft, order or otherwise.



Three Stages of Indian Banking



Pre-Independence Stage - Before 1947: - There were almost 600 banks present in India before independence. The first bank to be established as the Bank of Hindustan was founded in 1770 in Calcutta. It ceased operations in 1832. Oudh Commercial Bank holds the distinction of being India's inaugural commercial bank in its banking history. Several other banks established in the 19th century, including Allahabad Bank (Established in 1865) and Punjab National Bank (Established in 1894), have endured and continue to operate today. Meanwhile, institutions like the Bank of Bengal, Bank of Madras, and Bank of Bombay, founded in the early to mid-1800s, amalgamated to form the Imperial Bank, eventually evolving into the State Bank of India.

II Phase – 1947 to 1991: - Following independence, the trajectory of India's banking system largely remained unchanged. However, in 1969, the Government of India made the decision to nationalize banks under the Banking Regulation Act of 1949. A total of 14 banks, including the Reserve Bank of India (RBI), were nationalized. In 1975, the government recognized the financial exclusion faced by several groups. Between 1982 and 1990, it established specialized banking institutions to align with the evolving financial landscape in India. These included NABARD (1982) to support agricultural activities, EXIM (1982) to foster export and import trade, the National Housing Board for financing housing projects, and SIDBI to provide funding for small-scale industries.

III Phase – 1991 & beyond: - Beginning in 1991, the Indian economy underwent a profound transformation. The government opened its doors to private investors, inviting them to invest in India. The Reserve Bank of India (RBI) granted approval to ten private banks during this period. Some notable names that emerged from this era of liberalization and continue to thrive today include HDFC, Axis Bank, ICICI, DCB, and IndusInd Bank. In the early to mid-2000s, two more banks, Kotak Mahindra Bank (established in 2001) and Yes Bank (established in 2004), obtained their licenses. Additionally, IDFC and Bandhan banks were granted licenses in the years 2013-14.



Evolution of Banking



LITERATURE REVIEW

The Hindu (2022) according to a report by senior officials including the Governor, Deputy Governor, and other executives of the apex banking regulator, the Reserve Bank of India (RBI), convened with Managing Directors (MD) and Chief Executive Officers (CEOs) of both public and select private sector banks. They acknowledged the significant role played by private commercial banks in supporting economic growth amidst the pandemic and ongoing financial market challenges. The Governor emphasized the importance for banks to remain vigilant amid evolving macroeconomic conditions, including global influences. Discussion topics encompassed concerns such as slower growth in deposits compared to credit expansion, asset quality issues, and the adoption of modern technological solutions, among others.

Tiwari, V. (2020) Study this paper on “Role of Commercial Banks in Economic Development of India” Banks play a crucial role in a country's economic development by accumulating savings from individuals and directing them towards capital growth and entrepreneurship. This facilitates investment in various projects, contributing to overall economic growth. The agricultural and industrial sectors, being major employers and GDP contributors, rely heavily on financial institutions, especially banks, for their development. Additionally, exports are vital for bringing in foreign currency, and commercial banks play a significant role in supporting this sector through financing and currency transactions. Furthermore, commercial banks aid in combating the parallel economy and curbing illicit transactions by periodically conducting campaigns to uncover unreported income. Overall, this study underscores the importance of commercial banks in fostering economic growth.

Manish, M. K. (2020) this paper study on “The Role of Commercial Banks in Economic Growth in India: A Perspective Study.” Banks have long been essential components of national economies, playing a pivotal role in nurturing industry and commerce. They function as crucial catalysts for economic progress, supporting the accumulation of wealth and serving as fundamental pillars for national development. In India, commercial banks such as the State Bank of India (SBI), nationalized banks, foreign banks, and regional rural banks offer financial services to individuals and enterprises, ensuring economic stability and sustainable advancement. With a network spanning over 50,000 branches and 8,000 regional rural banks nationwide, commercial banks primarily extend short-term and, in some cases, medium-term financing to small-scale businesses, catering to their financial requirements through specialized units. Given the paramount importance of agriculture in India's economy, the study concentrates on examining the role



of commercial banks in facilitating economic growth through lending and credit, with a specific focus on their influence on Gross Domestic Product (GDP) and broader economic progress.

Subbareddy, K. (2020) research aim to “An Empirical Study on Role of Commercial Banks on Issuing Loans and Advances in Selected Areas: Impact on Economic Growth in India” Commercial banks play a vital role in a nation's progress by mobilizing financial resources to bolster diverse sectors of the economy. Specifically, they serve as drivers of economic advancement by overseeing a considerable portion of the money supply. In India, they enhance funding for both domestic and international trade while also offering long-term financial support for agricultural and consumer endeavours. This study investigates the contribution of commercial banks to economic development, with a focus on key sectors including industry, agriculture, and trade. Additionally, it assesses advancements made under Financial Inclusion Plans spanning from 2011 to 2019.

Rajeev Vashisht (2019) research paper on “Role of Banking Institutions in the Development of Industry” Highlighted the substantial contribution of banking institutions to industrial development. In his 2020 research paper titled "An Empirical Study on the Role of Commercial Banks in Granting Loans and Advances in Selected Sectors and Their Impact on Economic Growth in India," K. Subbareddy delves into the involvement of commercial banks in various sectors of economic development, including manufacturing and agriculture, both domestic and international trade, and advancements achieved through financial inclusion plans from 2011 to 2019.

Dube, P., & Gupta, K. (2018) research paper “A study of the role of commercial banks in rural development in India.” The Indian economy presents several distinctive features, including rapid urbanization, sluggish rural progress, substantial migration from rural to urban locales, and limited infrastructure and employment opportunities in rural regions. Tackling these challenges requires comprehensive rural development efforts, which entail bolstering financial services in rural areas. Banks play a pivotal role in aggregating and channelling funds from various sources to diverse sectors. This study investigates the expansion of banking services in rural regions and the facilitation of credit facilities from 2006 to 2016. Utilizing published data from the Reserve Bank of India and existing literature, the research scrutinizes trends such as the establishment of bank offices and branches, growth in account numbers and deposits, and the dispersal of funds. Based on these insights, the paper offers recommendations to enhance rural banking services and improve access to credit.

Banbury Shewakena Tessema (2017) The objective of the research was to examine the contribution of collaboration between universities and industries in shaping banking and financial diploma programs, as perceived by instructors and industry professionals regarding employability. The study emphasized the importance of crafting skill frameworks for each profession or employee, enabling the recognition of graduates' achievements based on demonstrated skills within specific work environments.

Saini, P., & Sindhu, J. (2017) research paper “Role of Commercial Bank in the Economic Development of India” Banks play a crucial role in fostering a nation's economic progress by mobilizing dormant savings, generating demand deposits, facilitating trade, and promoting capital mobility. As of March 31, 2009, all commercial banks in India have successfully met Basel II standards. In India, a robust banking system is indispensable for capital accumulation, mitigating speculation, and channelling resources into priority sectors. Commercial banks facilitate the flow of credit, stimulate employment growth in rural regions, and significantly contribute to the holistic advancement of the Indian economy.

Chetan Dudhe (2017) research paper “Role of Indian Commercial Banks in Economy Development” The discussion highlighted notable transformations within the Indian banking system over the past decade, underscoring the pivotal role of commercial banks in fostering its economic advancement. Globalization has spurred the establishment of business entities by multinational corporations and foreign banks in India, exerting a direct impact on economic development.

Bandlamudi, K., & Taidala, V. R. (2017) research paper “Role of commercial banks in the economic development of India” Commercial banks, such as the State Bank of India and other institutions, are integral to India's economy, offering essential financial services to both individuals and enterprises. With a vast network of over 50,000 branches, they extend short-term and medium-term financial support, particularly catering to the needs of small-scale industries. Research examining their influence on GDP and broader economic growth is imperative.

OBJECTIVE OF THE STUDY

The objective of the study is to evaluate and analyse the impact of commercial banks on India's economic development. The study also illustrates how credit and loans impact India's GDP and, in turn, its rate of economic growth.

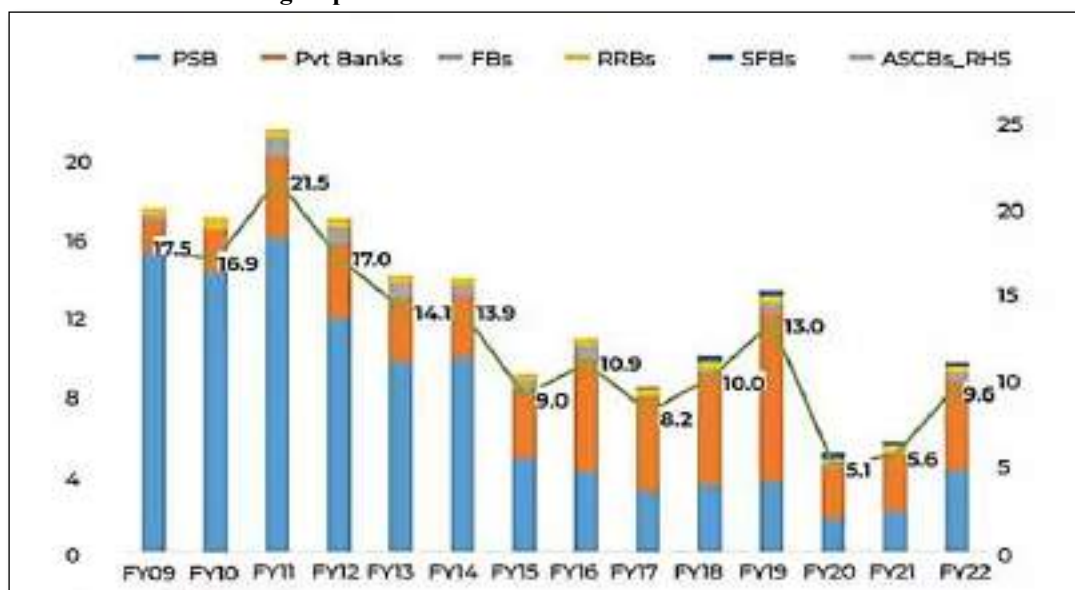
RESEARCH METHODOLOGY

The contents of this paper stem from secondary research on the Indian banking sector, concentrating on the Indian context. Annual reports, numerous books, journals, periodicals, specific reports on the subject matter, and online searches were utilized to compile



this information. The current inquiry was conducted following the outlined approach. The study is the culmination of an extensive literature review on related subjects.

Bank groupwise contribution to Incremental Credit



Source: SBI research

In the past, whenever credit growth turns the corner and jumps from single digit to double digit, the share of PSBs has always jumped commensurately, the report said. It seems that the PSBs are always early movers at the beginning of a pick-up in credit cycle and later become all pervasive when the BCBs join the bandwagon, the report added.

Role of Commercial Banks in Economic Development

Commercial banks serve as a financing avenue for small businesses, contributing significantly to economic development primarily through their function as financial intermediaries. In this role, commercial banks facilitate the movement of investment capital across the market. The primary means by which they allocate capital in the economy is through the lending process, which is instrumental in their operations.

- **Risk:** One of the key functions of commercial banks in promoting economic development is their role as risk evaluators. This occurs primarily when banks extend loans to businesses or individuals. For example, when individuals seek to borrow funds from a bank, the bank scrutinizes various aspects of the borrower's financial situation, such as income, credit history, and existing debt. This assessment enables the bank to assess the probability of borrower default. By identifying and avoiding high-risk borrowers, commercial banks mitigate the potential for financial losses.
- **Small Business:** Commercial banks participate in financing business ventures through diverse means. For instance, a business proprietor might seek a loan to cover the initial expenses of establishing a small enterprise. With the necessary funding secured, the small business can commence operations and pursue expansion strategies. The cumulative impact of small business activities contributes substantially to job creation nationwide.
- **Wealth:** Commercial banks participate in financing business ventures through diverse means. For instance, a business proprietor might seek a loan to cover the initial expenses of establishing a small enterprise. With the necessary funding secured, the small business can commence operations and pursue expansion strategies. The cumulative impact of small business activities contributes substantially to job creation nationwide.
- **Government Spending:** Commercial banks also aid in facilitating the federal government's function as a driver of economic development. Typically, commercial banks assist in financing government expenditure by acquiring bonds issued by the Department of the Treasury. These bonds, both long and short-term, serve to fund various governmental operations, programs, and sustain deficit spending..

Significance of banks in the Economic Development of the Country

- **Encourage Business & Capital Formation:** - One of the most important parts of a corporation or sector is funding. It is the lifeblood of the business. By increasing borrowers' deposits or converting them into lead loans to businesses, banks amass assets.
- **Smoothing of Trade & Commerce Function:** - In contemporary times, international trade and commerce play a crucial role, underscoring the necessity for smooth currency exchange processes. Present-day banks facilitate their customers in transferring



funds globally, enabling transactions across borders. A well-integrated banking system provides convenient functionalities for swift and hassle-free transactions, including mobile payments, online banking, card payments, and loan facilities. Through these services, banks actively contribute to the expansion of trade.

- **Boost Saving Practices of the Citizens Bank:** - attracts depositors by providing many deposit options and dividends or returns in the form of interest. Banks require their customers to have different types of deposit accounts. It makes it possible for people to form saving or banking habits.
- **Balanced Development:** - Banking institutions conduct business globally. You can observe several central banks, including Baroda Bank, Citi Bank, and others. It makes it possible for a nation to spread out banking operations to rural and local areas. By assisting rural areas with the global expansion of commercial banks, it helps to foster equitable growth. Modern banking is crucial to the nation's socioeconomic development. Without considering the rich and the poor, urban and rural areas, etc., the established banking industry aids in the equal growth of its clients.
- **Using Monetary Policy:** - Every administration needs a plan to monitor policy. The major goal of the monitoring strategy is to protect the nation's financial system from the risk of deflation, inflation, crisis, etc.
- **Support Agriculture Development:** - Every economy must have an agriculture component. Every country's main goal and task is to become self-sufficient in food. By providing loans and advances at cheap interest rates compared to alternative loan or advance systems, modern banks support the agricultural sector.

Current Scenario of Indian Banking Sector

- The Indian banking landscape encompasses 12 public sector banks, 22 private sector banks, 46 foreign banks, 56 regional rural banks, 1485 urban cooperative banks, and 96,000 rural cooperative banks, along with cooperative credit institutions. As of September 2021, the country boasted a total of 213,145 ATMs, with 47.5% located in rural and semi-urban areas. From 2020 to 2022, there was a notable increase in bank assets across various sectors. The total assets within the banking sector, inclusive of both public and private sector banks, surged to US\$ 2.67 trillion in 2022. Specifically, by 2022, the public sector banking sector accounted for US\$ 1,594.51 billion in total assets, while the private banking sector contributed US\$ 925.05 billion.
- Over the period from FY16 to FY22, bank credit experienced a Compound Annual Growth Rate (CAGR) of 0.62%. By FY22, total credit extended had surged to US\$ 1,532.31 billion. Meanwhile, deposits saw a robust growth, registering a CAGR of 10.92% during the same period and reaching US\$ 2.12 trillion by FY22. As of November 4, 2022, bank deposits amounted to Rs. 173.70 trillion (US\$ 2.12 trillion). India Ratings & Research (Ind-Ra) anticipates credit growth to achieve a double-digit rate of 10% in 2022-23, marking the first time in eight years. As of November 4, 2022, bank credit stood at Rs. 129.26 lakh crore (US\$ 1,585.09 billion). Non-food bank credit witnessed a substantial increase of 17.6% in November 2022 compared to 7.1% a year earlier, propelled by robust demand across sectors such as services, industry, personal, agriculture, and allied activities, as highlighted in the RBI's statement on Sectoral Deployment of Bank Credit.

Recent Investments and Developments in India's Banking Industry

- M&A activity with an India angle hit a record US\$ 171 billion in 2022.
- According to a Refinitiv report, domestic M&A (Merger and Acquisition) activity reached unprecedented heights in 2022, totalling US\$ 119.2 billion, marking a remarkable surge of 156.3% compared to 2021. Companies such as HDFC Bank, HDFC, Ambuja Cements, ACC, Adani Group, Biocon, Mindtree, L&T Infotech, AM/NS, and Essar Ports were among those engaged in M&A deals during 2022.
- In June 2022, the count of bank accounts initiated through the government's flagship financial inclusion initiative, 'Pradhan Mantri Jan Dhan Yojana (PMJDY),' reached 45.60 crore, with deposits in Jan Dhan bank accounts amounting to Rs. 1.68 trillion (US\$ 21.56 billion).
- In April 2022, HDFC Bank, India's largest private bank, disclosed a transformative merger with HDFC Limited.
- On November 09, 2021, the Reserve Bank of India (RBI) announced the initiation of its inaugural global hackathon, 'HARBINGER 2021 – Innovation for Transformation,' themed 'Smarter Digital Payments.'
- In November 2021, Kotak Mahindra Bank declared the completion of its acquisition of a 9.98% stake in KFin Technologies for Rs. 310 crore (US\$ 41.62 million).
- In October 2021, Indian Bank revealed its acquisition of a 13.27% stake in the proposed National Asset Reconstruction Company Ltd. (NARCL).
- In July 2021, Google Pay for Business facilitated access to credit for small merchants through a collaboration with FlexiLoans, a digital lending platform for MSMEs.
- In February 2021, Axis Bank acquired a 9.9% stake in the Max Bupa Health Insurance Company for Rs 90.8 crore (US\$ 12.32 million). In December 2020, in response to the RBI's cautionary message, the Digital Lenders' Association issued a revised code of conduct for digital lending.
- On November 6, 2020, WhatsApp introduced its UPI payments service in India after receiving approval from the National Payments Corporation of India (NPCI) to gradually launch on UPI.



- In October 2020, HDFC Bank collaborated with Apollo Hospitals to introduce the 'Healthy Life Programme,' a comprehensive healthcare solution aimed at promoting accessible and affordable healthy living through Apollo's digital platform.
- In March 2020, State Bank of India (SBI), the largest lender in India, issued US\$ 100 million in green bonds through private placement.
- In February 2020, the Cabinet Committee on Economic Affairs granted approval for the continuation of the recapitalization process of Regional Rural Banks (RRBs) by providing minimum regulatory capital for another year beyond 2019-20, extending until 2020-21 for those RRBs unable to maintain the minimum Capital to Risk weighted Assets Ratio (CRAR) of 9% as mandated by RBI regulatory norms.

CONCLUSION

For a considerable duration, nations have been actively pursuing their own growth trajectories. The mixed-capitalist economic system has sought to leverage the banking function embedded within existing or specially established institutions to advance developmental objectives. The significance of these institutions for the progress of post-industrialized developing nations cannot be overstated. Anticipated growth in the banking industry is expected to be further fueled by increased infrastructure investment, streamlined project execution, and ongoing reforms. These indicators collectively suggest a promising outlook for the banking sector in India, as expanding enterprises increasingly turn to banks for their credit requirements. The advent of technological advancements has elevated the significance of internet and mobile banking services. Consequently, the banking industry is placing greater emphasis on enhancing customer service offerings and modernizing technological infrastructure to enhance the overall customer experience and gain a competitive edge.

Economic growth stimulates the development of the credit market in India, with potential long-term implications for the country. In a credit-constrained Indian market, achieving critical mass in a new class of credit is likely to expand the possibilities and reach of the credit market, expedite loan disbursement, and better align with increasing demand, thereby supporting economic development rates. Banks play a pivotal role in incentivizing traditional farming practices by providing low-interest loans, thereby aiding individuals across various sectors of life. Consequently, it can be inferred that commercial banks are indispensable for fostering comprehensive economic growth.

REFERENCE

1. Hussain, A., & Javaid, A. (2021). Role of Commercial Banks in the Economic Development of a Country: An Indian Perspective. *Economics, Business*, 10.2139/ssrn.3884302. <https://ssrn.com/abstract=3884302>
2. Subbareddy, K. (2020). An Empirical Study on Role of Commercial Banks on Issuing Loans and Advances in Selected Areas: Impact on Economic Growth in India. *International Journal of Computer Science and Information Technology Research*, 8(3). ISSN: 2320-2882. www.ijcrt.org
3. Manish, M. K. (2020). The Role of Commercial Banks in Economic Growth in India: A Perspective Study. *International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS)*, 2(3), 151-154. ISSN: 2581-9925.
4. Tiwari, V. (2020). Role of Commercial Banks in Economic Development of India. *International Journal of Education, Modern Management, Applied Science & Social Science (IJEMMASSS)*, 2(1), 93-96. ISSN: 2581-9925.
5. Tuz Zohra, F. (2020). Role of Commercial Bank in the Economic Development of Bangladesh. *Journal of Society & Change*, XIV(4), 57.
6. Yuvaraja, U., et al. (2019). Development of Commercial Banks during Pre and Post Globalization Era in India: An Analysis. *Shanlax International Journal of Arts, Science and Humanities*, 7(1), 26-34. <https://doi.org/10.34293/sijash.v7i1.371>.
7. Vashisht, R. (2019). Role of Banking Institutions in the Development of Industry. Vol 8, Issue 2, July - December, 10-18. <https://doi.org/10.51976/gla.prastuti.v8i2.821908>
8. Dube, P., & Gupta, K. (2018). A study of the role of commercial banks in rural development in India. *International Journal for Research in Engineering Application & Management (IJREAM)*, ISSN: 2454-9150, Special Issue - NSAPSDS - 2018, 43, NSAPSDS2018015, 10.18231/2454-9150.2018.1160.
9. Kalpana, B., & Rao, T. V. (2017). Role of Commercial Banks in the Economic Development of India. *International Journal of Management and Applied Science*, 3(4). ISSN: 2394-7926. <http://iraj.in>
10. Saini, P., & Sindhu, J. (2017). Role of Commercial Bank in the Economic Development of India. *International Journal of Engineering and Management Research (IJEMR)*, 4(1), 27-31. Print ISSN: 2394-6962. Online ISSN: 2250-0758.
11. Bandlamudi, K., & Taidala, V. R. (2017). Role of Commercial Banks in the Economic Development of India. *International Journal of Management and Applied Science (IJMAS)*, 3(4), 1-4. DOI: IJMAS-IRAJ-DOIONLINE-7728
12. Bandlamudi, K., & Taidala, V. R. (2017). Role of commercial banks in the economic development of India. **International Journal of Management and Applied Science**, 3(4), ISSN: 2394-7926. Retrieved from <http://iraj.in>
13. Saini, P., & Sindhu, J. (2014). Role of Commercial Bank in the Economic Development of India. *International Journal of Engineering and Management Research*, 4, 27-31.



PROMOTING COGNITIVE STIMULATION AND ENGAGEMENT: INNOVATIVE NURSING INTERVENTIONS FOR ALZHEIMER'S PATIENTS

Dr.(Prof.) Jomon Thomas¹

¹Principal, PhD Nursing, Mental Health Nursing Department HOD, Anushree College of Nursing, Jabalpur, MP, India

ABSTRACT AND ABOUT THE AUTHOR

Dr. Jomon Thomas, Ph.D., is a distinguished professional boasting a diverse educational background and over 15 years of comprehensive experience across Nursing Education, Administration, Nursing Practice, and Nursing Research. He earned his B.Sc. in Nursing from Rani Durgawati University, Jabalpur, followed by an M.Sc. in Psychiatric Nursing from RGUHS, Bangalore. Additionally, he holds a Diploma in Guidance and Counseling from Acharya Nagarjuna University, Guntur, and a Ph.D. in Psychiatric Nursing from Mahwanchal University, Indore.

Currently serving as the Principal at Anushree College of Nursing in Jabalpur, Madhya Pradesh, Dr. Jomon Thomas brings a profound depth of knowledge and expertise to his role. His academic journey, complemented by extensive professional experience, underscores his dedication to advancing the nursing field through education, administration, and research. Dr. Jomon Thomas's significant contributions to nursing education and practice have solidified his reputation as a highly esteemed figure within the nursing community.

Alzheimer's disease poses significant challenges in maintaining cognitive function and meaningful engagement for affected individuals. Nurses play a crucial role in promoting cognitive stimulation and engagement through innovative interventions. This review explores creative approaches and activities that nurses can implement to enhance cognitive function, engagement, and meaningful interaction among Alzheimer's patients. Key strategies include reminiscence therapy, multisensory stimulation, art and music therapy, therapeutic recreation, and technology-assisted interventions. By incorporating these innovative nursing interventions into practice, healthcare professionals can improve the quality of life for individuals living with Alzheimer's disease.

KEYWORDS: *Alzheimer's disease, cognitive stimulation, engagement, nursing interventions, reminiscence therapy, multisensory stimulation, art therapy, music therapy, therapeutic recreation, technology-assisted interventions*

INTRODUCTION

Alzheimer's disease is a progressive neurodegenerative disorder characterized by cognitive decline, memory loss, and impairment in daily functioning. As the disease advances, individuals may experience difficulties in communication, social interaction, and engagement with their environment. Maintaining cognitive stimulation and promoting meaningful engagement are essential components of Alzheimer's care, as they can enhance cognitive function, emotional well-being, and overall quality of life for patients. Nurses, with their unique expertise in holistic care and therapeutic communication, are well-positioned to implement innovative interventions aimed at stimulating cognition and fostering engagement among Alzheimer's patients. This review explores various creative approaches and activities that nurses can utilize to promote cognitive stimulation and engagement in this population. Alzheimer's disease stands as one of the most prevalent neurodegenerative disorders globally, characterized by progressive cognitive decline, memory impairment, and functional limitations. Its impact extends beyond the individual diagnosed, affecting families, caregivers, and healthcare systems. Amidst its complexities, sustaining cognitive stimulation and meaningful engagement emerges as a pivotal aspect in the care of individuals living with Alzheimer's disease. Nurses, occupying a central role in healthcare delivery, possess a unique opportunity to implement innovative interventions that address these critical needs, thereby enhancing the quality of life for patients and their caregivers.

In this review, we delve into the multifaceted realm of nursing interventions aimed at promoting cognitive stimulation and engagement among individuals with Alzheimer's disease. While pharmacological treatments target disease progression, nursing interventions focus on optimizing cognitive function, preserving independence, and fostering connections with the surrounding environment. As caregivers intimately involved in patients' daily lives, nurses are well-positioned to integrate creative approaches and activities that capitalize on individuals' remaining abilities, evoke positive emotions, and enhance overall well-being.



The journey through Alzheimer's disease presents a myriad of challenges, yet within these challenges lie opportunities for meaningful interventions. By exploring innovative strategies such as reminiscence therapy, multisensory stimulation, art and music therapy, therapeutic recreation, and technology-assisted interventions, nurses can create enriching experiences that transcend the boundaries of cognitive impairment. As we navigate this landscape, it becomes evident that promoting cognitive stimulation and engagement is not merely a professional duty but a profound expression of compassionate care and human connection.

Through this review, we aim to provide insights, inspiration, and practical guidance for nurses seeking to enhance their approach to Alzheimer's care. By embracing creativity, empathy, and evidence-based practices, nurses can empower individuals living with Alzheimer's disease to live with dignity, purpose, and joy amidst the challenges they face. Together, let us embark on a journey of exploration, innovation, and compassion as we strive to make a meaningful difference in the lives of those affected by Alzheimer's disease.

Reminiscence Therapy: Reminiscence therapy involves the use of past experiences, memories, and life events to stimulate cognitive function and promote social interaction among individuals with Alzheimer's disease. Nurses can facilitate reminiscence sessions by incorporating memory prompts, photographs, music, and familiar objects to evoke memories and encourage storytelling. Group reminiscence activities, such as reminiscence circles or themed reminiscence sessions, provide opportunities for socialization and emotional expression, thereby enhancing overall well-being.

Reminiscence therapy is a structured intervention that harnesses the power of past memories and life experiences to promote cognitive stimulation, emotional well-being, and social interaction among individuals with Alzheimer's disease. Rooted in the belief that reminiscing about significant life events and personal stories can evoke positive emotions and enhance self-esteem, this therapeutic approach has gained recognition for its effectiveness in improving quality of life for Alzheimer's patients.

Nurses play a pivotal role in facilitating reminiscence therapy sessions within various healthcare settings, including long-term care facilities, hospitals, and community-based programs. These sessions are typically conducted individually or in group settings, depending on the preferences and needs of the patients.

Individual Reminiscence Sessions: In individual reminiscence sessions, nurses engage with Alzheimer's patients one-on-one to explore their personal history, interests, and memories. These sessions often begin with the creation of a safe and supportive environment, where patients feel comfortable sharing their thoughts and emotions. Nurses may utilize memory prompts such as photographs, music, familiar objects, or sensory stimuli to evoke memories and facilitate reminiscing. Through open-ended questions and active listening, nurses encourage patients to reflect on significant life events, achievements, relationships, and cherished memories. By validating and affirming the patient's experiences, nurses help individuals find meaning and purpose in their past, fostering a sense of identity and self-worth.

Group Reminiscence Activities: Group reminiscence activities provide opportunities for socialization, peer support, and shared storytelling among Alzheimer's patients. Nurses can organize reminiscence groups based on common themes, interests, or cultural backgrounds, allowing participants to connect with others who share similar life experiences. These group sessions may involve structured activities such as reminiscence circles, where individuals take turns sharing memories or discussing specific topics, or themed reminiscence sessions focused on holidays, historical events, or personal milestones. Group reminiscence activities promote social engagement, emotional expression, and a sense of belonging, reducing feelings of isolation and loneliness often experienced by individuals with Alzheimer's disease.

Benefits of Reminiscence Therapy: Reminiscence therapy offers numerous benefits for individuals living with Alzheimer's disease, as well as their caregivers and family members. Research has shown that reminiscence interventions can improve cognitive function, mood, communication skills, and overall quality of life for patients. By tapping into long-term memories, reminiscence therapy provides a sense of continuity and coherence to individuals whose short-term memory may be impaired. It also offers opportunities for emotional validation, validation, and closure, allowing patients to process unresolved emotions or grief associated with past experiences. For caregivers and family members, reminiscence therapy can facilitate meaningful connections, enhance understanding, and promote empathy towards their loved ones with Alzheimer's disease.

Multisensory Stimulation: Multisensory stimulation techniques leverage the use of various sensory modalities, including sight, sound, touch, taste, and smell, to engage individuals with Alzheimer's disease and stimulate cognitive function. Nurses can create multisensory environments by incorporating elements such as soothing music, aromatherapy, tactile objects, and visual stimuli into the care setting. Activities such as sensory gardens, sensory boxes, and multisensory storytelling can provide rich sensory experiences and promote cognitive engagement among patients.



Multisensory stimulation is a highly effective approach in promoting cognitive stimulation and engagement among individuals living with Alzheimer's disease. This section delves deeper into the concept of multisensory stimulation, exploring its principles, benefits, and practical applications within nursing care.

Principles of Multisensory Stimulation: Multisensory stimulation operates on the principle of engaging multiple sensory modalities simultaneously to create rich and immersive experiences for individuals with Alzheimer's disease. By incorporating stimuli that target various senses including sight, sound, touch, taste, and smell, nurses can provide dynamic and interactive environments that stimulate cognitive function and promote engagement. The underlying principle is to leverage the brain's innate ability to process and integrate sensory information, thereby enhancing neural connectivity and cognitive functioning.

Benefits of Multisensory Stimulation: There are numerous benefits associated with multisensory stimulation for individuals living with Alzheimer's disease. Firstly, it can evoke memories, emotions, and associations, providing opportunities for reminiscence and emotional expression. For example, the aroma of freshly baked cookies may evoke memories of past holidays or family gatherings, eliciting positive emotions and fostering a sense of connection. Additionally, multisensory stimulation can enhance sensory awareness and perception, helping individuals to remain engaged with their surroundings and maintain a sense of agency and autonomy. Furthermore, it can promote relaxation, reduce agitation, and improve overall mood and well-being.

Practical Applications in Nursing Care: Nurses can incorporate multisensory stimulation into various aspects of care delivery to enhance cognitive stimulation and engagement among Alzheimer's patients. Practical applications may include:

1. **Sensory Environments:** Creating sensory-rich environments within care settings by integrating elements such as soft lighting, soothing music, comfortable furnishings, and tactile materials. These environments provide a calming and stimulating space for individuals to explore and interact with their surroundings.
2. **Sensory Activities:** Facilitating sensory-based activities and experiences tailored to individual preferences and abilities. This may include activities such as sensory gardens, tactile stimulation with textured objects, aromatherapy with essential oils, and listening to nature sounds or calming music. Nurses can observe and assess the responses of patients to determine which sensory stimuli are most effective in promoting engagement and well-being.
3. **Multisensory Storytelling:** Engaging individuals in multisensory storytelling experiences that combine auditory, visual, and tactile elements to create immersive narratives. This may involve reading aloud from familiar stories or personal narratives while incorporating props, images, and sensory cues to enhance comprehension and engagement.
4. **Therapeutic Touch:** Utilizing gentle touch and massage techniques to provide comfort, relaxation, and sensory stimulation. Touch is a powerful sensory modality that can convey warmth, reassurance, and connection, promoting feelings of security and well-being for individuals with Alzheimer's disease.
5. **Food and Nutrition:** Incorporating sensory stimulation into mealtime experiences by offering a variety of foods with different textures, flavors, and aromas. Encouraging patients to participate in food preparation and cooking activities can also stimulate their senses and enhance their enjoyment of meals.

Art and Music Therapy: Art and music therapy offer powerful means of expression and communication for individuals with Alzheimer's disease. Nurses can facilitate art and music therapy sessions to engage patients in creative activities that stimulate cognitive function, enhance mood, and foster self-expression. Art activities such as painting, drawing, and collage-making promote creativity and sensory engagement, while music interventions, including singing, listening to music, and playing musical instruments, can evoke emotions, memories, and social connections.

Therapeutic Recreation: Therapeutic recreation interventions encompass a wide range of structured activities and leisure pursuits designed to enhance physical, cognitive, and psychosocial well-being. Nurses can collaborate with recreational therapists and activity coordinators to develop tailored recreation programs that cater to the interests and abilities of Alzheimer's patients. Activities such as gardening, pet therapy, gentle exercise, and games promote cognitive stimulation, social interaction, and enjoyment, thereby improving overall quality of life.

Technology-Assisted Interventions: Advances in technology have enabled the development of innovative interventions to support cognitive stimulation and engagement among individuals with Alzheimer's disease. Nurses can incorporate technology-assisted tools such as touchscreen devices, virtual reality applications, and interactive games into care plans to provide stimulating and engaging experiences for patients. Virtual reality simulations, reminiscence apps, and cognitive training programs offer opportunities for cognitive stimulation, sensory engagement, and virtual travel experiences, enhancing overall well-being and quality of life.

CONCLUSION

Promoting cognitive stimulation and engagement is paramount in the care of individuals living with Alzheimer's disease. Nurses can implement innovative interventions such as reminiscence therapy, multisensory stimulation, art and music therapy, therapeutic



recreation, and technology-assisted interventions to enhance cognitive function, foster social interaction, and improve overall quality of life for patients. By incorporating these creative approaches into practice, nurses can make a significant impact on the well-being of individuals affected by Alzheimer's disease.

REFERENCES

1. Aguirre, E., Woods, R. T., & Spector, A. (2013). Orrell M. Cognitive stimulation therapy (CST): effects on different areas of cognitive function for people with dementia. *Int J Geriatr Psychiatry*, 28(2), 158-164.
2. Brotons, M., Koger, S. M., & Pickett-Cooper, P. (1997). Musical stimuli in dementia: Individualized assessment and personalized playlists. *Journal of Gerontological Nursing*, 23(10), 45-53.
3. Clark, M. E., Lipe, A. W., & Bilbrey, M. (1998). Use of music to decrease aggressive behaviors in people with dementia. *Journal of Gerontological Nursing*, 24(7), 10-17.
4. Cohen-Mansfield, J., Werner, P., & Marx, M. S. (1989). An observational study of agitation in agitated nursing home residents. *International Psychogeriatrics*, 1(2), 153-165.
5. Joy, Ambily. (2024). The Integration of MindfulnessBased Interventions in Mental Health Nursing Practice. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 243-248.
6. Kurmi, Mithun Kumar. (2024). Community Health Nursing's Role in Preventing and Responding to Domestic Violence: A Comprehensive Review. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 284-288. Retrieved from <http://www.bijnr.in>
7. Chandekar, Shailendra. (2024). Ecopsychology and Nature-Based Interventions: Exploring Therapeutic Benefits and Integration into Mental Health Nursing Practice. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 279-283. Retrieved from <https://bijnr.in/index.php/current-issue/>
8. Paul, Meenu. (2024). Preconception counseling: Optimizing maternal and fetal health outcomes. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 249-254.
9. Kumar, S. J. (2024). Beyond Healing: Pioneering Recovery-Oriented Care in Mental Health Nursing. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 198-203
10. Paul, Meenu (2024). Empowering Motherhood: Unveiling the Imperative of Respectful Maternity Care (RMC) and Ensuring Universal Rights for Childbearing Women. *Brio International Journal of Nursing Research (BIJNR)*, 5(1), 176-181.
11. Garre-Olmo, J., López-Pousa, S., Turon-Estrada, A., & Juvinya, D. (2007). Blesa R. [Problems in planning and strategies in patients with Alzheimer's disease: effectiveness of cognitive stimulation programs]. *Rev Neurol*, 44(5), 294-299.
12. Gitlin, L. N., & Marx, K. (2007). Feasibility of a dementia caregiver social support intervention (DRESS) for in-home care. *American Journal of Alzheimer's Disease and Other Dementias®*, 22(6), 458-469.
13. Tryfonos, C., Chrysafi, M., Papadopoulou, S. K., Vadikolias, K., Spanoudaki, M., Mentzelou, M., ... & Giaginis, C. (2024). Association of Mediterranean diet adherence with disease progression, quality of life and physical activity, sociodemographic and anthropometric parameters, and serum biomarkers in community-dwelling older adults with multiple sclerosis: a cross-sectional study. *Aging Clinical and Experimental Research*, 36(1), 73.
14. Chen, C. L., Cheng, S. Y., Montaser-Kouhsari, L., Wu, W. C., Hsu, Y. C., Tai, C. H., ... & Wu, R. M. (2024). Advanced brain aging in Parkinson's disease with cognitive impairment. *npj Parkinson's Disease*, 10(1), 62.
15. Prado-Mel, E., Ramallo, H. R., Villalba-Moreno, Á. M., Cabrera, E. G., & Sánchez-Fidalgo, S. (2024). Características sociodemográficas, clínicas y perfil de riesgo anticolinérgico en una residencia sociosanitaria pública: estudio descriptivo. *Pharmaceutical Care España*, 26.
16. Zhang, Y., & Wang, L. (2024). Early diagnosis of Alzheimer's disease using dual GAN model with pyramid attention networks. *Connection Science*, 36(1), 2321351.
17. Manek, A. S., Priyanga, P., Christa, S., & Dawda, N. (2024). Role of AI and Machine Learning in Mental Healthcare. In *International Conference on Data Science and Big Data Analysis* (pp. 33-48). Springer, Singapore.
18. Gitlin, L. N., Winter, L., Dennis, M. P., Corcoran, M., Schinfeld, S., & Hauck, W. W. (2006). A randomized trial of a multicomponent home intervention to reduce functional difficulties in older adults. *Journal of the American Geriatrics Society*, 54(5), 809-816.
19. Graff, M. J., Vernooij-Dassen, M. J., Thijssen, M., Dekker, J., Hoefnagels, W. H., & Rikkert, M. G. (2006). Community based occupational therapy for patients with dementia and their care givers: randomised controlled trial. *BMJ*, 333(7580), 1196.
20. Lin, L. C., Yang, M. H., Kao, C. C., Wu, S. C., & Tang, S. H. (2010). Lin JG. Using acupuncture and montessori-based activities to decrease agitation for residents with dementia: A cross-over trial. *Journal of the American Geriatrics Society*, 58(10), 2019-2026.
21. Moyle, W., Cooke, M. L., Beattie, E., Jones, C., Klein, B., Cook, G., & Gray, C. (2013). Exploring the effect of companion robots on emotional expression in older adults with dementia: A pilot randomized controlled trial. *Journal of Gerontological Nursing*, 39(5), 46-53.
22. O'Connor, D. W., Ames, D., Gardner, B., King, M., & Psychogeriatric Resource Group. (2009). Psychosocial treatments of psychological symptoms in dementia: a systematic review of reports meeting quality standards. *International Psychogeriatrics*, 21(2), 241-251.
23. Orrell, M., Aguirre, E., Spector, A., & Hoare, Z. (2014). Woods RT. Maintenance cognitive stimulation therapy for dementia: single-blind, multicentre, pragmatic randomised controlled trial. *British Journal of Psychiatry*, 204(6), 454-461.
24. Ory, M. G., & Hoffman, R. R. (2003). 3rd, Yee, J. L., Tennstedt, S., & Schulz, R. Prevalence and impact of caregiving: a detailed comparison between dementia and nondementia caregivers. *The Gerontologist*, 43(6), 873-879.



25. Skingley, A., Vella-Burrows, T., & Stige, B. (2015). Dementia care mapping to support staff in the care of people with intellectual disability and dementia: a feasibility study. *BMC Health Services Research*, 15(1), 290.
26. Sloane, P. D., Zimmerman, S., & Williams, C. S. (2005). Dementia care: the quality chasm. *Health Affairs*, 24(4), 1123-1133.
27. Spector, A., Orrell, M., & Davies, S. (2001). Woods RT. Can reality orientation be rehabilitated? Development and piloting of an evidence-based programme of cognition-based therapies for people with dementia. *Neuropsychological Rehabilitation*, 11(3-4), 377-397.
28. Spector, A., Thorgrimsen, L., Woods, B., Royan, L., Davies, S., Butterworth, M., ... & Orrell, M. (2003). Efficacy of an evidence-based cognitive stimulation therapy programme for people with dementia: randomised controlled trial. *British Journal of Psychiatry*, 183(3), 248-254.
29. Teri, L., Truax, P., Logsdon, R., Uomoto, J., Zarit, S., & Vitaliano, P. P. (1992). Assessment of behavioral problems in dementia: the revised memory and behavior problems checklist. *Psychology and Aging*, 7(4), 622.
30. Van der Roest, H. G., Meiland, F. J., Maroccini, R., Comijs, H. C., Jonker, C., & Dröes, R. M. (2007). Subjective needs of people with dementia: a review of the literature. *International Psychogeriatrics*, 19(3), 559-592.
31. Van Wijngaarden, E., van der Wedden, H., Henning, Z., Komen, R., & The, H. S. (2007). The caregiver's role in the design of supportive home environments for people with dementia. *American Journal of Alzheimer's Disease and Other Dementias®*, 22(6), 437-448.



A STUDY ON INTERDISCIPLINARY COOPERATIVE TEACHING OF PHYSICAL EDUCATION TEACHERS IN THE CONTEXT OF PHYSICAL EDUCATION AND HEALTH CURRICULUM INTEGRATION

Katherine Ning LI

Associate Professor, Institute of Sports science, Xi'an Physical Education University, China, 710068

Article DOI: <https://doi.org/10.36713/epra16153>

DOI No: 10.36713/epra16153

ABSTRACT

Integrating physical education and health curriculum has become a prevalent trend, aiming to promote students' overall well-being. This research investigates the interdisciplinary cooperative teaching practices of physical education teachers in this integrated curriculum context, exploring the application of health assessment tools and methods and the formulation of individualized exercise plans. Utilizing a mixed-methods approach, the study combines qualitative and quantitative data collection and analysis techniques involving physical education teachers, health professionals, and students from selected schools. The findings reveal the current status of curriculum integration, highlighting challenges and opportunities, and delve into the utilization of health assessment tools for physical fitness, physiological health, and psychological well-being evaluations. Case studies and best practices elucidate the process of developing individualized exercise plans based on these comprehensive health assessments. The research proposes strategies for effective interdisciplinary cooperative teaching, offers recommendations for the appropriate selection and application of health assessment tools and personalized exercise plans, and discusses limitations and future research directions. This study contributes to the growing knowledge of curriculum integration and interdisciplinary collaboration in physical and health education, informing educational policymakers, curriculum designers, and practitioners in promoting holistic student development.

KEYWORDS: *Sports and Health Curricula, Integration, Physical Education Teachers, Interdisciplinary*

1. INTRODUCTION

1.1 Research Background

The Importance of Curriculum Integration and Interdisciplinary Collaborative Teaching

In today's society, students face increasingly complex challenges that require the comprehensive application of interdisciplinary knowledge and skills. The traditional discipline-separated teaching model can hardly meet students' comprehensive development needs. Therefore, curriculum integration and interdisciplinary collaborative teaching have emerged, aiming to break disciplinary boundaries and promote the coherence and integrity of learning.

Curriculum integration organically integrates content from different subjects, helping students establish connections between knowledge and form a systematic understanding. This integrated learning helps cultivate students' comprehensive thinking skills and flexibly apply what they have learned to real-world problem situations. Simultaneously, interdisciplinary collaborative teaching brings together teachers from different professional fields, who draw on each other's expertise and collaborate in discussing and designing meaningful and coherent learning experiences during the teaching process.

In the field of physical and health education in China, curriculum integration and interdisciplinary collaborative teaching are critical. Physical education not only concerns the development of physical fitness but also relates to students' overall health. Through integration with subjects such as biology, nutrition, and psychology, students can fully understand the multidimensional connotations of health and develop a health consciousness and a good lifestyle. Interdisciplinary collaboration can effectively integrate physical education, medicine, and psychology resources, providing comprehensive health support and guidance for students.

Furthermore, curriculum integration and interdisciplinary collaborative teaching are conducive to innovating teaching models and optimizing learning outcomes. Through cross-disciplinary cooperation, teachers can inspire each other's creativity and develop challenging and practical teaching activities, stimulating students' enthusiasm for learning. Students can comprehensively apply their learned knowledge in real-world situations, enhancing their initiative and application abilities in learning.

In summary, curriculum integration and interdisciplinary collaborative teaching are essential trends in contemporary educational reform, holding significant implications for cultivating students' comprehensive qualities and abilities to address complex problems.



In the field of physical education and health education, this teaching model will provide strong support for students' comprehensive development.

2. ANALYSIS OF THE CURRENT STATUS OF INTERDISCIPLINARY TEACHING INTEGRATION IN PHYSICAL EDUCATION AND HEALTH CURRICULUM

Many regions in China have begun implementing curriculum integration reforms in physical education and health, but overall progress has been relatively slow, with many difficulties and challenges. On one hand, the traditional discipline-separated model is deeply rooted, and teachers' mindsets are difficult to change. For a long time, physical education teachers have focused on developing students' physical fitness, neglecting the importance of health education. At the same time, teachers of other subjects also have biases in their understanding of physical education curricula, equating them solely with exercise. These mindsets seriously hinder the process of interdisciplinary integration.

On the other hand, the existing curriculum arrangements and allocation of teaching resources are organized according to a discipline-based model, lacking integration and systematization. There are strict "barriers" between different subjects, and resources such as faculty, class hours, and venues can often not be efficiently integrated and shared. Moreover, professional development for teachers has not met the needs of integrated curricula, with a general lack of interdisciplinary understanding and collaborative awareness.

Nevertheless, some regions and schools have made positive progress in integrating physical education and health curricula, accumulating valuable experiences. For instance, educationally developed regions such as Beijing and Shanghai proposed the concept of "health education" relatively early and attempted to establish organic connections between physical education and other subjects. Some schools have integrated physical education curricula with subjects such as biology, psychology, and sociology, forming comprehensive courses such as "life skills" or "healthy living." In the teaching process, teachers of different specialties, such as physical education, medicine, and nutrition, collaborate and jointly participate in curriculum design and implementation. At the same time, these regions have also undertaken systematic reforms in areas such as teacher training, curriculum resources, and management mechanisms, creating necessary conditions for curriculum integration. Through practical exploration, they have preliminarily constructed a "life-holistic-comprehensive" health education curriculum system and achieved positive results.

However, some regions have encountered difficulties in practice. For example, in some regions, integration remains superficial in the curriculum without genuinely achieving deep integration. Content from different subjects is juxtaposed, lacking intrinsic logical connections. Although the curriculum names have been integrated in some regions, actual teaching still follows the traditional "subject-separated" model. Moreover, some regions have exhibited a rather hasty approach, rushing to integrate to meet the requirements of higher authorities, resulting in a lack of operability and effectiveness in the integration process. Overall, although the integration of physical education and health curricula has been comprehensively launched, its depth and breadth still need to be strengthened, and its systematicity, professionalism, and operability need to be further improved, leaving considerable room for reform and development potential.

3. IMPLEMENTATION MODELS OF INTERDISCIPLINARY COLLABORATIVE TEACHING

3.1 Application Analysis of Health Assessment Tools and Methods

3.1.1 Questionnaire Survey and Lifestyle Assessment

Comprehensive individual health information can be collected, including lifestyle, health behaviors, medical history, family medical history, etc., to understand one's health status and risk factors. Meanwhile, measuring biomedical indicators such as height, weight, waist circumference, body fat rate, blood pressure, and heart rate can also provide objective evidence of an individual's health status. Additionally, requiring the evaluated individual to record daily information related to health, such as diet, exercise, sleep, and medication use, helps assess the impact of their behavioral patterns on health.

3.1.2 Assessment of Mental Health

Psychological assessment tools such as depression screening questionnaires and anxiety symptom scales can be used to evaluate an individual's mental health level. By comprehensively assessing physiological and psychological data and other risk factor information, the possibility of an individual developing a particular disease or health problem can be predicted and assessed. Furthermore, physical fitness tests such as muscle strength, flexibility, and aerobic endurance can reflect an individual's physical function and fitness level, providing a reference for exercise prescriptions.

3.1.3 Health Risk Assessment

Based on the assessment findings, exercise prescriptions should aim to improve the individual's health condition and eliminate or reduce their health risks by scientifically designing exercise types, intensity, duration, etc., while considering the individual's interests, hobbies, and living environment to ensure the operability and sustainability of the exercise plan. This will help the individual develop good exercise habits and achieve a healthy physique.



3.2 Individualized Exercise Plan Formulation Process and Case Analysis

3.2.1 Setting Goals and Formulating Intervention Strategies

The first step in formulating an individualized exercise plan is to clearly define the individual's specific health goals based on the health assessment results and design intervention strategies around these goals. For example, weight loss may be the primary goal for an overweight individual. Therefore, the intervention strategy should focus on promoting energy expenditure and increasing aerobic exercise; at the same time, it should also emphasize dietary control to reduce caloric intake. Furthermore, for special populations such as diabetes or heart disease patients, the goal may be more focused on controlling the condition and improving quality of life. Intervention priorities and strategy plans need to be formulated for different health conditions. Goal setting should not be overly idealistic but should consider the individual's actual conditions and tolerance to ensure the achievability of the goals.

3.1.2 Applying Appropriate Health Management Methods and Intervention Measures

After determining the goals and strategic framework, the next step is to select and apply appropriate health management methods and specific intervention measures. These include exercise prescriptions, dietary guidance, behavioral interventions, and more. Exercise prescriptions should be tailored to the individual's physical fitness status, health goals, and preferences, customizing elements like exercise types, intensity, duration, and frequency. Dietary guidance should consider the individual's cultural background, living habits, etc., to develop a feasible dietary plan. Simultaneously, behavioral interventions are also crucial, helping the individual establish correct health knowledge and awareness, develop good lifestyle habits, and use behavioral incentives to enhance the individual's motivation and adherence to healthy behaviors. Other specialized health management measures may be required for specific special populations, such as medication guidance, psychological counseling, etc.

3.1.3 Formulating a Personalized Health Plan

After setting goals and selecting intervention measures, the final step is integrating all the components into a personalized and systematic health plan. This plan should specify the details of exercise, diet, lifestyle adjustments, and other aspects, tailored to the individual's actual situation and consistent with their health goals. Moreover, the formulation of the plan should also consider the individual's preferences, conditions, and living environment, striving for operability and sustainability of the measures to ensure the plan's successful implementation. Furthermore, the plan should retain some flexibility, leaving room for adjustments so that it can be adjusted and optimized promptly based on the implementation results. Once the individualized health plan is formulated, its implementation, effect monitoring, and follow-up are also indispensable and essential steps, requiring professional guidance and support to help individuals achieve their health goals.

4. RESULTS AND CONCLUSIONS

4.1 The interdisciplinary teaching model integrating physical education and medicine has profoundly impacted students' learning. Traditional physical education courses primarily focused on developing students' athletic skills and physical fitness, neglecting the importance of health education. Through integration with disciplines such as medicine, biology, and nutrition, students can learn about exercise knowledge and systematically understand the physiological mechanisms of the human body, the importance of healthy behaviors, and establish comprehensive health awareness.

In interdisciplinary courses, students can access diverse learning resources and real-world situations, facilitating the internalization and transfer of knowledge. For example, when discussing sports injuries, medical teachers can lecture on human anatomy and exercise biomechanics knowledge; physical education teachers can demonstrate rehabilitation exercises; and nutritionists can introduce dietary principles for post-injury recovery. By integrating multiple disciplinary perspectives, students can better understand the causes, symptoms, prevention, and treatment of sports injuries.

Furthermore, interdisciplinary teaching emphasizes the integrated application of knowledge, cultivating students' ability to think comprehensively and solve practical problems. In interdisciplinary projects, students need to integrate knowledge from multiple disciplines to explore a theme or solve a real-world problem jointly; in the process, they exercise critical thinking and develop communication and collaboration skills. These valuable abilities benefit students' future learning and development.

4.2 The interdisciplinary teaching model integrating physical education and medicine has also positively impacted students' professional development. Taking students majoring in physical education or medicine as examples, interdisciplinary teaching broadens their horizons, enhances their understanding of related disciplines, and lays a solid foundation for their future learning and careers.

Students majoring in physical education not only need athletic skills but should also possess knowledge and abilities in health management. Students can learn about human anatomy, exercise physiology, and sports medicine through integration with medicine and master scientific rehabilitation theories and methods. This prepares them for future careers as athletic coaches, rehabilitation instructors, and more. Simultaneously, medical students can also learn about the importance of exercise for health through the



physical education discipline, enabling them to have a more comprehensive health perspective in future clinical diagnosis and treatment, providing holistic guidance for patients.

Beyond the impact on professional knowledge, integrating physical education and medicine can also promote enhancing students' professional competencies. In cross-disciplinary collaboration, students must continually consider integrating knowledge from different fields, requiring them to adopt an open learning attitude and possess cross-disciplinary communication and collaboration abilities. Such experiences will significantly enhance students' professional identity, sense of responsibility, and teamwork abilities, laying an essential foundation for their future career development.

4.3 The interdisciplinary teaching model integrating physical education and medicine has also impacted teachers' professional development. On the one hand, interdisciplinary teaching requires teachers to have a solid grasp of their discipline and a particular understanding of related disciplines, prompting teachers to learn from other fields and broaden their horizons actively. On the other hand, in teaching practice, teachers need to actively communicate and collaborate with colleagues from other disciplines, jointly designing teaching content and activities; this process strengthens mutual learning and exchange among teachers, improving teaching abilities and professional levels.

Moreover, interdisciplinary teaching also compels teachers to update their teaching philosophies and methods. Unlike traditional single-subject teaching, interdisciplinary teaching emphasizes situational creation, project-based learning, and other diversified teaching models, requiring teachers to actively transform their role from a one-way transmitter of knowledge to a learning guide and collaborative partner. Teachers must continuously learn and innovate in these new teaching models, optimizing classroom structures and strategies to adapt to the new teaching requirements.

The interdisciplinary teaching model integrating physical education and medicine has created a new environment and opportunities for teachers' professional growth. It is conducive to comprehensively enhancing their teaching design, cross-disciplinary communication, and classroom organization abilities. This two-way professional development effect will simultaneously improve teachers' teaching levels and students' learning quality, forming a virtuous cycle.

REFERENCE

1. van Dongen, B. M., de Vries, I. M., Ridder, M. A. M., Renders, C. M., & Steenhuis, I. H. M. (2021). *Opportunities for Capacity Building to Create Healthy School Communities in the Netherlands: Focus Group Discussions With Dutch Pupils*. *Frontiers in public health*, 9, 630513. <https://doi.org/10.3389/fpubh.2021.630513>
2. McLoughlin, G. M., Candal, P., Vazou, S., Lee, J. A., Dziewaltowski, D. A., Rosenkranz, R. R., Lanningham-Foster, L., Gentile, D. A., Liechty, L., Chen, S., & Welk, G. J. (2020). *Evaluating the implementation of the SWITCH® school wellness intervention and capacity-building process through multiple methods*. *The international journal of behavioral nutrition and physical activity*, 17(1), 162. <https://doi.org/10.1186/s12966-020-01070-y>
3. McHugh, C., Lloyd, J., Logan, S., & Wyatt, K. (2022). *Enablers and barriers English secondary schools face in promoting healthy diet and physical activity behaviors*. *Health Promotion International*, 37(2), daab148. <https://doi.org/10.1093/heapro/daab148>
4. van Dongen, B. M., Ridder, M. A. M., Steenhuis, I. H. M., & Renders, C. M. (2019). *Background and evaluation design of a community-based health-promoting school intervention: Fit Lifestyle at School and Home (FLASH)*. *BMC Public Health*, 19(1), 784. <https://doi.org/10.1186/s12889-019-7088-3>
5. Wessely, S., Starke, D., Weyers, S., & Joisten, C. (2021). *Closing the gap between practice and science in school- and community-based participatory physical literacy promotion: study protocol of the StuPs project*. *BMC Public Health*, 21(1), 642. <https://doi.org/10.1186/s12889-021-10666-3>
6. Allen, M. P., Auld, M. E., & Zorn, M. E. (2020). *K-12 Health Education, Communication, and Health Literacy: Strategies to Improve Lifelong Health*. *Studies in health technology and informatics*, 269, 400–438. <https://doi.org/10.3233/SHTI200054>
7. Adams, W. M., Scarneo, S. E., & Casa, D. J. (2017). *State-Level Implementation of Health and Safety Policies to Prevent Sudden Death and Catastrophic Injuries Within Secondary School Athletics*. *Orthopedic journal of sports medicine*, 5(9), 2325967117727262. <https://doi.org/10.1177/2325967117727262>
8. Kulmatycki L. (2005). *Trójwymiarowy model ewaluacji promocji zdrowia w szkole -- propozycja [Tridimensional evaluation model of health promotion in school -- a proposition]*. *Medycyna wieku rozwojowego*, 9(4), 791–804.
9. Yu, Q. (2024). *Teaching Core Literacy in College Physical Education and Health Courses Based on Multiple Data Integration*. *Applied Mathematics and Nonlinear Sciences*, 9(1) -. <https://doi.org/10.2478/amns-2024-0507>
10. Harrington, D. M., Davies, M. J., Bodicoat, D., Charles, J. M., Chudasama, Y. V., Gorely, T., Khunti, K., Rowlands, A. V., Sherar, L. B., Tudor-Edwards, R., Yates, T., & Edwardson, C. L. (2019). *A school-based intervention ('Girls Active') to increase physical activity levels among 11- to 14-year-old girls: cluster RCT*. *NIHR Journals Library*.
11. Strömmer, S., Barrett, M., Woods-Townsend, K., Baird, J., Farrell, D., Lord, J., Morrison, L., Shaw, S., Vogel, C., Lawrence, W., Lovelock, D., Bagust, L., Varkonyi-Sepp, J., Coakley, P., Campbell, L., Anderson, R., Horsfall, T., Kalita, N., Onyimadu, O., Clarke, J., ... Barker, M. (2020). *Engaging adolescents in changing behavior (EACH-B): a study protocol for a cluster randomized controlled trial to improve dietary quality and physical activity*. *Trials*, 21(1), 859. <https://doi.org/10.1186/s13063-020-04761-w>



USE OF RENEWABLE SOURCES OF ENERGY TO MINIMISE ELECTRICITY CONSUMPTION

Prof.A.H.Patil, Harsh.V.Gondane, Yash.V.Devkar , Sunil.S.Chavan, Mitesh.M.Jogdand, Abhishek.B.Ghodke

Patil A.H, Head of Civil Engineering Department, Y.B.Patil Polytechnic, Akurdi, Pune-411044.

ABSTRACT

As the world grapples with the challenges of climate change and dwindling fossil fuel reserves, the imperative to transition towards renewable energy sources has become increasingly urgent. This abstract explores the utilization of renewable energy technologies as a means to minimize electricity consumption, thereby mitigating environmental impacts and ensuring sustainable energy practices. Through a comprehensive review of literature and case studies, this research highlights the diverse array of renewable energy sources available, including solar, wind, hydro, biomass, and geothermal energy. It examines their potential to effectively offset traditional electricity generation methods, thereby reducing greenhouse gas emissions and dependence on finite resources. Furthermore, the abstract delves into the various strategies and technologies employed to integrate renewable energy into existing energy infrastructures, emphasizing the importance of policy frameworks, technological advancements, and public awareness in facilitating this transition. By synthesizing existing knowledge and identifying emerging trends, this abstract underscores the significance of harnessing renewable energy sources as a pivotal strategy in minimizing electricity consumption and advancing towards a sustainable energy future.

KEYWORDS— *Electricity consumption, Environmental impacts, Sustainable energy practices, Solar, Wind, Hydro, Biomass, Geothermal energy*

1. INTRODUCTION

In the wake of burgeoning environmental concerns and the escalating demand for electricity, the imperative to transition towards sustainable energy practices has become paramount. With Pune, a bustling metropolis nestled in the heart of Maharashtra, India, facing its own set of energy challenges, the exploration of renewable energy sources emerges as a pivotal solution to minimize electricity consumption while fostering environmental stewardship and economic resilience.

Pune, renowned for its vibrant culture, burgeoning industries, and rapidly expanding urban landscape, grapples with the repercussions of escalating energy consumption. As one of India's most populous cities, Pune's energy demands continue to soar, placing immense pressure on traditional electricity grids and exacerbating environmental degradation. The reliance on conventional energy sources, predominantly fossil fuels, not only perpetuates carbon emissions but also underscores the city's vulnerability to energy shortages and price volatility.

Furthermore, Pune's commitment to sustainability is exemplified by initiatives such as the Pune Smart City Mission, which prioritizes renewable energy adoption and energy efficiency measures to enhance urban livability and resilience. By leveraging renewable energy sources, Pune endeavours to mitigate its carbon footprint, reduce dependency on non-renewable resources, and foster a greener, more sustainable urban environment for its residents and future generations.

This capstone project seeks to delve into the multifaceted implications of harnessing renewable energy to minimize electricity consumption in Pune. By analysing local data, case studies, and policy frameworks, it aims to offer insights, recommendations, and actionable strategies to propel Pune towards a more sustainable energy trajectory while serving as a model for other cities worldwide.

2. LITERATURE REVIEW

The utilization of renewable energy sources to minimize electricity consumption has garnered significant attention in academic research, policymaking, and industry practices. This section provides an overview of key findings from relevant literature, highlighting the effectiveness of renewable energy technologies in reducing electricity demand and mitigating environmental impacts.

Solar Energy

Solar photovoltaic (PV) systems have emerged as a promising solution for minimizing electricity consumption. Studies by Jäger-Waldau (2016) and Zhang et al. (2018) have demonstrated the substantial potential of solar energy in offsetting electricity demand, particularly in regions with ample sunlight. Rooftop solar installations, as explored by Jain et al. (2020), have been shown to



empower households and businesses to generate their own electricity, thereby reducing reliance on centralized power grids and fossil fuels.



Wind Energy

Wind power represents another viable renewable energy source for minimizing electricity consumption. Research by Barbour et al. (2019) and Khan et al. (2020) has highlighted the scalability and cost-effectiveness of wind energy projects in offsetting electricity demand, particularly in regions with favourable wind conditions. Moreover, community wind projects, as investigated by Wolsink (2019), have demonstrated the socio-economic benefits of decentralized wind energy generation, fostering community engagement and local ownership.



Hydroelectric Power

Hydroelectric power has long been recognized as a reliable and renewable source of electricity. Studies by Lu et al. (2018) and Gulagi et al. (2021) have underscored the role of hydroelectricity in minimizing electricity consumption, particularly in regions with abundant water resources. However, concerns regarding environmental impacts, such as habitat disruption and reservoir emissions, necessitate careful planning and management of hydroelectric projects (Kibaroglu, 2017).



Policy Frameworks and Integration Strategies

Effective integration of renewable energy into existing energy systems requires comprehensive policy frameworks and supportive regulatory environments. Research by Sovacool et al. (2019) and Schreuer et al. (2020) has emphasized the importance of policy incentives, such as feed-in tariffs and renewable energy targets, in promoting renewable energy adoption and minimizing electricity consumption. Additionally, technological advancements in energy storage, grid integration, and demand-side management play a crucial role in optimizing the utilization of renewable energy sources (Kazempour et al., 2018).

2.1 Disadvantage of Use Of Renewable Sources of energy

Disadvantages of using renewable sources of energy to minimize electricity consumption:

Intermittency: Renewable energy sources like solar and wind power are dependent on weather conditions, resulting in variability in energy generation and reliability.



Energy Storage: Storage technologies for renewable energy, such as batteries, can be costly and have limited capacity, hindering their ability to provide continuous power during periods of low generation.

Land Use: Large-scale deployment of renewable energy infrastructure may require significant land area, potentially leading to conflicts over land use and environmental impacts such as habitat disruption.

Initial Cost: The upfront investment for installing renewable energy systems, such as solar panels or wind turbines, can be substantial, deterring some individuals or businesses from adopting these technologies.

Transmission Challenges: Renewable energy sources are often located in remote areas, necessitating long-distance transmission infrastructure, which can be expensive to build and maintain.

Environmental Impacts: While renewable energy sources are generally cleaner than fossil fuels, they can still have environmental impacts, such as habitat disturbance from hydroelectric dams or bird mortality from wind turbines.

Resource Limitations: Certain renewable energy sources, such as biomass and geothermal energy, are limited by the availability of feedstocks or geological suitability, constraining their scalability and widespread deployment.

3. CASE STUDY

1]Case study 1 (Residential house)

We have done a case study on a residential house name tirupati niwas in pimple Gurav, Pune, With a family of five members.

- Electricity consumption- 350kwh per month
- Electricity costs- 3150 rupees per month Our aim was to minimise the electrical consumption by using solar panels

Survey

Standard size of solar panel = 65*39 inch

Electricity Produce by solar panel per day = 1.5 kWh

Electricity Produce by solar panel per months = 45kWh

Electricity consumption of a house per day = 11.1Wh

Electricity consumption of a house per months = 350Wh

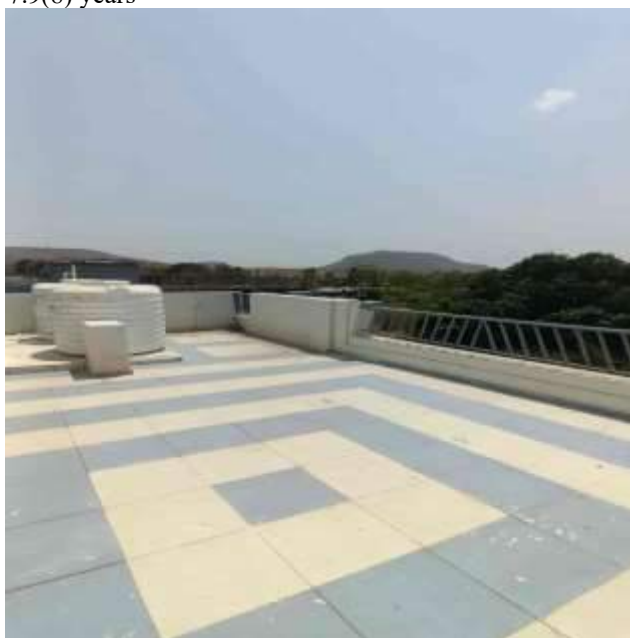
Panels required to minimise the cost = 8 panels

Cost of solar panel+ battery+ fitting cost+ maintenance=
72,000rs + 2,00,000rs+ 16000rs+ 6000rs=2,94,000rs

To recover this cost it requires around

Total cost/ Electricity cost

2,94,000rs/3150rs= 95.23 month or 7.9(8) years





2|Case study 2 (Y.B.PATIL POLYTECHNIC BUILDING) We have done case study on our college building Y.B. PATIL POLYTECHNIC in Akurdi, Pune.



TOOLS AND MATERIALS

Estimation (it's depended on energy audit)

- Light bill: first we get unit consumption of top 5 in year average
- $22360+22555+20690+20555+19315=110,475$
- $110475/5=22095$
- Then we divided by 30 in average answer so we get per day consumption of unit in electricity
- So, per day electricity unit is $22095/30=736.5$
- Then again divided by 4 in per day electricity
- $736.5/4=184.12$ K WC

Price of Solar Panel

TATA: 65000rs per KWC

$= 185 \times 65000 = 12025000$

Vikram: 70000rs per KWC

$= 185 \times 70000 = 1295000$

So we have took benefits of PM surya Ghar:Muft Bijli yojana,

In this our electricity bill was above>300kW

So, we have to pay 48000 for subsidy to apply for the 78,000rs





PM – Surya Ghar: Muft Bijli Yojana

Subsidy for residential households

Rs. 30,000/- per kW up to 2 kW

Rs. 18,000/- per kW for additional capacity up to 3 kW

Total Subsidy for systems larger than 3 kW capped at Rs 78,000

Suitable Rooftop Solar Plant Capacity for households

Average Monthly Electricity Consumption (units)	Suitable Rooftop Solar Plant Capacity	Subsidy Support
0-150	1 – 2 kW	Rs 30,000 to Rs 60,000/-
150-300	2 – 3 kW	Rs 60,000 to Rs 78,000
>300	Above 3 kW	Rs 78,000/-

Online Applications may be submitted on the National Portal at <https://pnvsuryaghar.gov.in>

CONCLUSION

The utilization of renewable sources of energy presents a promising solution to minimize electricity consumption. By harnessing sustainable energy from sources such as solar, wind, and hydropower, we can significantly reduce our dependence on fossil fuels and mitigate environmental impacts associated with traditional energy generation. Embracing renewable energy not only fosters energy independence but also promotes economic growth, job creation, and environmental sustainability. Through continued investment, innovation, and adoption of renewable technologies, we can pave the way towards a cleaner, greener, and more resilient energy future for generations to come.

REFERENCES

1. International Renewable Energy Agency (IRENA) www.irena.org

2. National Renewable Energy Laboratory (NREL) - www.nrel.gov

3. Websites used for reference: www.google.com; www.wikipedia.in; 4]Solar Energy Industries Association (SEIA) Website:

4. <https://www.seia.org/>



STEM STRAND IN THE PHILIPPINES: AN ANALYSIS

Joel I. Alvarez

Faculty, Nueva Ecija University of Science and Technology, Cabanatuan City, 3100, Nueva Ecija, Philippines

Article DOI: <https://doi.org/10.36713/epra16077>

DOI No: 10.36713/epra16077

ABSTRACT

One of the Department of Education's (DepEd) programs is the K-12 program. They extended it for two more years to give students more time to consider their options for the future. The Senior High School (SHS) program had four tracks: Arts and Design, Sports, Technical and Vocational, and Academic, which included the Science Technology Engineering and Mathematics (STEM) strand. STEM is understood to be an integral part of math and science courses at the school level. It also contributed to the development of 21st-century abilities for all learners. This study determined the status of STEM students in the Philippines. Through descriptive research, this study described and analyzed the trends in the enrolment of STEM students as well as the factors that explain the dropout rate of STEM students. The data under this study came from a trusted source, which is the Department of Education's reports of enrollment from 2016- 2021. The enrollment rate and completion rate of SHS-STEM students are steadily increasing year after year. Thus, different intervention activities were proposed to address the identified factors that led to students dropping out of the STEM track. In addition, the findings of this study were used to improve the STEM strand's implementation in SHS and helped future generations as well as the Department of Education in the effective implementation of STEM education across the country.

KEYWORDS: STEM, Department of Education, SHS, Enrollment rate, Completion rate.

INTRODUCTION

"The function of education is to teach one think intensively and to think critically. Intelligence plus character – that is the goal of true education." – Martin Luther King.

Education plays a crucial role in shaping both individual lives and society as a whole, with educational institutions providing the foundation for students to enhance their self-confidence and acquire knowledge (Estonanto, 2013).

The K to 12 program, initiated by the Department of Education (DepEd), aims to extend basic education by adding two years, known as the Senior High School Program (SHS), to help students explore future options (Estonanto, 2013). SHS offers four tracks, including Arts and Design, Sports, Technical and Vocational, and Academic, with the Science Technology Engineering and Mathematics (STEM) strand being a part of the Academic track.

STEM education encompasses math, science, engineering, and technology, fostering critical thinking, problem-solving, leadership, and other 21st-century skills (Sahin, Ayar & Adiguzel, 2014; NCR, 2012). DepEd prioritizes the expansion of Special Science schools to promote Science and Mathematics education at all levels (DECS Order No. 69, s. 1993; DepEd Order No. 51, 2. 2010; DepEd Order No. 55, s. 2010). The curriculum emphasizes Spiral Progression across subjects to ensure students master knowledge and skills, aiming to develop globally competitive learners (DepEd Orders; NCR, 2012). By making STEM education accessible to all high school students, regardless of attending science-focused schools or universities, the curriculum seeks to enhance the quantity and quality of STEM education nationwide (DepEd Orders; Bishop, 2015). Early exposure to active learning activities enhances STEM content learning and academic preparedness in science and mathematics (Bishop, 2015).

According to Blotnick et al. 2018; Wang et al. 2013, students with stronger self-efficacy in mathematics and STEM career knowledge are more likely to choose a STEM job. Subject teachers who consider the preparation of young people for work as an intrinsic part of their professional responsibility and who have the professional abilities and confidence to act on this have better STEM careers activities (Finegold, Stagg, & Hutchinson, 2011).



Students who wish to pursue a STEM field career may be disheartened by the diminishing number of students studying the strand if they lack sufficient knowledge about STEM-based careers. This may lead to misunderstandings and a decrease in their desire to participate in activities that increase their awareness and knowledge about STEM careers. Not all SHS graduates advanced to STEM-related courses in college. Despite assistance and initiatives to achieve a match and a decrease in degree-job mismatch after college, there was a decrease in students in the STEM field track (Harackiewicz, Rozek, Hulleman, and Hyde (2012).

Hence, this investigated the status of STEM students in the Philippines. The findings of this study were used to improve the STEM track's implementation in SHS and served as a model for all academic tracks. The findings of this study helped future generations as well as the Department of Education in the effective implementation of the STEM curriculum across the country in order to grow the STEM workforce sectors.

Statement of the Problem

This study determined the status of STEM students in the Philippines.

Specifically, this study seemed to answer the following questions:

- 1) How may the rate of the enrolment of STEM students in the Philippines be described in the past five years compared to the enrolment rate of other academic tracks?
- 2) How may the trends on the enrolment of STEM students be compared to the trends on the number of Grade 12 Completers of STEM track?
- 3) Is there a significant difference between the enrolment rate of STEM students and the number of completers of the STEM track?
- 4) How may the identified factors that explains the dropped-out rate of STEM students be described?
- 5) What intervention plan may be proposed with the result of the study?

Hypotheses of the Study

- 1) There is no significant difference between the enrolment rate of STEM students and the number of completers of the STEM track.

Theoretical Framework

This study underpinned the Progressive Education Theory of John Dewey. Progressive education, according to Dewey, is a "result of dissatisfaction with traditional education," which imposes adult norms, subject matter, and methodology. It is also defined as a vision of education that emphasizes the necessity of learning by doing. According to the John Dewey theory, people learn best through a hands-on approach. Furthermore, he considered that traditional education was out of reach for young students. According to Flinders & Thomson (2013), Dewey believed that effective education occurred mostly through social contacts, and that the educational setting should be considered a social institution.

John Dewey's theory that children, not content, should be the focus of the educational process has made an indelible imprint on educators who share his views on education and how children learn best (Schiro, 2013).

This theory suggests that educators should teach children how to think rather than rely on rote memorization. Also, the school was conceived of as a laboratory in which the child was to take an active part – learning through doing. This theory was applied in the current study in order to view the children as passive recipients of knowledge, and they certainly couldn't indicate whether they liked to learn more about a specific subject. Lastly, this theory satisfied the aims of the current in which his view of education was focused on the policy and view of most schools.

RESEARCH METHODOLOGY

Research Design

In this study, the researchers used descriptive research design in order to determine the status of STEM students in the Philippines. A descriptive study design tries to accurately and thoroughly characterize a population, situation, or phenomenon, and it answers the questions of what, when, where, and how. Furthermore, a descriptive research design uses a range of research methods to explore one or more variables.



In this study, a descriptive research design was used in order to describe and analyze gathered data regarding the trends in the enrolment of STEM students as well as the factors that explain the dropped-out rate of STEM students.

The researchers utilized this research design as the most appropriate for the study in order to gather data and statistically analyze data in order to define and determine variables in the study.

Focus of the Study

This study focused on the data of the Philippines regarding the status of STEM students. The data needed for this study is the enrolment rate of STEM students in the Philippines in the past five years and the enrolment rate of other academic tracks. In addition, data on trends in the enrolment of STEM students and factors that explain the drop-out rate of STEM students are also required for this study.



Source: mapsfordesign

Figure 2. Map of the Philippines

Statistical Analysis of Data

To interpret the data gathered by the researchers, the following statistical treatments are being utilized:

1. Frequency is being used to described the rate of STEM students' enrolment in the Philippines. Also, to compare the enrolment rate of STEM students and other academic tracks, the Mean and T-test are being used.
2. To determine the trends in the enrolment of STEM students and the trends in the number of STEM completers, regression and predictive analysis were used.
3. A T-test was used to determine if there was significant difference between the enrolment rate of STEM students and the number of STEM track completers.
4. Mean and frequency are being used to describe the factors that explain the dropped-out rate of STEM students.
5. Thematic analysis is being used to propose the intervention plan.



RESULTS & DISCUSSION

Figure 4: Enrollment Rate of Academic Strands A.Y. 2016-2021

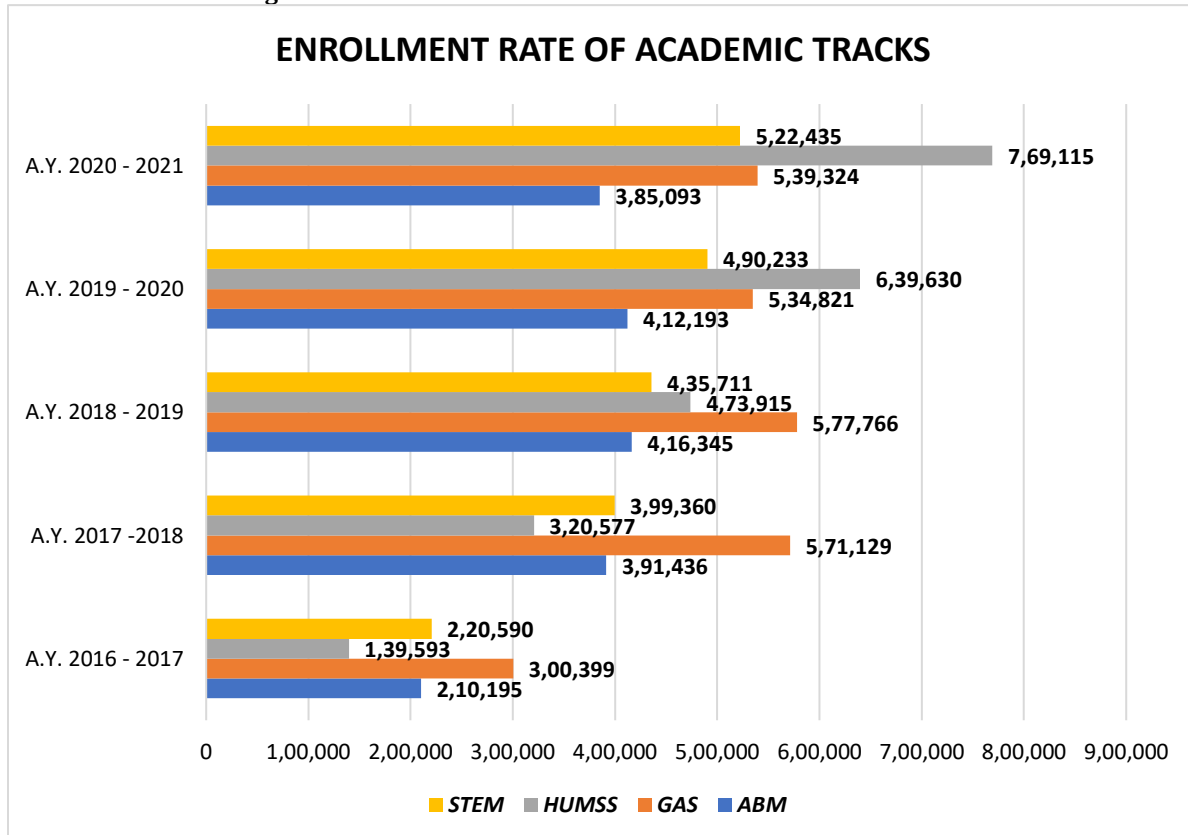


Figure 4 showed the enrollment rate of academic tracks for the past five years. In the academic year 2016-2017, the STEM strand obtained an enrollment rate of 220,590, which had a difference of 79,809 enrollees and was less than compared to the enrollment rate of the GAS strand, which had 300,399, and STEM strand is 80,997 higher than the enrollment rate of HUMSS, with 139,593 enrollees, and 10,395 higher than ABM, with 210,195 enrollees. The STEM track obtained 399,360 enrollees, which is 171,769 fewer enrollees than GAS strand which had 571,129 enrollees in the year 2017-2018. In addition, the STEM strand is 7,924 higher compared to the enrollment rate of ABM, with 391,436 enrollees, and 78,783 higher compared to HUMSS, with 320,577 enrollees. In the academic year 2018-2019, the STEM track obtained 435,711 enrollees, which was a difference of 142,055 enrollees compared to the enrollment rate of the GAS strand, which had 577,766. It is also 38,204 lower than HUMSS, which had 473,915 total enrollees in the said academic year. Also, the STEM strand is 19,366 higher than the enrollment rate of ABM, with 416,345 enrollees. For the year 2019-2020, the STEM strand obtained 490,233 enrollees, which is 120,603 fewer enrollees compared to the enrollment rate of the HUMSS strand, which have 639,630, and the STEM strand is 78,040 higher than the enrollment rate of ABM, with 412,193 enrollees, and 122,628 lower than GAS, with 534,821 enrollees. In the academic year 2020-2021, the STEM strand obtained 522,435 enrollees, which had a difference of 246,680 enrollees compared to the enrollment rate of the HUMSS strand, which had 769,115, and the STEM strand is 137,342 higher than the enrollment rate of ABM, with 385,093 enrollees, and 154,231 lower than GAS, with 539,324 enrollees.

Based on Figure 4, the strand with the highest enrollment rate for academic year 2016–2017 is GAS, followed by STEM, ABM, and HUMMS. In academic year 2017–2018, GAS had the highest number of enrollees, followed by STEM, ABM, and the least enrollment, HUMSS. In the year, 2018–2019, GAS is still leading among other academic strands and followed by HUMSS, STEM, and ABM. Lastly, HUMSS obtained the highest number of enrollees, followed by GAS, STEM, and ABM in the academic years 2019-2020 and 2020-2021.

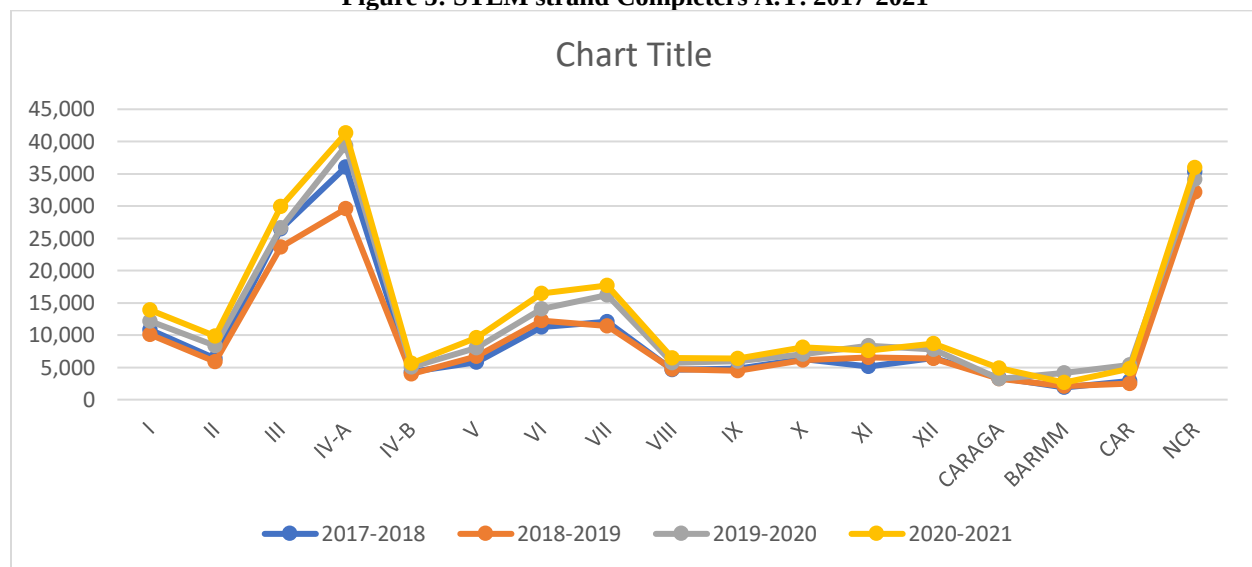
In June 2016, the Department of Education (DepEd) introduced senior high school (SHS) across the country, a new level of basic education that includes grades 11 and 12. In the first three (3) academic year since SHS launched, GAS obtain the highest enrollment



rate among other academic tracks. According to Cruz (2016), students who choose GAS are those students who are unsure and undecided about the path they want to take. Edukasyon.ph says that the General Academic Strand is ideal for students who are indecisive about their academic path. This program allows you to select electives from a variety of academic strands. Cueva (2019) says that if you're unsure or undecided about the road you want to choose, GAS is the strand offered in this track. What makes this great is that the courses given here are all-encompassing; that is, they cover every subject. The things that one can learn in this can help your uncertain mind explore your possible college options. To put it another way, this strand applies to all college courses.

A.Y. 2019 – 2020 and A.Y. 2020 – 2021, HUMSS got the highest number of enrollees among other strands in academic track. According to Klent (2020), HUMSS is one of the demand strands nowadays because they are the future servant in our country. HUMSS related job opportunities in the Philippines, from the biggest social enterprises to tech companies, people are finally realizing that in order to tackle today's social and technological problems, we need to think about these challenges in the human aspect De Guia (2018).

Figure 5: STEM strand Completers A.Y. 2017-2021



The figure showed the total number of SHS-STEM completers in the years 2017-2021. Based on the graph, the top 3 regions with the highest STEM completion rates in AY 2017-2018 are Region IV-A, accounting for 36,078, followed by NCR with 35,325 completers, and Region III with 26,486 completers. NCR leads 32,127 total number of completer, followed by Region IV-A with 29,622, and Region III with 23,627 in AY 2018-2019. In 2019-2020, the top 3 regions with the highest total of STEM completers came from Region IV-A with 39,362, followed by NCR with 34,135, and Region III with 26,602. Lastly, in AY 2020-2021, the highest total of STEM completers is from Region IV-A with 41,304, followed by NCR with 35,955 and from Region III with 29,946.

Based on the graph, Region IV-A had the highest number of STEM completers in the academic years 2017-2018, 2019-2020, and 2020-2021, while NCR had the highest number of STEM completers in the academic year 2018-2019. As we can see, the completion rates of SHS-STEM students have been continuously increasing from the year of the first completers of SHS up to academic year 2021. In addition, year-by-year, the completion rates of SHS-STEM students from the 17 regions of the country are also continuously increasing.

Students who entered in the STEM strand in June 2016 and graduated in the current year have left the STEM field. According to Barbosa (2019), only 87.32 percent of 1.4 million students who registered in Grade 11 STEM Strand continued to Grade 12, while 95.9 percent graduated. It means that as time passes, not all of the enrollees will have progressed to the same strand. Despite the assistance and activities, there was a drop in the number of students pursuing STEM careers (Papasin, 2015).



Table 1: t-Test Result: Paired Two Sample for Means

	<i>STEM Enrollment Rate</i>		<i>Grade 12 STEM Completers</i>
Mean	461934.75		199240.5
Observations	4		4
T Stat		15.6191002	
P(T<=t) two-tail		0.000570336	
t Critical two-tail		3.182446305	

Since the obtained p-value of 0.000570336 is less than the p-critical and significance level of 0.05, therefore, there is enough evidence to reject the null hypothesis “There is no significant difference between the enrolment rate of STEM students and the number of STEM completers. This means that there is a significant difference between the enrolment rate of STEM students and the number of STEM completers.

Several researches revealed that STEM majors were academically prepared especially in mathematics and science test scores, were successful when it comes to Grade Point Average (GPA), and persistent in earning a STEM degree (Chen, 2013; Chen & Ho, 2012; Mattern, Radunzel, & Westrick, 2015). Furthermore, Orale & Sarmiento (2016) discovered that SHS-STEM strand in the Philippines is better than that in Japan and the United States (US).

However, in the Philippines, STEM graduates are insufficient; hence, the country does not have sufficient scientists (Anito, Morales & Palisoc, 2019). The Philippines only has 189 scientists per million which is very low compared to the UNESCO recommendation which is 380 per million (Anito et al., 2019). The low number of scientists in the country is greatly attributed to the low graduates of STEM-related careers. The Commission on Higher Education (CHED) report revealed that the completion rate across STEM areas based on the average five-year data until 2016-2017 is only 21.10%. This scenario is further validated by EduTECH (2016) that the Philippines is experiencing shortages in the workforce in the field of STEM.

Rask (2010) states that the STEM program is very costly in terms of one’s motivation and future career potential as well. STEM education is one of the most in-demand strands in DepEd’s senior high school. With the K to 12 curriculum, more students became more competitive, especially in the field of science and technology, as well as in engineering and mathematics using advanced concepts and topics. As a result, the Philippine education system is continuously improving, and it also helps the students to be more globally competitive. But due to lack of scholarship opportunities, lack of parental support, and some other factors, many STEM students fail to finish their chosen careers.



Figure 6: Dropped-Out Rate of STEM Students A.Y. 2017-2021

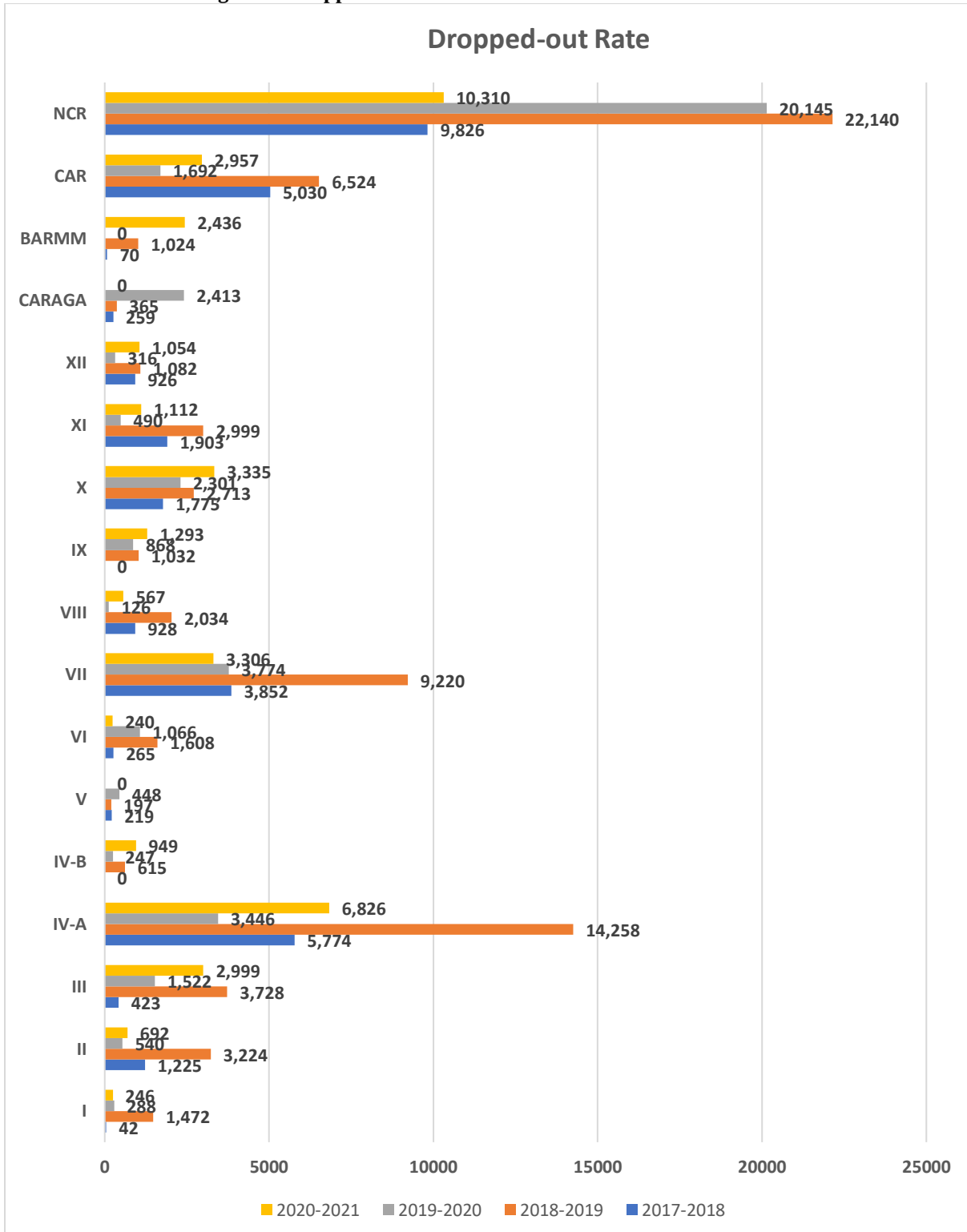




Figure 6 represents the dropped-out rate of STEM students in the different regions of the Philippines from Academic Year 2017-2021. It showed that National Capital Region (NCR) has the highest count of dropped-out STEM students from AY 2017-2021 accounting for 62,421 students.

Region IV-B and IX are the two regions with the lowest count of dropped-out students for AY 2017-2018, with a 0% drop-out rate. In AY 2018-2019, Region V has the lowest number of dropped-out students, accounting for 197. Lastly, BARMM, and Region V and CARAGA, AY 2019-2020, and 2020-2021, respectively, have a 0% dropped-out rate.

Formal education is regarded the route to a better life in developing countries, and the Philippines is on the list of perennials, persistent developing nations. Despite the fact that public education is free from primary to secondary school, the Philippines has the highest dropout rate of any ASEAN country (Borgen, 2019).

Based on the 2020 Census of Population and Housing (2020 CPH), the population of the Philippines as of May 2020 is 109,035,343, representing the total number of persons living in the 17 administrative regions of the country. With these 17 administrative regions, Region IV-A (CALABARZON) had the biggest population in 2020 with 16.20 million, followed by NCR with 13.48 million, and Region III (Central Luzon) with 12.42 million. Also included in the top five most populous regions were Region VII (Central Visayas) with 8.08 million, and Region VI (Western Visayas) with 7.95 million. That is why according to Bostwick (2019), because of the growing nation, there are shortages and dropout rate that are the norm throughout the country and are harming the countries well-being. In addition, funding for education in the Philippines as of 2018 is 672.41 billion, this funding is among the lowest budgeted among the ASEAN countries, that is why there is also a shortage of supplies in the classroom. Classrooms will sometimes have two or even three students sharing a single textbook. These are one of the reasons for the high dropout rate of STEM students in the Philippines.

According to Harackiewicz, Rozek, Hulleman, and Hyde (2012), without the proper knowledge about STEM-based careers, students who prefer to take a STEM field career might be discouraged with the decreasing number of students pursuing the strand. This may result in misconception and diminish their desire to participate in activities that may open awareness and knowledge about the STEM career. According to a new Pew Research Center Survey, more students don't pursue a degree in STEM because they are more likely to point the difficulty of these subjects. About half of adults say the main reason young people don't pursue STEM degrees is they think these subjects are too hard.

The alarming poor achievement results in science which were documented for many years are also one of the reasons for enhancing STEM education in the Philippines (Magulod, 2017). This poor performance in the primary science curriculum in the Philippines according to Bernardo (2004) is due to the inadequate science curriculum and poor preparation of STEM teachers. Moreover, the scarcity of instructional materials has also contributed to the dropout rate of STEM students (Tupas & Matsuura, 2011).

Rask (2010) states that the STEM program is very costly in terms of one's motivation and future career potential as well. STEM education is one of the most in-demand strands in DepEd's senior high school. With the K to 12 curriculum, more students became more competitive, especially in the field of science and technology, as well as in engineering and mathematics using advanced concepts and topics. As a result, the Philippine education system is continuously improving, and it also helps the students to be more globally competitive. But due to lack of scholarship opportunities, lack of parental support, and some other factors, many STEM students fail to finish their chosen careers. According to Andrada and David (2020), external motivation is one of the reasons why students leave STEM. The requirements and fear of getting low grades led most participants to think of dropping from STEM.

Lastly, according to Dang (2015), the lack of money is one of the major problems of the students to pursue STEM career. It is sad to think that some students do not achieve their dreams because of this problem. Some of them stop studying and just working.

**Proposed Intervention Plan**

Identified Factors	Intervention Activity	Length of Activity
1. Lack of budget due to growing populations. There are shortages of supplies in the classroom.	Supplemental Instruction Program (peer-led review sessions).	Two times per semester of academic quarter
2. Without proper knowledge about STEM-based careers that leads to misconception about STEM.	School-based orientation about STEM.	Four months per year (per semester or per academic quarter)
3. Poor preparation of STEM teachers.	Professional and Education Development Program.	Four months per year (per semester or per academic quarter)
4. Lack of external motivation (parental support)	Personal development programs and family mentoring sessions.	Four months per year (per semester or per academic quarter)
5. Lack of financial support.	Financial Aid Program for Students	Twice a month

CONCLUSIONS

As the result of the study, the researchers therefore concluded that:

1. The strands with the highest number of enrollees for the five consecutive years are GAS (2016-2017 to 2018-2019) and HUMSS (2019-2020 to 2020-2021).
2. Because of the highest number of enrollees in Region IV-A and NCR, they are the two regions with the highest number of STEM completers in the following years since the implementation of the K to 12 Program.
3. The numbers of STEM enrollees and completers are significantly different since the p-value is less than the p-critical and significance levels. The number of STEM enrollees is higher compared to the number of completers.
4. The NCR had the highest dropped-out rate of STEM students since it is the second region in the country to have the highest population, which is one of the main factors in STEM students' dropping-out.

RECOMMENDATIONS

To address the STEM students' enrollment and identified factors of the drop-out rate in the Philippines, programs and activities are recommended.

Since GAS and HUMSS got the highest number of enrollees for the past five years of the implementation of the K to 12 Program and STEM ranked second or third, the researchers recommended that SHS may design various activities during the career week wherein, these activities may include possible career paths in STEM courses, students' careers, and motivation. In addition, the school administration may also conduct an orientation about STEM so that students will understand the concepts of the STEM strand in SHS.

Moreover, to address the shortages of facilities and supplies in the classroom, there is a need to ensure that STEM education budgets are efficiently allocated to its respective areas. Also, STEM teachers must undergo education development to eradicate misconceptions about the program. Professional development of teachers is required to bring strong information in science and enable them to acquire new knowledge. Lastly, since external motivation is one of the factors of STEM drop-out, it is recommended that personal development programs and family mentoring sessions be conducted to guide students in their careers and motivate them to pursue STEM careers.

REFERENCES

1. *Algamata, DR., Alvin J., Guilingay MA., Mabasa RA., Para J., Puguon MN. and Rivera JL. (2018). ADVANTAGES OF TAKING UP STEM IN SENIOR HIGH SCHOOL: Preparation for College, Academia.edu.*http://www.academia.edu/37587600/ADVANTAGES_OF_TAKING_UP_STEM_IN_SENIOR_HIGH_SCHOOL_PREPARATION_FOR_COLLEGE
2. *Alvarez, JI. & Galman, SMA (2023), HyFlex Learning: Continuing Tertiary Education in a Post – Pandemic Environment, Proceedings of the 3rd International Conference on Education and Technology (ICETECH 2022), Atlantis Press, 584 – 601.* https://doi.org/10.2991/978-2-38476-056-5_57
3. *Alvarez, J. I. (2023). Massive Open Online Course in Elementary Statistics: A Tool in Empowering Data Analysis for Philippine Pre –*



- Service Educators. *Asian Journal of Applied Education (AJAE)*, 2(3), 515–528. <https://doi.org/10.55927/ajae.v2i3.4260>
4. **Alvarez, J. & Galman, S.M. (2021)**, Development of Massive Open Online Course in Elementary Statistics, NEUST Graduate School, Cabanatuan City, Nueva Ecija.
 5. **Alvarez, J. I., & Galman, A. S. M. A. (2023)**. Use of Filipino Language as Medium of Instruction in Teaching Advanced Algebra Class. *European Journal of Science, Innovation and Technology*, 3(2), 157-171. Retrieved from <https://www.ejsit-journal.com/index.php/ejsit/article/view/192>
 6. **Alvarez, J. I. (2021)**. Game of the radicals: Intervention in teaching simplifying radicals. *International Journal of Research Studies in Education*, 10(3), 73-80. <https://doi.org/10.5861/ijrse.2021.5015>
 7. **Alvarez, J. I. (2023)**. Relationship between Mathematics Beliefs and Student Engagement in Mathematics as Mediated by Creative Self-Efficacy. *EPRA International Journal of Multidisciplinary Research (IJMR)*, 9(3), 93-102. <https://doi.org/10.36713/epra12481>
 8. **Angeles, J.R. & Alvarez, J.I. (2023)**. CMS 21: Integrating Game-Based Learning in Basic Automotive. *EPRA International Journal of Research and Development (IJRD)*, 8(3), 117 –124. <https://doi.org/10.36713/epra12664>
 9. **Amatrol (2022)**. Reasons Students Leave STEM Programs in College. <https://amatrol.com/reasons-students-leave-stem-programs-in-college/>
 10. **Ambar, R. (2018, August 9)**. STEM In the PH workforce: A critical, ever-growing need. <https://www.flipsience.ph/news/features-news/features/stem-ph-workforce/>
 11. **ANDRADA, M.D., DAVID, A.P. (2020)**. K to 12 Students' journey in and out of STEM: Some Experiences to Share, *IOER INTERNATIONAL MULTIDISCIPLINARY RESEARCH JOURNAL (IIMRJ)*, 79-88. https://www.google.com/url?sa=t&source=web&rct=j&url=http://issuu.com/internationalresearch8/docs/k_to_12_students_journey_in_and_out_of_stem_some&ved=2ahUKWwiyh5bpu-7yAhXbAygKHV7oA3IQFnoECDcQAQ&usq=AOvVawOfDWIBVYjaq2-foFdHnC9s
 12. **Aranda, Crispin (2021, August 9)**. School of hard knocks. <https://www.manilatimes.net/2021/08/09/opinion/columns/school-of-hard-knocks/1810236>
 13. **Brillantes, Orbeta, Abrigo, Capones, & Jovellanos (December 2019)**. Status of Senior High School Implementation: A Process Evaluation. <https://pidswebs.pids.gov.ph/CDN/PUBLICATIONS/pidsdps1913.pdf>
 14. **By Craig O (June 2021)**. What is STEM? <https://www.topuniversities.com/courses/engineering/what-stem>
 15. **Cogal, M., Diestro, C., Nacorda, S., Olila, J., & Paras, M. (December 2019)**. Effective Implementation of the Senior High School Curriculum: A Descriptive Analysis. Volume 08, Issue 12. <https://www.ijert.org/effective-implementation-of-the-senior-high-school-curriculum-a-descriptive-analysis>
 16. **Creswell (2006)**. Chapter 4: Choosing a Mixed Methods Design, page 58. https://www.sagepub.com/sites/default/files/upm-binaries/10982_Chapter_4.pdf
 17. **DepEd Order No. 55, s. 2010. (2010, May 17)**. Policies and Guideline on strengthening science and mathematics education at the Secondary Level. <https://www.deped.gov.ph/2010/05/17/do-55-s-2010-policies-and-guidelines-on-strengthening-science-and-matematics-education-at-the-secondary-level/>
 18. **Geminiano, PM. (2018)**. More students now prefer Science and Technology courses. Philippine New Agency. <http://www.pna.gov.ph/articles/1051947>
 19. **Hansen (2018)**. Advantages of taking up STEM in senior high school: Preparation for college. https://www.academia.edu/37587600/ADVANTAGES_OF_TAKING_UP_STEM_IN_SENIOR_HIGH_SCHOOL_PREPARATION_FOR_COLLEGE
 20. **Jaschik, S. (2014)**. The STEM Enrollment Boom, *INSIDE HIGHER ED*, <http://www.insidehighered.com/news/2014/04/07/study-finds-increased-stem-enrollment-recession>
 21. **Kaleva, S., Pursiainen, J., Hakola, M., Rusanen, J., & Muukkonen, H. (December 13, 2019)**. Student's reasons for STEM choices and the relationship of mathematics choice to university admission. <https://stemeducationjournal.springeropen.com/articles/10.1186/s40594-019-0196-x>
 22. **Kennedy, B., Hefferon M., & Funk, C. (2018)**. Half of Americans think young people don't pursue STEM because it is too hard. <https://www.pewresearch.org/fact-tank/2018/01/17/half-of-americans-think-young-people-dont-pursue-stem-because-it-is-too-hard/>
 23. **Nucum, Karl Nicole (October 2018)**. Your complete guide to the academic track in senior high school. <https://www.edukasyon.ph/blog/senior-high-school-academic-track>
 24. **Lana, A. (2018)**. Implication of the implementation of the K-12 curriculum to Grade 10 students. https://www.academia.edu/37795603/Implication_of_the_implementation_of_the_K_12_curriculum_to_Grade_10_students
 25. **Magno, A.** The plight of the Senior High School in the Philippines. https://www.academia.edu/31301300/TITLE_1_The_plight_of_the_Senior_High_School_in_the_Philippines
 26. **Philippine Statistics Authority (2021)**. Highlights of the Philippine Population 2020 Census of Population and Housing (2020 CPH). <https://psa.gov.ph/content/highlights-philippine-population-2020-census-population-and-housing-2020-cph>
 27. **Rafanan RJ., De Guzman C. and Rogayan Jr. D. (2020)**. Pursuing STEM Career: Perspectives of Senior High School Students, *ResearchGate*, 7(3):38-58. http://www.researchgate.net/publication/342766109_Pursuing_STEM_Career_Perspective_of_senior_high_School_students



28. **Rafanan, R., De Guzman, C., & Rogayan, D. (December 2020).** Pursuing STEM Careers: Perspectives of Senior High School Students. https://www.researchgate.net/publication/342766109_Pursuing_STEM_Careers_Perspectives_of_Senior_High_School_Students
29. **Republic Act No. 10533 (2013, May 15).** Enhanced basic education act of 2013: an act enhancing the Philippines basic education system strengthening its curriculum and increasing the number of years for basic education, appropriating funds therefore and for other purposes. <https://www.officialgazette.gov.ph/2013/05/15/republic-act-no-10533/>
30. **Sarmiento, D., & Orale, R. (September 2016).** Senior High School Curriculum in the Philippines, USA, and Japan. https://www.researchgate.net/publication/318494693_Senior_High_School_Curriculum_in_the_Philippines_USA_and_Japan



ERANDA PATRA (*Ricinus communis* L.) AS A KRIMIGHNA DRAVYA (ANTIMICROBIAL DRUG) WITH SPECIAL REFERENCE TO ESCHERICHIA COLI BACTERIA- AN IN VITRO STUDY

Anoosha Adiga¹, Prajwal C R², Pradeep³

^{1,2}Postgraduate scholar, Department of Dravyaguna, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan

³Associate Professor, Department of Dravyaguna, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan.

ABSTRACT

Background: The recognition of any of the Dravya is through its Karma (Action). The karma is mainly explained with the help of Rasa panchaka in Ayurvedic science. Krimighna karma is one such karma which is responsible for the destruction of the krimi. **Methods and materials:** Swarasa, Aqueous- Methanolic and the chloroform extracts of Eranda Patra (*Ricinus communis* L.) was evaluated for its antimicrobial activity against *Escherichia coli* bacteria using Agar well diffusion method. *Escherichia coli* is a gram-negative bacterium residing in the colon which on pathological conditions will cause urinary tract infection, diarrhea, sepsis. As *Eranda patra* mainly acts on the urinary and digestive system and *E. coli* also affects the same system, the present work was undertaken to evaluate the Krimighna karma of *Eranda patra* against *Escherichia coli*.

Observation and result: The zone of inhibition was observed using agar well diffusion antimicrobial screening method against *Escherichia coli* bacteria. Swarasa had shown maximum Zone of inhibition (12.66mm) for *Escherichia coli* bacteria when dispensed directly and moderate zone of inhibition (8mm) for swarasa with diluted concentrations after 48 hours of incubation period when compared to control group but not as that of standard group. Methanolic and the chloroform extract had shown moderate (5.5mm and 6mm) ZOI against *Escherichia coli* bacteria when compared to control but not as that of standard drug. The aqueous extract did not show any inhibition against the bacteria. These findings established the potential of swarasa and the extracts of *Eranda patra* as an effective antimicrobial agent against selected organisms. However, further studies are needed to evaluate active compounds and probable medicinal benefits in humans by clinical trials.

KEY WORDS- Eranda, Krimighna, Swarasa, *Escherichia coli*, Zone of inhibition, Antimicrobial

INTRODUCTION

Traditional system of medicine mainly depends upon the plant, animal and mineral crude drugs. Plant origin drugs are mainly used in clinical practice. *Eranda* is a widely available plant and commonly used in *vatavyadhis*¹. *Krimighna karma* (Antimicrobial activity) is mainly mentioned for its leaf in Bhavaprakasha and Kaiyadeva Nighantu^{2,3}. *Eranda* is a soft-wooded small tree widespread throughout tropic and warm temperature regions of the world⁴. There are some indirect references in Vedas for microbes causing infection and infectious diseases in the name of *krimi* and *krimi rogas* which are the causative factors of a number of diseases. The word *krimi* is a broad term which includes all types of worms and microbes. The word *krimi* is derived from the root word 'Kramana' which means attacking, overcoming, suppressing⁵. *Krimi* are said as minute and are of different shapes and colour. Some of the *krimi* are visible and some of them are invisible. Thus, they can be considered as macro and micro forms of organism. *Escherichia coli* is a gram-negative bacterium which is rod-shaped bacterium. It commonly resides in the intestines and which on pathological conditions will cause urinary tract infection, diarrhea, sepsis. 90% of UTI are due to *Escherichia coli* bacteria⁶.

METHOD AND MATERIALS

The study was conducted in the following phases.

a. Pharmacognostical study

b. In vitro antimicrobial study

a. Pharmacognostical study: The leaf of *Eranda* was collected from natural habitat of Hassan and authenticated by the department of Dravyaguna, SDM College of Ayurveda and Hospital, Hassan. The sample leaf powder was subjected for macroscopic-microscopic evaluation, physicochemical evaluation, phytochemical evaluation and HPTLC.

b. In vitro antimicrobial study: The study was undertaken for the following test samples.

a. *Eranda patra* swarasa

b. Aqueous extract of *Eranda patra*



c. Methanolic extract of *Eranda patra*

d. Chloroform extract of *Eranda patra*

Method of sample preparation- The *swarasa* of *Eranda patra* and the extracts were prepared using the standard method. Agar well diffusion method was selected for conducting the invitro antimicrobial study.

PREPARATION OF NUTRIENT AGAR MEDIA

Requirements

1. Beef extract (1 g)
2. Yeast extract (2 g)
3. Peptone (5 g)
4. Sodium Chloride (5 g)
5. Distilled water -1000 ml
6. Agar -15g

Method of Preparation

The first 4 ingredients are weighed using digital balance. These extracts were dissolved in 990 ml of distilled water. The pH was adjusted to 7.2 and the volume was made up to 1000 ml. Finally, 15g agar was added to the media and autoclaved at 121°C for 20 minutes.

Preparation of the Inoculum

Escherichia coli (MTCC 42) was procured from Microbial Type Culture Collection and Gene Bank (MTCC), IMTECH, Chandigarh. They were supplied in frozen form in sealed glass vials.

Optimum care was taken in opening the vials. The work place was cleaned in laminar air flow using 70% ethyl alcohol and UV for 20 minutes. Loopful of 48h old culture of *Escherichia coli* from the slants was transferred to 5 ml of sterile saline and mixed well to prepare a homogenous inoculum.

Preparation of Agar Plates

Purpose of preparing the Agar plate is to provide a larger surface area for the growth of micro-organisms. The autoclaved sterile petri plates were taken and labelled with the name of the organism and the drug along with the date of preparation. Then, the different concentrations of the drug were also labelled on the backside of the culture plates.

Table 1: Dilutions of standard and extracts

Test sample	Dilution
1mg ampicillin	600 µL
10mg aqueous extract	1000 µL
20mg of methanolic extract	1000 µL
20 mg of chloroform extract	1000 µL

Well Diffusion Method

The nutrient agar media was cooled to around 45-55°C, around 20 ml of the media was poured into each sterile Petri plate. One ml of the inoculum was immediately added to the plate, swirled for uniform distribution. The air bubbles were removed using heat from the Bunsen burner. A sterile environment was achieved by placing two Bunsen burners. The plates were left undisturbed, cooled down and solidified to look opaque and this media is autoclaved at 121°C for 20 minutes. Once it solidifies, equidistant wells were bored using a sterile borer.

Table 2: Different concentrations of the test sample, control and the standard group

	<i>Swarasa</i>	Methanolic Extract	Chloroform Extract	Aqueous Extract
Test drug	50 µL	25 µL	25 µL	10 µL
	100 µL	50 µL	50 µL	20 µL
	150 µL	100 µL	100 µL	50 µL
				100 µL
				150 µL
Control	-	50 µL	50 µL	50 µL
Standard	50 µL	20 µL	20 µL	30 µL

In the above said concentrations of test sample, standard drug and the control were dispensed into the bored well. These culture plates were incubated overnight at 37°C and observed after 48 hours. Then, it was taken out and observed for the zone of inhibition.



Zone of inhibition (The diameter) was measured for each concentration using a scale and noted for each concentration of *swarasa*, aqueous, methanolic and chloroform extracts respectively. The difference in the zone of inhibition between the control and the test groups were calculated for each concentration and was noted. Average of ZOI of each control group and the test drug group was calculated and compared to the standard group.

OBSERVATIONS AND RESULTS

Pharmacognostical study-

The macroscopic features of *Eranda patra* (*Ricinus communis* L.) was found with the following features.

Table 3: Organoleptic Characteristics

	<i>Eranda Patra</i>	Powder of the <i>Eranda patra</i>
Appearance	Palmately lobed, simple with elongated petiole	-
Texture	Smooth	Smooth
Colour	Light Green in colour	Green in colour
Taste	<i>Tikta</i>	<i>Tikta</i>
Odour	Characteristic odour	Characteristic odour

Microscopic Evaluation

Eranda patra (*Ricinus communis* L.)- Transverse section of midrib of the leaf shows the following structures- A layer of upper and lower epidermis embedded with stomata and covered with thick cuticle. The whole ridge of upper epidermis is occupied with many rows of collenchymatous tissues and shows laterally placed laminar extensions on its either side.

The lamina shows a narrow band of palisade layer underneath the upper epidermis, the remaining mesophyll tissue being occupied by many rows of spongy parenchyma.

The ground tissues of the midrib consist of radially arranged xylem vessels and narrow band of phloem embedded with plenty of clusters and few rosette crystals of calcium oxalate.

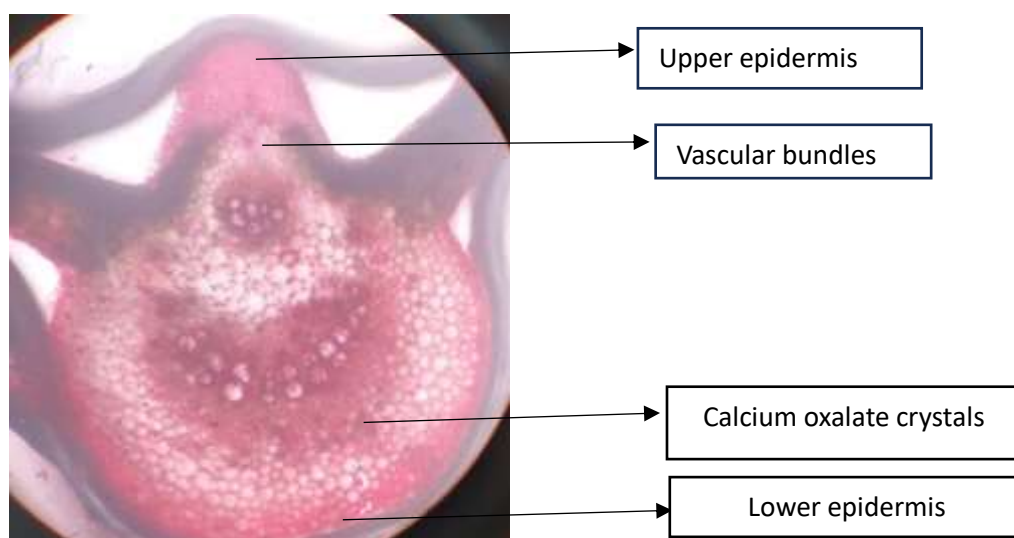


Fig.1-Microscopy of TS of *Eranda* leaf

Observations During Zone Of Inhibition

Zone of inhibition of *Eranda patra* (*Ricinus communis* L.) *swarasa*, aqueous extract, methanolic extract and the chloroform extract at different dosage forms were observed during the study and were recorded in tabular format from which graphs were designed.

**Table 4: ZOI of Swarasa of *Eranda patra* (*Ricinus communis* L.) against *E. coli***

Swarasa of <i>Eranda patra</i>	Dilution	Volume	Zone of inhibition (mm)	
	10+90µL	100µL	6	7
	25+75µL	100µL	7	8
	50µL+50µL	100µL	8	9
	75µL+25µL	100µL	9	10
	-	50µL	11	12
	-	100µL	12	13
Control (Distilled water)	-	150µL	14	14
Standard (Ampicillin)	-	150µL	0	0
		50µL	24	24

**Fig. 2- Agar well plate with the test sample, control and the standard drug****Table 5: ZOI of Methanol and Chloroform extracts of *Eranda patra* (*Ricinus communis* L.) against *E. coli*.**

Methanol extract of <i>Eranda patra</i> (<i>Ricinus communis</i> Linn.)	Volume	Zone of inhibition – (Radius in mm)	
	25 µl	5	5
	50 µl	5	6
	100 µl	6	7
Methanol control	50 µl	4	5
<i>Eranda patra</i> (<i>Ricinus communis</i> Linn.) powder of Chloroform extract	25 µl	5	6
	50 µl	6	6
	100 µl	6	7
Chloroform control	50 µl	5	5
Standard (Ampicillin) 1 mg/ml	20 µl	20	20

Table 6: ZOI of aqueous extract of *Eranda patra* (*Ricinus communis* Linn.) against *E. coli*

Sample	Volume	Zone of inhibition – (Radius in mm)	
Aqueous extract of <i>Eranda patra</i> (<i>Ricinus communis</i> Linn.) powder (10 mg / ml)	10 µl	0	0
	20 µl	0	0
	50 µl	0	0
	100 µl	0	0
	150 µl	0	0
Control (DD water)	50 µl	0	0
Standard (Ampicillin) 1mg / 600 µl	30 µl	21	21

Statistics

Arithmetic mean is applied for statistical analysis of this study.

**Table 5: Average of ZOI of each test samples, control and the standard drugs**

Type of the test sample	Volume	Control ZOI (mm)	Average ZOI (mm)	Difference with the control
Swarasa of <i>Eranda Patra</i> (<i>Ricinus communis</i> L.) with dilutions		0	6.5 (6+7/2)	6.5
		0	7.5 (7+8/2)	7.5
		0	8.5(8+9/2)	8.5
		0	9.5(9+10/2)	9.5
Direct swarasa-	50 µL	-	11.5(11+12/2)	11.5
	100 µL	-	12.5(12+13/2)	12.5
	150 µL	-	14(14+14/2)	14
Methanolic extract of <i>Eranda patra</i> (<i>Ricinus communis</i> L.)	25 µL	4.5	4.5 (4+5/2)	0
	50 µL	4.5	5.5 (11/2)	1
	100 µL	4.5	6.5 (13/2)	2
Chloroform extract of <i>Eranda patra</i> (<i>Ricinus communis</i> L.)	25 µL	5	5.5 (11/2)	0.5
	50 µL	5	6 (12/2)	1
	100 µL	5	6.5(13/2)	1.5

Table 6: Average of ZOI of Swarasa of *Eranda patra*

Test Sample	Average
Swarasa (Direct)	12.66mm
Swarasa with dilutions	8mm
Control (Distilled water)	0
Standard (Ampicillin)	24 mm

The average ZOI of *Eranda patra* swarasa group was more than the control group but not as that of the standard group.

Table 7: Average of ZOI of methanolic extract of *Eranda patra*

Test sample	Average
Methanolic extract of <i>Eranda patra</i>	5.5 mm
Control (Methanol)	4.5mm
Standard (Ampicillin)	20 mm

The average ZOI of methanolic extract of the *Eranda patra* (*Ricinus communis* L.) was more than the control group but not as that of the standard ampicillin.

Table 8: Average of chloroform extract of *Eranda patra*

Test sample	Average
Chloroform extract of <i>Eranda patra</i>	6 mm
Control (Chloroform)	5 mm
Standard (Ampicillin)	20 mm

The average ZOI of chloroform extract *Eranda patra* (*Ricinus communis* L.) was more than the control group.

For Aqueous Extract

As there was no zone of inhibition found in different concentrations, average cannot be applied.

Results

a. The swarasa of *Eranda Patra* (*Ricinus communis* L.) with and without dilutions had shown positive antimicrobial effect against *Escherichia coli* bacteria in comparison with the control group but not as much as the standard group.



b. The methanolic extract and the chloroform extracts of *Eranda patra* (*Ricinus communis* L.) has shown positive antimicrobial activity in comparison with the control group but not as that of standard drug.

c. The aqueous extract of *Eranda patra* (*Ricinus communis* L.) didn't show any antimicrobial activity on *Escherichia coli* bacteria. By all the above observations, we can analyze that the *swarasa* of *Eranda patra* (*Ricinus communis* L.) without dilution had shown maximum antimicrobial effect when compared to different diluted concentrations of Methanolic and Chloroform extract of *Eranda patra*. Aqueous extract of *Eranda patra* didn't show any antimicrobial effect against the strain of *Escherichia coli* bacteria.

DISCUSSION

Based on the Selection of the Drug

The plant *Eranda* is a drug that is abundantly available and *Krimighna karma* is specifically mentioned for its leaf in Bhavaprakasha and Kaiyadeva Nighantu^{2,3}. The leaf is selected because it is the part which can be easily collected and used. Rutin is the main phytoconstituent present in the leaf of *Ricinus*. It has been extensively studied for antimicrobial activity against various strains of bacteria⁷. It has demonstrated a profound degree of inhibition on growth of bacteria *Escherichia coli*. A study shows that the methanolic, ethanolic and aqueous extracts of *R. communis* leaves exhibited antimicrobial activity against four isolates of bacteria *S. aureus*, *B. subtilis*, *P. aeruginosa* and *K. pneumoniae*⁸.

Based on the Selection of the form of the Drug

As the *swarasa* is considered to be the most potent *Kalpana* among *Panchavidha Kashaya Kalpana*⁹ and it is easy to prepare from the leaves of the plant, this form was selected for the study. Aqueous extract is considered to be the one which is a bit similar to *Kashaya Kalpana* and it dissolves the water-soluble components of the drug. Rutin, the main constituent of the leaf of *Ricinus communis* L. is known to have high solubility in polar solvents such as methanol, ethanol, etc.¹⁰ Hence, the methanolic extract of the leaf was selected for the antimicrobial study. Ricinine is an alkaloid present in the leaf of *Ricinus*. As this alkaloid is soluble in chloroform, it was selected for study.

Pharmacognostical Evaluation- All the pharmacognostical parameters indicated the genuinity of the drug.

In vitro Antimicrobial Study- Agar well diffusion method is widely used to evaluate the antimicrobial activity of plant extracts. This method is simple, qualitative and easy to perform. Hence, this method was selected to evaluate the antimicrobial activity of *Eranda patra* (*Ricinus communis* L.).

In this study, it was observed that, as the volume of the concentrations of the *swarasa* or the extract were increased, there was a subsequent increase in the zone of inhibition also. As the concentration decreases, the active molecule content has also decreased which might not be capable of destroying the strains of bacteria. There was no activity observed for aqueous extract with reference to the control as rutin is found to be slightly soluble or insoluble in water.

Based on *Rasa panchaka*^{11,12,13}

Rasa- *Tikta rasa*. *Tikta rasa* is '*Krimin jayeth*', which means to destroy or to kill the *krimis*. It can be taken as, by virtue of its *tikta rasa*, it helps in destroying the *krimis* or helps in stopping the growth of the organisms.

Guna - Laghu, Ruksha. *Laghu guna* - It has *Kaphahara* property which also hinders the growth of the *Krimi*. *Ruksha guna* - The main action of *Ruksha guna* is *Shoshana*, *Sthambhana* and also *kaphahara* which helps in drying or shrinks the size of the cells. Thus, it will act as *Krimi shoshaka* and it stops the growth of the bacteria.

Veerya - Ushna veerya. *Ushna veerya* of the *dravya* will cause *dhatu kshaya* which helps in destruction of the *Krimi* which may help the organism in preventing its multiplication or further growth. This *guna* also causes destruction of the cell components of the bacteria because of its *pachana* property. Thus, it helps in both bacteriostatic and bactericidal action.

Doshaghnata- Vatakapahara

Growth of the *Krimi* is mainly due to *Vata* and *Kapha dosha*. *Eranda patra* having *Kapha* and *vatahara* property which inhibits the growth of *Krimi*.

Based on the Phytoconstituents

Eranda patra (*Ricinus communis* L.) is having Ricinine (1%), Quercetin 3-O-B- rutoside (rutin) in it⁷. And the preliminary phytochemical analysis determines the presence of tannins, tannic acid, proteins and carbohydrates in it. As the phytochemical constituent rutin is slightly or insoluble in water, the antimicrobial activity may not have been found in the aqueous extract. And it is highly soluble in polar solvents such as methanol (55 g/L), ethanol (5.5 g/L), etc., the antimicrobial effect was found in methanolic extract of *Eranda* (*Ricinus communis* L.). Tannins hamper the plasma coagulating the property of *Escherichia coli*, preventing the



formation of fibrin rich membranous structures by the organisms¹⁴. Tannins have shown antimicrobial effects against various microorganisms. Rutin inhibit the synthesis of DNA, RNA and related macromolecules in the bacteria and hence prevent the growth of the bacteria¹⁵.

CONCLUSION

Eranda patra (*Ricinus communis* L.) swarasa, methanolic and the chloroform extracts possess antimicrobial activity (*Krimighna karma*) against the *Escherichia coli* bacteria but not as that of standard drug.

REFERENCES

1. Acharya YT, Charaka Samhita by Agnivesha, Sutrasthana, Chapter 25: Yajjapurusheeya adhyaya, Verse No. 40, New Delhi: Chaukhambha Publications, 2016; p.131.
2. Chunekar K.C., Bhavaprakasha Nighantu of Bhava Mishra; Chapter Guduchyadi varga: Verse no. 55; Varanasi: Chaukhambha Bharti Academy, 2015; p.299.
3. Sharma P.V, Sharma G, Kaiyadeva Nighantu, Chapter Aushadhi Varga, Verse no. 113- 120; Varanasi: Chaukhambha Orientalia, 2019; p.24-25.
4. CCRAS, Database on Medicinal Plants Used in Ayurveda, Volume 4, New Delhi, 2002, p.122-126
5. Krimi
6. Edgar V Lerma, Jeffrey S Berns, Allen R Nissenson. Current Diagnosis and Treatment in Nephrology and Hypertension. 1st ed. New York: The Mc Graw- Hill Companies; 2009.p.329
7. Gupta DP, The Herbs.ed.1. Indore: Smt. Prem Lata Gupta; 2008; p.381-382
8. Araruna M.K., Brito S.A., Morais-Braga M.F., Santos K.K., Souza T.M., Leite T.R., Costa J.G., Coutinho H.D. Evaluation of antibiotic & antibiotic modifying activity of pilocarpine & rutin. Indian J. Med. Res. 2012; 135:252–254. [PMC free article] [PubMed] [Google Scholar] [Ref list]
9. Angadi R, Textbook of Bhaishajya Kalpana Vijnana, Varanasi: Chaukhambha Surbharati Prakashan:2016; p.65
10. Evans WC, Trease and Evans' pharmacognosy, British library Cataloguing in publication data, ed.13,1994, p.421
11. 11.Vidyanath R, Illustrated Astanga Hridaya of Vagbhata, ed.1, Sutrasthana, Rasabhedeya Adhyaya, chapter 10, verse no.14-19. Varanasi, Chaukhambha Surbharati Pratisthan; p.176
12. Acharya YT, Sushruta Samhita of Sushruta with Nibandha sangraha tika of Sri Dalhanacharya, Sutrasthana, Chapter 42: Rasavishesha vijnaneeya Adhyaya, Verse No. 4-5, 1992. Varanasi: Chaukhambha Sanskrit Sansthan; p.186
13. Acharya YT, Sushruta Samhita of Sushruta with Nibandha sangraha tika of Sri Dalhanacharya, Sutrasthana, Chapter 42: Rasavishesha vijnaneeya Adhyaya, Verse No. 4-8, 1992. Varanasi:Chaukhambha Sanskrit Sansthan; p.184
14. International Journal of Technology and Science, ISSN (Online) 2350-1111, Tannins- Antimicrobial chemical components, (Print) 2350-1103 Volume IX, Issue 3, 2016; p.5-9
15. Hidetoshi ARIMA, Hitoshi ASHIDA & Gen-ichi DANNO (2002) Rutinenhanced Antimicrobial Activities of Flavonoids against *Bacillus cereus* and *Salmonella enteritidis*, Bioscience, Biotechnology, and Biochemistry, 66:5, 1009-1014, DOI: 10.1271/bbb.66.1009



FACILE SYNTHESIS STRUCTURAL CHARACTERIZATION PHOTOCATALYTIC AND ELECTROCHEMICAL APPLICATIONS OF $\text{CrO}_4\text{-CeO}_2$ NANOCOMPOSITE MATERIAL

K. Subashri

*Ph.D Research Scholar, Department of Chemistry, Centre for Research and Evaluation, Bharathiar University,
Coimbatore 641046, Tamilnadu, India.*

ABSTRACT

The CeO_2 and $\text{CrO}_4\text{-CeO}_2$ nanocomposite material prepared by co-precipitation method and sonication technique and nanocomposite material characterized by HR-SEM and HR-TEM result demonstrate that the initial spherical shape like an irregular particle for the nanocomposite material. The EDX analysis confirms that Cr, Ce and O are present from nano photocatalyst. The X-ray XRD study catalyst are fine crystallized among that little surface areas and to gives high crystalline size by HR-TEM images, The PL measured low intensity and UV-Vis DRS calculated low band gap energy also result as conformed high photocatalytic activity on by Trypan Blue (TB) dye at $\text{CrO}_4\text{-CeO}_2$ nanocomposite material. The prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material high efficiency of photocatalyst that of CeO_2 under UV and solar-light irradiation and mechanism has been discussed and high current produced from DSSCS application of, electrochemical industrial was done; prepared nanocomposite material was stability and reusability of photocatalyst.

1. INTRODUCTION

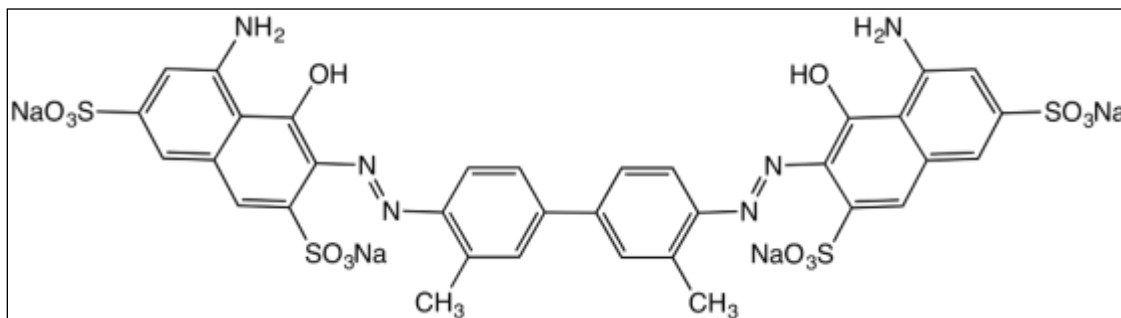
Cerium dioxide is an important rare earth oxide, which has multiple applications such as electrolyte material of solid oxide ultraviolet blocking materials, catalysts, chemical mechanical polishing, and oxygen gas sensors [1]. The photostability of pigments can be enhanced by the addition of cerium. CeO_2 nanoparticles are interesting due to their wide variety of applications in polishing agents, sunscreens, solid electrolytes, solar cells, fuel cells, phosphorescent/luminescent materials, photocatalysis, sensors, oxygen pumps, and metallurgy [2]. Nanostructured cerium oxide powders can effectively degrade pollutants. CeO_2 nanostructure is an n-type semiconductor that is coupled with wealthy oxygen vacancies, in current research, ceria has been established to be a capable photocatalyst for the removal of industrial pollutants in the environment owing to the redox property of the two stable oxidation states of ceria ($\text{Ce}^{4+}/\text{Ce}^{3+}$), strong absorption of light, stability, non-toxicity, and availability [3-6].

In this work we report on a study in prepared nanocomposite material was characterized by HR-SEM with X-ray (EDX) analysis, HR-TEM, XRD analysis, PL analysis and UV-Vis DRS analysis. $\text{CrO}_4\text{-CeO}_2$ nanocomposite material will expand the photocatalytic application of UV-light and Solar-Light irradiation at 60 min and electrochemical application from synthetic dye based DSSCS analysis result was obtained.

2. EXPERIMENTAL SECTION

2.1. Materials

The Ammonium cerium (IV) Sulfate, Trypan Blue (TB), $((\text{NH}_4)_2\text{Cr}_2\text{O}_7 \cdot 2\text{H}_2\text{O})$, Citric acid, ammonia and ethanol solution and Fluorine doped Tin oxide FTO-plate) and Ruthenium dye (535-bisTBA, N719) solution, it was Sigma Aldrich reagent and was used as such All glassware was cleaned with acid and washed thoroughly with distilled water. Water is used as an experiment throughout. The Trypan Blue (TB) Chemical structure shown in Fig. 1.



2.2. Synthesis of CrO₄-CeO₂ nanocomposite material

(NH₄)₂Cr₂O₇·2H₂O were first dissolved with distilled water respectively, The resulting solution was added dropwise into Ammonium cerium (IV) sulfate with ammonia solution added in 1:2 ratio. Solution with anhydrous ethanol as solvent at room temperature under vigorous stirring 4 h until precipitate formed was placed in sonication 20 min. The obtained precipitate was filtered and washed with distilled water and ethanol until alkali phases were removed from precipitation. Then the precipitate was collected and dried in oven at overnight. The resulting powder was finally calcined at 150, 300 and 450 °C for 3 h. The prepared CrO₄-CeO₂ 450 °C heat treatment at a higher photocatalytic activity.

2.3. Characterization of CrO₄-CeO₂ Nanocomposite Material

Ultraviolet and visible (UV-vis) absorbance spectra were measured over a range of 800–200 nm with a Shimadzu UV-1650PC recording spectrometer using a quartz cell with 10 mm of optical path length. High resolution Scanning Electron Microscopy (HR-SEM) as well as Elementary Dispersive X-ray (EDX) evaluation experiments were performed on a FEI Quanta FEG 200 instrument with EDX analyzer facility at 25 °C. The nanoparticles size and structure verifications were done by Transmission Electron Micro-scopy (HR-TEM) making use of PHILIPS CM200. Each spectrum was recorded with an acquisition time of 18 s. XRD spectrum was recorded on the X'PERT PRO model X-ray diffractometer from Pan Analytical instruments operated at a voltage of 40 kV and also a current of 30 mA with Cu K α radiation. Photoluminescence (PL) spectra at a room temperature were recorded using a Perkin-Elmer LS 55 fluorescence spectrometer. UV spectral measurements were done using a Hitachi-U-2001 spectrometer. Ultraviolet and visible (UV-vis) absorbance spectra were measured over a range of 800–200 nm with a Shimadzu UV-1650PC recording spectrometer using a quartz cell with 10 mm of optical path length. The antibacterial activity was studied by disc diffusion method; the test compound was dissolved in DMSO (200 mg/mL) for about half an hour. Commercially available drug disc, Ciprofloxacin (10 mg/ disc) was used as positive reference standard and Cyclic voltammetry (CV) measurements were carried out using CHI 60 AC electro-chemical analyzer (CHI Instruments Inc. USA).

2.4. Photocatalysis

The photocatalytic activities of CrO₄-CeO₂ nanocomposite material were evaluated by the photodegradation of dye. The light irradiation at 365 nm. The reaction was carried out at ambient temperature (303 K). The experiment, aqueous suspensions of dye (40 mL, 1 × 10⁻⁴ M) and 0.080 g of photocatalyst were loaded in reaction tube of 50 mL capacity with a Prior 60 min in the irradiation, the suspension was magnetically stirred in dark to ensure the establishment of an adsorption or desorption equilibrium. The suspension was kept under constant air-equilibrated condition. At the intervals of given irradiation time. The suspension was measured spectrophotometrically within the theory to Beer-Lambert law limit.

3. RESULTS AND DISCUSSION

3.1. High-Resolution Scanning Electron Microscope Analysis (HR-SEM) & Energy Dispersive Analysis (EDX).

The scanning electron microscope (SEM) is a technique for high-resolution surface imaging. The texture and morphology of the catalyst are critical parameters that influence photocatalytic activity. **Figures 3.1.a-c** show a close-up and overall view of the sample. The product has a uniform homogeneous dispersal spherical structure with cluster formation. The diameter of these particles is approximately 10 nm, as shown in **Fig.3.1.a**. Kumar et al [7] synthesized cerium oxide nanoparticles with a 20 nm size that have a uniform homogeneous dispersal spherical structure, good thermal stability, and good photocatalytic activity. The elemental composition of a synthesized CrO₄-CeO₂ nanocomposite material was evaluated using EDS. The EDS analysis reveals well-defined peaks of Cr, O, and Ce atoms, indicating that CrO₄⁻ has been incorporated with CeO₂, as shown in **Figure.3.1**



3.2. High-Resolution Transmission Electron Microscope Analysis (HRTEM)

A TEM uses energetic electrons to provide morphological, compositional, and crystallographic information on samples. TEM images were used to examine the surface morphology of prepared $\text{CrO}_4\text{-CeO}_2$. As shown in **Fig. 3.2.a**, the sample has spherical shapes with agglomeration and the diameter of the nano particles is about 100 nm. The prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material has a spherical surface morphology. Hailstone et al [8] synthesized cerium oxide nanoparticles with 20 nm size that have a spherical shape like an irregular particle, good photocatalytic activity, and antimicrobial activity. The values obtained in this study agree well with those reported by another research group [9].

The prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material has a morphological structure that resembles a spherical shape with irregular particles measuring 100 nm in size. At 100 nm magnifications, **Figure 3.2.b** shows the well-resolved lattice fringes. The average particle size distribution is depicted in **Figure 3.2.c**. The highlighted selected particle size at 0.456 nm is shown in **Figure 3.2.d**. The particle size observed in TEM studies agrees well with the average size obtained from XRD results. Using the "Image J Viewer" software skills, the image profile and normal particle range distribution were determined.

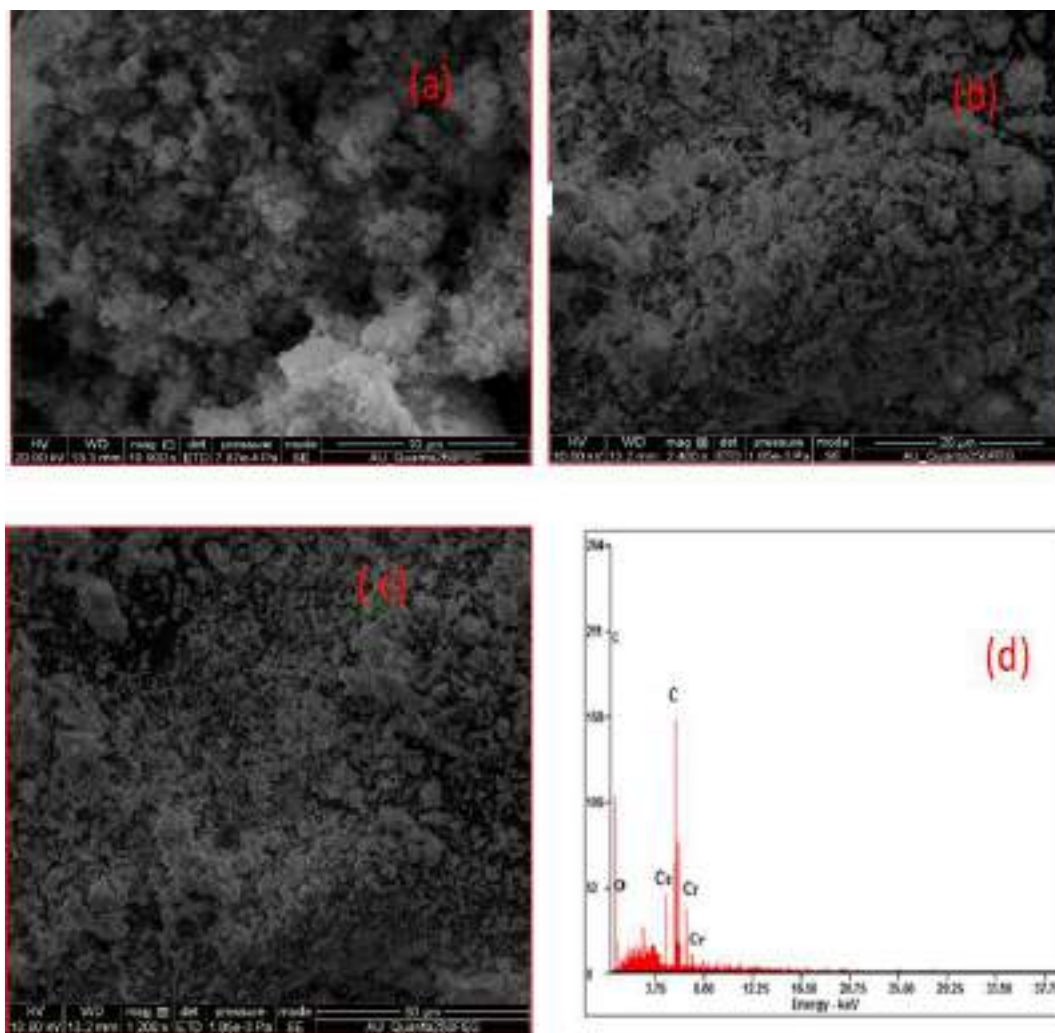


Figure.3.1. HR SEM image and EDX analysis of $\text{CrO}_4\text{-CeO}_2$ nanocomposite material

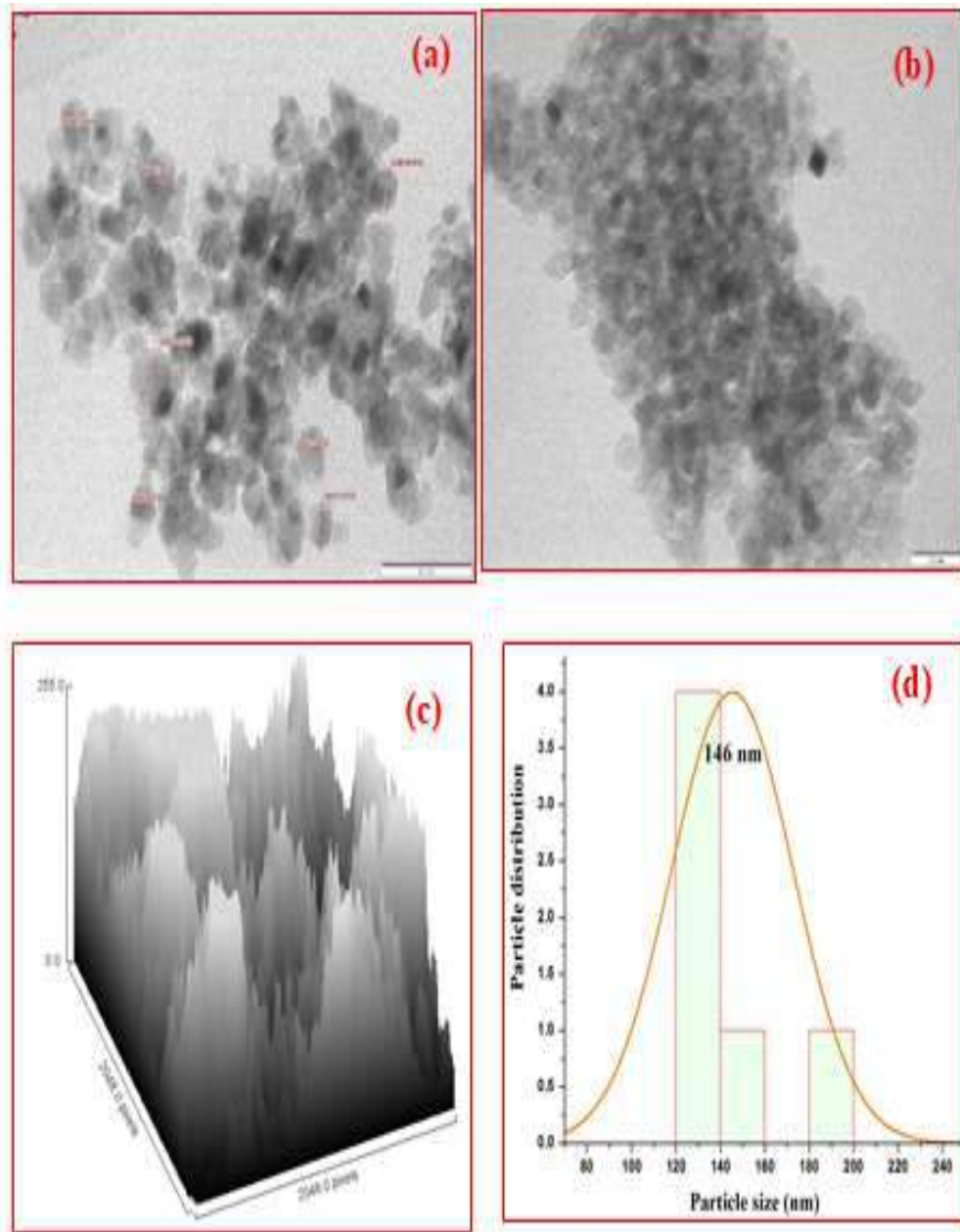


Figure.3.2. HR-TEM analysis of $\text{CrO}_4\text{-CeO}_2$ nanocomposite material (a,b) Image $\text{CrO}_4\text{-CeO}_2$ nanocomposite material (c) Surface plot and (d) particle size in selected area highlighted fig (a)

3.3 X-ray Diffraction (XRD)

The powder XRD study was carried out to find out crystalline structure of prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material. The **Figures 3.3 a and b** displayed the XRD patterns of bare CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material. The XRD patterns of CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ showed distinct peaks in the spectrum, the 2θ values at 28.53° , 33.09° , 47.50° , 56.26° , 59.13° , and 76.56° representing (111), (200), (220), (311), (322) and (311) planes respectively. As indexed in the Figure, all the diffraction patterns indicate the cubic phase (File No 34-0394 of the JCPDS). Thammadihalli et al [10] synthesized CeO_2 nanoparticles with have cubic phase and particle with 35nm size. The peak of the graph is in good agreement with the literature report.



In the XRD patterns of the prepared $\text{CrO}_4\text{-CeO}_2$ another sharp peak were observed for high crystalline nature by CrO_4 loaded CeO_2 . The peak intensity is lower, confirming the loading of $\text{CrO}_4\text{-CeO}_2$. Debye Schorr's equation was used to calculate the crystalline size of CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$. The Debye-Scherrer formula is used to calculate the average crystallite size of a nanocomposite material.

$$D = K\lambda / \beta \cos \Theta$$

Where, D = crystalline size of the nanocomposite material

K = shape factor (or) Dimensionless constant

λ = Wavelength of the X-rays

β = the full line width at the half-maximum elevation of the main intensity peak (FWHM), and

Θ = Bragg diffraction angle. Since this equation,

The crystalline size of CeO_2 nanocomposite material and prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material are calculated about 29 nm and 23.2 nm correspondingly.

3.4 Photoluminescence Discharge Spectral Analysis (PL)

The electronic structure, transfer behavior, and recombination rate of photo excited electron-hole pairs in semiconductor materials can all be studied using photoluminescence spectroscopy (PL). Irradiative recombination of photo excited electrons and holes produces the PL spectra.

These charge carriers are crucial in determining the efficiency of photocatalytic activity. **Figures 3.4. a and b** depict the PL spectrum of CeO_2 and a prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material with excitation wavelengths of 210 and 523 nm, respectively. It is primarily composed of two emission bands: a strong blue emission band at 210 nm and a green emission band at 523 nm. R.C Deus et al [11] reported a blue band at approximately 240 nm, as well as a green band at 529 nm. These values agree with the above result.

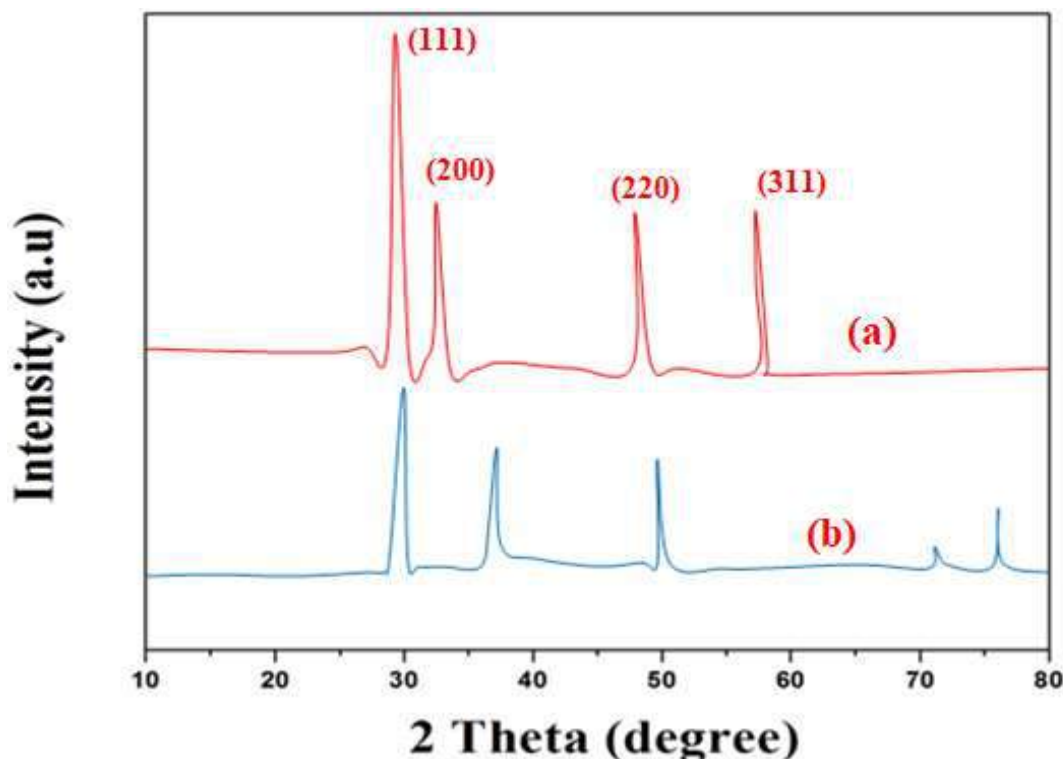


Figure.3.3. XRD pattern of (a) CeO_2 and (b) $\text{CrO}_4\text{-CeO}_2$ nanocomposite material

The recombination of electron-hole pairs in the nanocomposite material causes photoluminescence. The prepared $\text{CrO}_4\text{-CeO}_2$ has a lower PL intensity than CeO_2 . As a result, CeO_2 bands can be associated with bulk energy levels and high-intensity peaks. This matches their explanation for charge transfer (CT) transitions between O_2 and Ce^{4+} [6]. The peak intensity of prepared $\text{CrO}_4\text{-CeO}_2$ is low. The

characteristic photoluminescence peaks in the UV band are observed as a result of direct recombination of electrons in the Ce 4f conduction band with holes in the Oxygen 2p valence band, whereas the broad visible emission band has been proposed as a result of the presence of many point defects, such as oxygen vacancies, and suppression of recombination of the photogenerated electron-hole pairs by the CrO₄- loaded CeO₂. This catalyst becomes more photoactive when electron-hole recombination is inhibited [12,13].

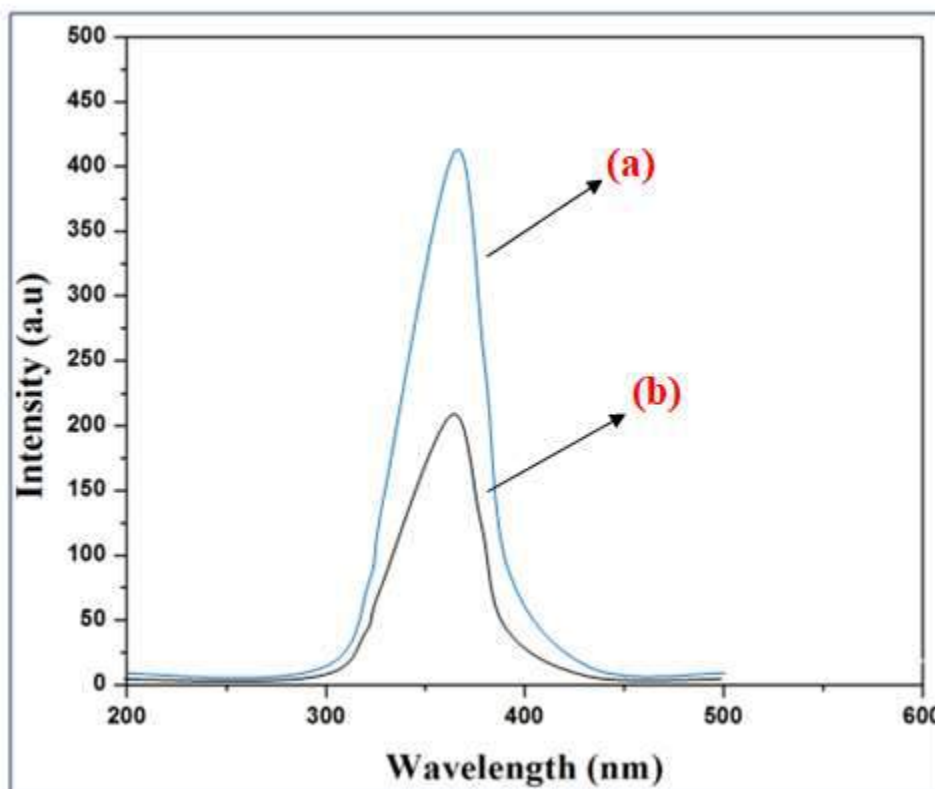


Figure. 3.4. PL analysis of (a) CeO₂ and (b) CrO₄-CeO₂ nanocomposite material

3.5 Diffuse Reflectance Spectroscopy

The UV-Vis DRS analysis is one of the spectra analysis show cut-off regions in a specific wavelength range which can be attributed to the photo-excitation of electrons from the valence band to the conduction band. The UV-Vis can be approximately calculated from the optical reflectance data by the Kubelka–Munk function,

$$A = F(R) = \frac{((1-R)^2)}{2R} \quad \dots (1.1)$$

where α is the absorbance coefficient, R is the diffuse reflectance (Guoli et al 2009).

An extrapolation of the linear region of a plot of $(F(R) \cdot h\nu)^2$ vs $h\nu$ gives the value of the optical bandgap energy. The bandgap energy for nanocomposite material is calculated from $E = h\nu = hc/\lambda$. The bandgap energy of CeO₂ and the prepared CrO₄-CeO₂ nanocomposite material is 3.19 and 3.0 eV correspondingly show in Figures 3.5 a and b. These results showing prepared CrO₄-CeO₂ nanocomposite material low bandgap energy high photocatalyst and electrochemical applications were obtained [14-17].

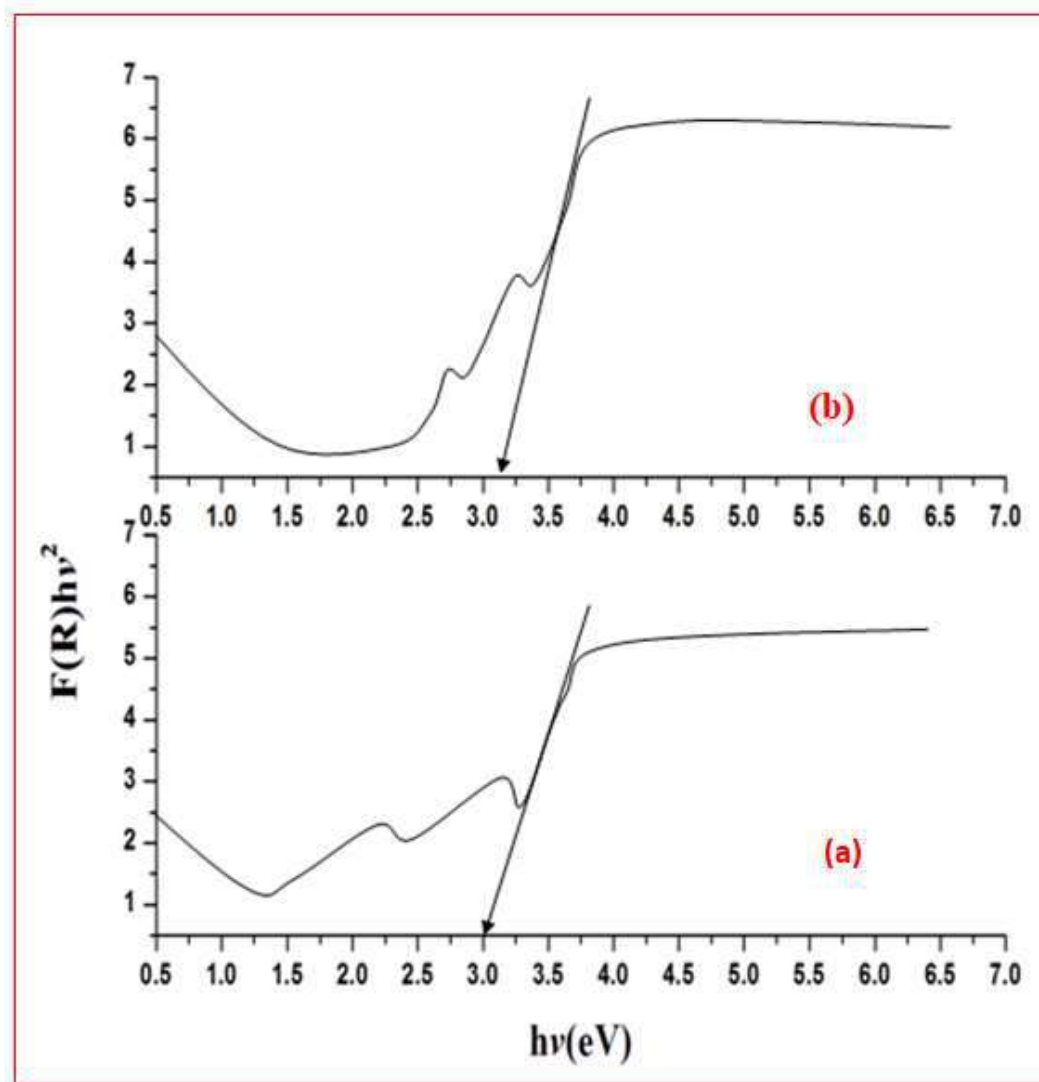


Figure. 3.5. UV-Vis DRS analysis of (a) CeO_2 and (b) $\text{CrO}_4\text{-CeO}_2$ nanocomposite material

3.6 Photocatalytic application under UV and solar-light

3.6.1 Primary Analysis

Figures 3.6.1. A and B show the photo degradability of Trypan Blue (TB) with various photocatalysts under UV and solar light. In the absence of UV and solar light, the percentage of dye degradation with $\text{CrO}_4\text{-CeO}_2$ is very low (curve-a). This could be due to dye adsorption on the catalyst's surface. The curve-b depicts the degradation of dye in the absence of a photocatalyst under UV and solar light. Self-photolysis is not a problem for dye. These findings suggest that both UV and solar light are required for the effective degradation of Trypan Blue (TB) dye. Under UV and solar light, the percentages of dye degradation with CeO_2 are 35% and 43%, respectively (curve-c). Under UV and solar light, the percentage of dye degradation with prepared $\text{CrO}_4\text{-CeO}_2$ is 80% and 85% (curve-d), respectively. This demonstrates that prepared $\text{CrO}_4\text{-CeO}_2$ degrades Trypan Blue (TB) more efficiently under solar light.

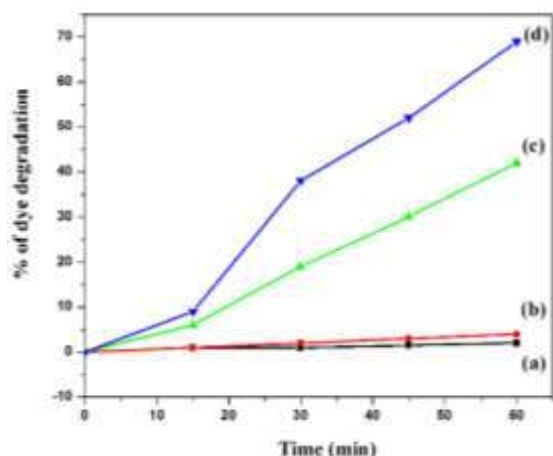


Figure 3.6.1. (A) Photodegradation study of TB dye under UV irradiation by (a) Dark (b) Nil catalysis (c) CeO₂ and (e) CrO₄- CeO₂ nanocomposite material

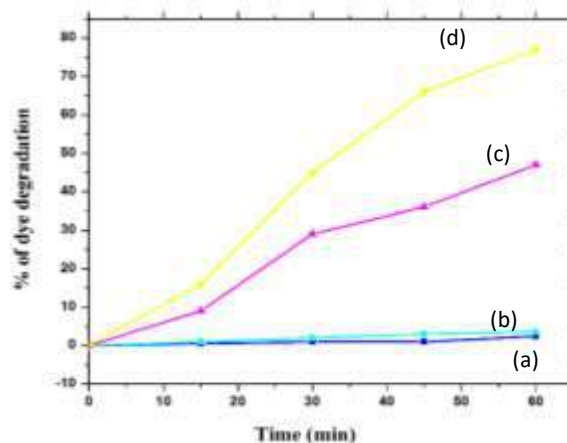


Figure 3.6.1. (B) Photodegradation study of TB dye under solar-Light irradiation by (a) Dark (b) Nil catalysis (c) CeO₂ and (e) CrO₄- CeO₂ nanocomposite material

➤ TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , IUUV = $1.381 \times 10^{-6} \text{ Einstein L}^{-1} \text{ S}^{-1}$

➤ TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , Isolar = $1250 \times 100 \pm 100 \text{ Lux}$.

3.6.2 Effect of pH on photodegradation of dye

The pH of the solution has a significant impact on photocatalytic activity. The surface properties of the CeO₂ and prepared CrO₄-CeO₂ catalyst are significantly affected by the pH of the reaction medium. The effects of pH on the photocatalytic degradation of trypan blue are depicted in **Figures 3.6.2 A and B**. The figure clearly shows that the photocatalytic process is highly dependent on the pH of the dye solution [18]. The pH changes the surface properties of the nanocomposite material, causing the dye molecules to dissociate. At pH 7, per hydroxyl radicals ($\text{O}_2\text{H}^\bullet$) are formed, which results in the formation of hydrogen peroxide, which produces several hydroxyl radicals ($\text{OH}^\bullet$) [19].

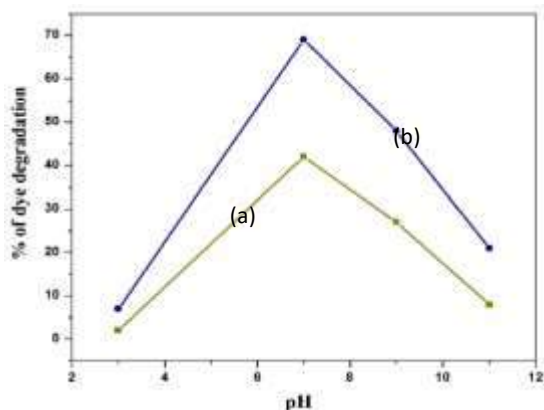


Figure 3.6.2. (A) pH study (a) CeO₂ and (b) CrO₄-CeO₂ nanocomposite material under UV

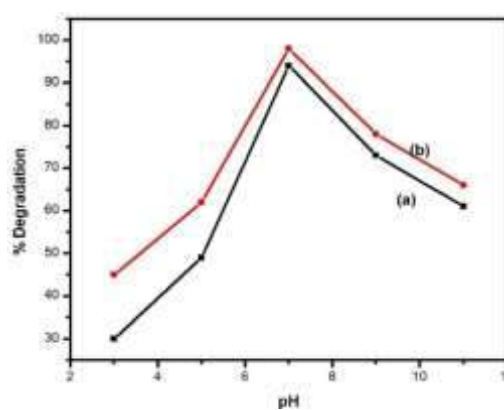


Figure 3.6.2. (B) pH study (a) CeO₂ and (b) CrO₄-CeO₂ nanocomposite material under solar -light

➤ TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , IUUV = $1.381 \times 10^{-6} \text{ Einstein L}^{-1} \text{ S}^{-1}$

➤ TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , Isolar = $1250 \times 100 \pm 100 \text{ Lux}$.



At pH 7, the highest photocatalytic degradation of CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ is observed. It has been discovered that degradation is strongly influenced by the pH of the solution. The percentage of degradation is observed to increase up to pH =7 and then decrease. Under UV and solar light, pH 7 has superior photocatalytic activities.

3.6.3 Effect of Temperatures on photodegradation of dye

Temperature effects on catalytic reaction of $\text{CrO}_4\text{-CeO}_2$ nanocomposite material were studied from 150°C to 450°C . As the reaction temperature was raised, the equilibrium of TB removal was reached in less time, as shown in **Figures 3.6.3 A and B**. The highest percentage degradation was observed at 450°C , where 69% and 77% of TB were removed after only 60 minutes under UV and solar light, respectively. The lowest percentage degradation was observed at 300°C , where 17% and 21% of TB were removed after only 60 minutes under UV and solar light, respectively. Significantly less percentage degradation was observed at 150°C , where 9% and 11% of TB were removed after only 60 minutes under UV and solar light, respectively. At high temperatures, hydrogen peroxide easily self-decomposes, and the rate of decomposition increases with every 150°C . Superior temperatures tend to reduce the number of defects on the photocatalyst's surface area.

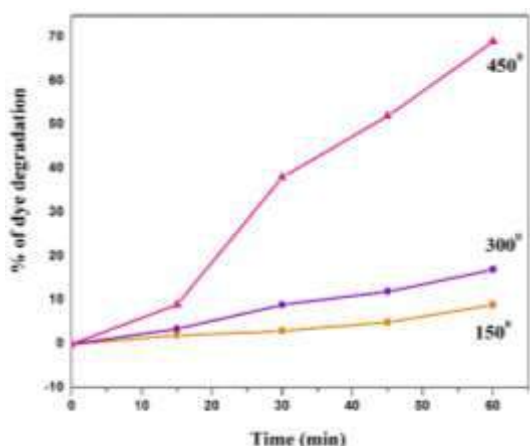


Figure 3.6.3. (A) The effects of Temperature of $\text{CrO}_4\text{-CeO}_2$ nanocomposite material nanocomposite material under UV

- TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , IUUV = $1.381 \times 10^{-6} \text{ Einstein L}^{-1} \text{ S}^{-1}$

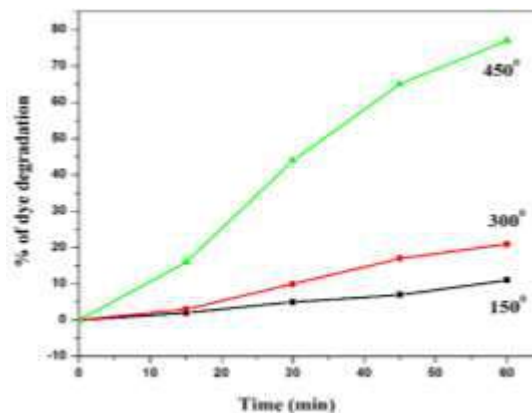


Figure 3.6.3. (B) The effects of Temperature of $\text{CrO}_4\text{-CeO}_2$ nanocomposite material nanocomposite material under solar – light

- TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , Isolar = $1250 \times 100 \pm 100 \text{ Lux}$.

3.6.4 Effect of Catalyst Loading on photodegradation of dye

One of the most important parameters in degradation studies is the amount of catalyst. To avoid the use of excess catalyst, the optimum loading for dye removal must be determined. **Figures 3.6.4 A and B** show the effect of catalyst load on the photocatalytic degradation of the dye. The catalytic (CeO_2 and $\text{CrO}_4\text{-CeO}_2$) load was varied from 0.05 to 0.1 g/50 mL to determine the optimal catalyst dosage. The ideal load was determined to be 0.08 g/50 mL. A screening effect may occur if the catalyst loading is increased beyond the optimal dosage. This effect reduces the catalyst's specific activity. Particle aggregation may reduce catalytic activity at higher catalyst dosages. Above the optimal load, slurry turbidity increases, light penetration decreases, and thus the availability of hydroxides and superoxides decreases; thus, photocatalytic activity decreases. As a result, the optimum catalyst dosage for the efficient removal of Trypan Blue (TB) dye was 0.08 g/50 mL under UV and solar light [20,21].

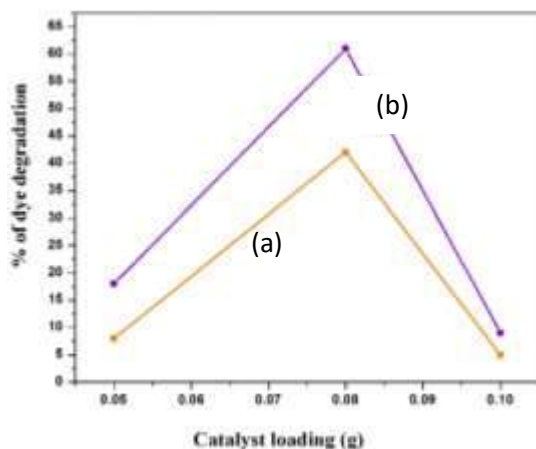


Figure 3.6.4. (A) . The effects of catalyst loading (a) CeO₂ and (b) CrO₄- CeO₂ nanocomposite material under UV irradiation

➤ TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , IUUV = $1.381 \times 10^{-6} \text{ Einstein L}^{-1} \text{ S}^{-1}$

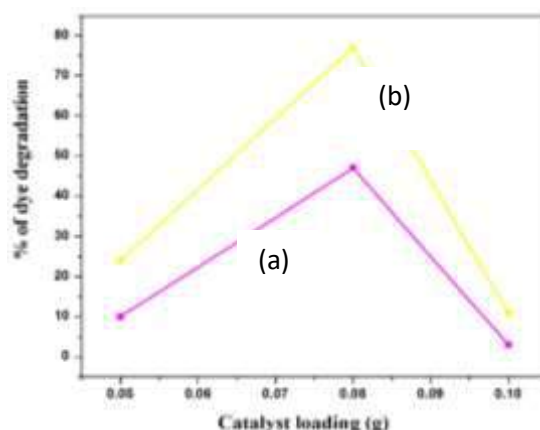


Figure 3.6.4. (B) . The effects of catalyst loading (a) CeO₂ and (b) CrO₄- CeO₂ nanocomposite material under solar-Light irradiation

➤ TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , Isolar = $1250 \times 100 \pm 100 \text{ Lux}$.

3.6.5 Effect of Concentration on photodegradation of dye

The impact of different dye concentrations on photocatalytic degradation has been studied. The effects of dye concentration on the photocatalytic activity of CeO₂ and the prepared CrO₄-CeO₂ nanocomposite material are depicted in **Figures 3.6.5 A and B**. Trypan blue was tested at concentrations ranging from 1×10^{-4} to $3 \times 10^{-4} \text{ M}$. The catalytic load was kept constant at 0.08 g and the pH was kept at 7. Under UV and solar light, the optimal dye concentration of CeO₂ and prepared CrO₄-CeO₂ nanocomposite was observed to be $1 \times 10^{-4} \text{ M}$. The time required for complete dye degradation increases as the dye concentration increases. When the dye concentration is low, many active sites in the photocatalyst are vacant, and the slurry remains almost clear, allowing light to pass through. Photodegradation is aided by light penetration.

The dye molecules occupy the active sites as the dye concentration increases, and this trend continues until all of the sites are filled, which occurs at a specified optimum concentration. Beyond this concentration, the slurry becomes turbid, preventing light penetration and thus slowing degradation. A significant amount of UV and solar – light may be absorbed by the dye molecules rather than the catalyst at high concentrations, reducing catalytic efficiency [22]. Under UV and solar light, the optimum dye concentration of CeO₂ and prepared CrO₄-CeO₂ nanocomposite was observed to be $1 \times 10^{-4} \text{ M}$.

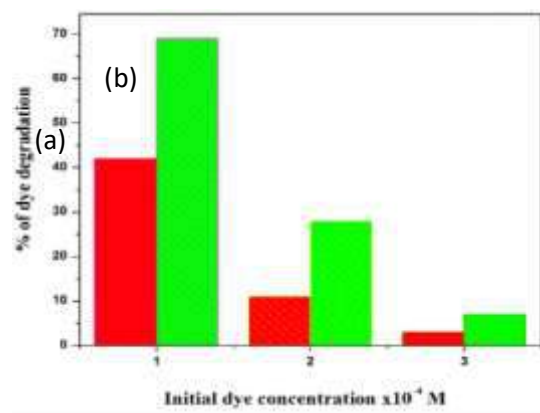


Figure 3.6.5. (A) The effects of concentrations of (a) CeO₂ and (b) CrO₄- CeO₂ nanocomposite material under UV irradiation.

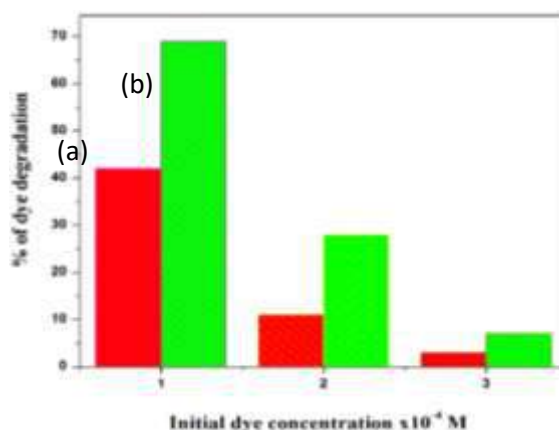


Figure 3.6.5. (B) The effects of concentrations of (a) CeO₂ and (b) CrO₄- CeO₂ nanocomposite material under solar-Light irradiation.



- TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , IUUV = $1.381 \times 10^{-6} \text{ Einstein L}^{-1} \text{ S}^{-1}$
- TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , Isolar = $1250 \times 100 \pm 100 \text{ Lux}$.

3.6.6 Stability and Reusability of photocatalyst

The Stability and Reusability of the nanocomposite material were experienced by moving out the degradation with the used nanocomposite material under UV and solar-light (**Figures.3.6.6 A and B**). The complete degradation of TB dye in CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material under UV and solar light are 100 % & 100 %, 85 % & 85 %, 79 % & 78 %, 75 % & 78 %, 70 % & 78 % and 100 % & 100 %, 85 % & 90 %, 78 % & 84 %, 74 % & 84 % and 70 % & 84 % respectively.

Table 1.1 shows the results of five cycles of the nanocomposite material: CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ exhibited exceptional photo stability with no significant loss of photocatalytic activity for the third to fifth cycles. The degradation efficiency of CeO_2 and the prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material is 61 and 76% under UV light, respectively. The degradation efficiency of CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material is 78 and 84%, respectively, when exposed to solar light. These findings indicate that CeO_2 and prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material remain effective and reusable when exposed to solar light. The final result shows that solar-light irradiation has higher photocatalytic activity than UV-light irradiation.

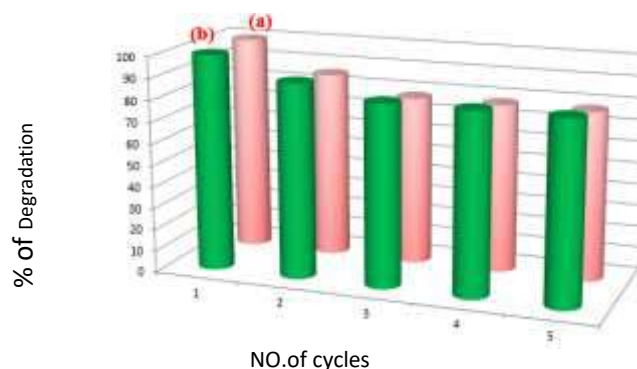
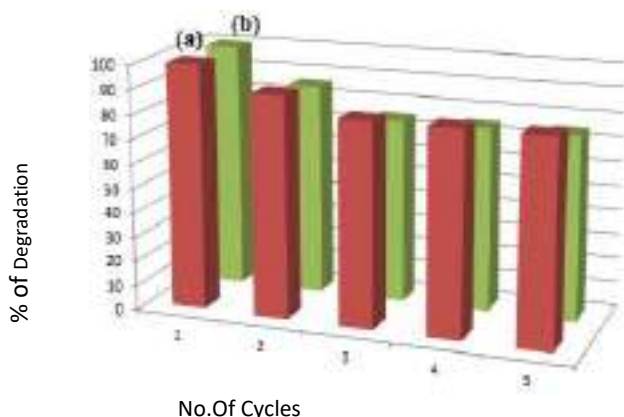


Figure 3.6.6 (A) Stability and Reusability on TB dye degradation; (a) CeO_2 and (b) $\text{CrO}_4\text{-CeO}_2$ nanocomposite material under UV-light irradiation

- TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , IUUV = $1.381 \times 10^{-6} \text{ Einstein L}^{-1} \text{ S}^{-1}$

Figure 3.6.6 (B) Stability and Reusability on TB dye degradation; (a) CeO_2 and (b) $\text{CrO}_4\text{-CeO}_2$ nanocomposite material under Solar-light irradiation

- TB dye 1×10^{-4} , nanocomposite material suspended = 2 gL^{-1} , airflow rate 8.1 mL s^{-1} , Isolar = $1250 \times 100 \pm 100 \text{ Lux}$.

Table 1.1 Nano Catalyst Reusability under UV & Solar light

No of cycles	Percentage of TB removal on CeO_2		Percentage of TB removal on $\text{CrO}_4\text{-CeO}_2$	
	UV	Solar	UV	Solar
1	100	100	100	100
2	85	85	85	90
3	79	78	78	84
4	75	78	74	84
5	70	78	70	84

4. Mineralization Study

4.1 Chemical Oxygen Demand Analysis (COD)

The chemical oxygen demand (COD) analysis is an important indicator of organic pollution in water. The COD for the degradation of Trypan Blue (TB) dye on prepared $\text{CrO}_4\text{-CeO}_2$ nanocomposite material loading amount of 0.08 gram on dye initial concentration $1 \times 10^{-4} \text{ M}$ suspension for 40 mL of PH 7 solution and air passing with UV 365nm was measured. The chemical oxygen demand test is a popular method for determining the organic strength of wastewater. The waste can be measured in terms of the total amount of oxygen required for the oxidation of organic matter to CO_2 and water. The dye solution's COD before and after treatment was calculated. The

reduction in COD values of the treated dye solution indicates dye molecule mineralization as well as color removal. The COD values of blank and treated dye solutions are shown in **Table.1.2**.

Table .1.2 Percentage of chemical oxygen demand analysis of Trypan Blue (TB)

Sl. NO.	Time (Min)	COD Values		% of degradation of Trypan Blue with CrO ₄ -TiO ₂
		Initial COD (mg/50ml)	Final COD (mg/50ml)	
1	60	4.5	1	77

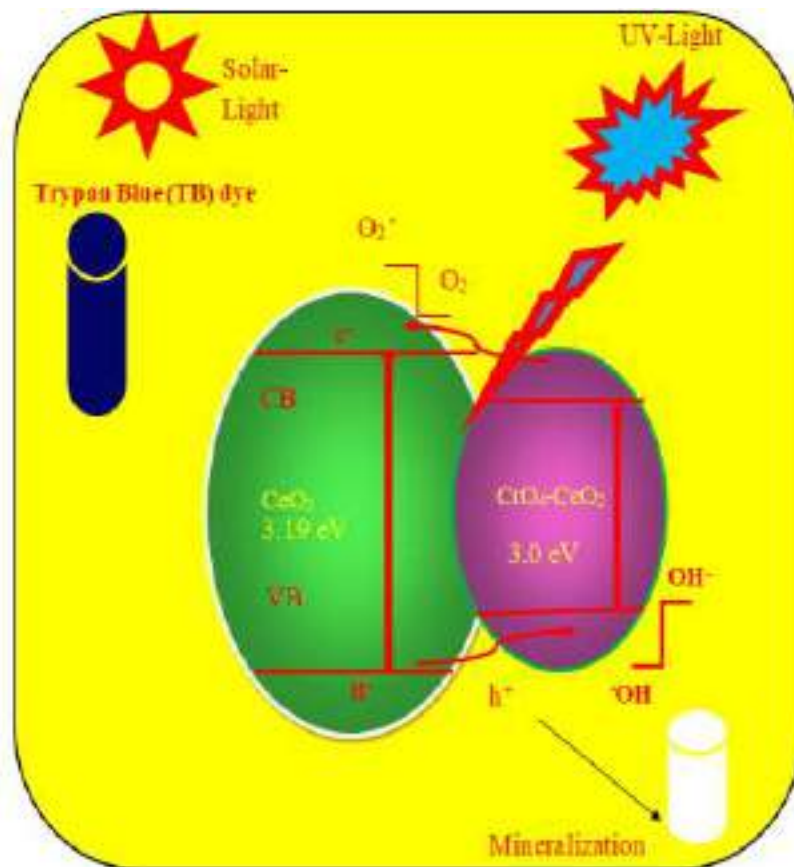
4.2 Mechanism of Degradation

From the photocatalytic mechanism results, a process based on photo-carrier transfer is discovered. With 365 nm light, CeO₂ is excited upon irradiation. The transfer of the photoexcited electron from the surface of CeO₂ to CrO₄ nanoflower occurs in the case of CrO₄ altered CeO₂ due to greater positive conduction band potential. The charge carriers are thus effectively separated. Electrons stored on the nanocomposite material conduction band are absorbed by adsorbed O₂ molecules. The result is super oxide radicals (O₂⁻) being formed. TB dye molecules are decomposed by these superoxide radicals and hydroxide radicals formed by holes [23,24]. It is shown in **Scheme 1.1**.

5 ELECTRO CATALYTIC APPLICATION

5.1 Dye Sensitized Solar Cells Analysis

The **Figures 5.1. a** and **b** show that the fabrication activity of photo current-voltage (I-V) in the sensitized solar cells (DSSCs) dye as photoelectrode, as photo electrodes are coated on the fluorine-doped tin oxide (FTO-plate) glass substrate, prepared CeO₂ and prepared CrO₄-CeO₂ nanocomposite material act as photoelectrode. The routine solar cell is fabricated with Prepared CeO₂ and prepared CrO₄-CeO₂ nanocomposite material with Ruthenium dye (535-bisTBA, N719).



Scheme. 1.1. Schematic representation for the photodegradation holes and electrons in the Nanocomposite material under Solar and UV- light for successive mineralization of TB dye.



From the data, it is clear that (N719) on prepared CrO₄-CeO₂ nanocomposite material-based cell gives the mainly brilliant activity with the use of dye as sensitizer reunite the maximum value of short-circuit current density, J_{sc} (3.5 mA/cm²) than CeO₂ (3.25 mA/cm²), open-circuit voltage, V_{oc} (500 mV), fill-factor, FF (0.94 and efficiency, η (1.7 %). The outcome indicates successful electron transfer of prepared CrO₄-CeO₂ nanocomposite material and keeps back the recombination of the photo generated charge carrier, thus increasing the short circuit current and electron transfer [25].

Photocurrent-photovoltage (I-V) measurement the overall conversion efficiency of the dye-sensitized solar cell calculated by

(I_{sc}) = Photocurrent density measured at short circuit current

(V_{oc}) = photovoltage open-circuit

(FF) = filling factor of the cell and

(P_{in}) = input optical power the formula known as

Efficiency = $[I_{sc} \times V_{oc} \times FF / P_{in}] \times 100\%$

Where P is the input optical power, and I_{sc}, V_{oc}, are determined from the photocurrent-photovoltage curve of the cell [26-30].

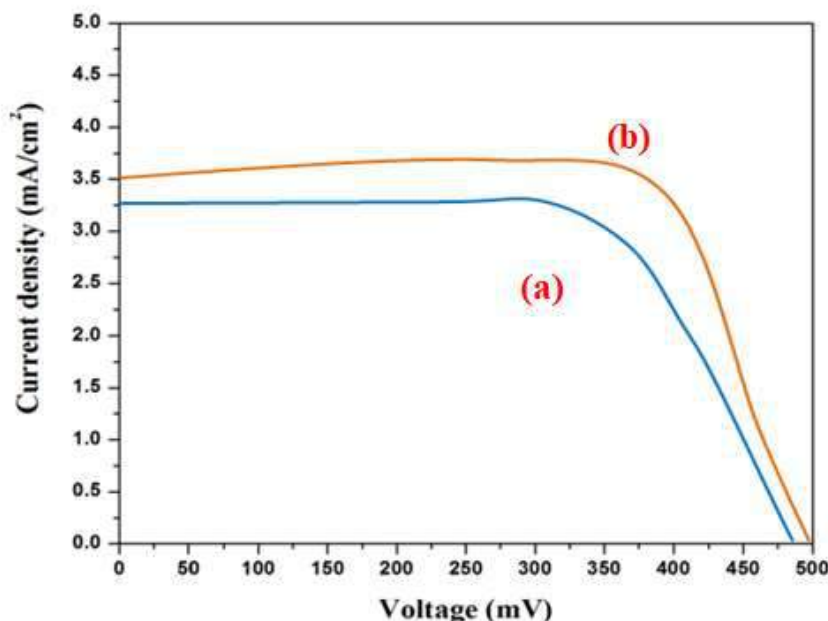


Figure. 5.1 Current density–voltage (I–V) curves for the DSSC's fabricated from (a) CeO₂ and (b) CrO₄- CeO₂ nanocomposite material

6.CONCLUSION

The prepared CrO₄-CeO₂ nanocomposite material was synthesized using a co-precipitation method and was characterized by HR-SEM and HR-TM analysis for spherical morphology structure, with X-ray (EDX) analysis confirming the presence of Cr, Ce, and O in the nanocomposite material. XRD analysis revealed that the average crystalline size of CeO₂ and prepared CrO₄-CeO₂ is 29 nm and 23.2 nm, respectively. The decrease in PL (CrO₄-CeO₂) intensity results in CeO₂'s high photocatalytic activity. The UV-Vis DRS spectrum had low bandgap energy, allowing it to function as an efficient photocatalyst and to be used in DSSCs applications. The photocatalytic application of TB dye under Solar-Light has a highly photocatalytic application that was done with UV-Light irradiation for 60 minutes. The prepared nanomaterial was found to be stable and reusable after an achievable mechanism was proposed and the nanomaterial was discussed extensively. According to the electrochemical analysis results, the prepared CrO₄-CeO₂ nanocomposite material is effective in electron transfer and inhibits photogenerated charge carrier recombination, which improves electron transfer and increases short circuit current.

Credit Authorship Contribution Statement

K. Subashri: Writing - original draft, Writing - review & editing, Conceptualization, Data curation, Methodology.

**Declaration of Competing Interest**

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

REFERENCE

1. Thammadihalli Nanjundaiah Ravishankar, Thippeswamy Ramakrishnappa, Ganganagappa Nagaraju and Hanumanaika Rajanaika, *Chemistry open* 4, 146-154, DOI: 10.1002/open.201402046, 2015.
2. T. Masui, H. Hirai, N. Imanaka, G. Adachi, T. Sakata, H. Mori, *J. Matter.Sci.Lett*, 21, 489-491, 2002.
3. Kumar, S. Babu, A.S. Karakoti, A. Shulte, S. Seal, *Langmuir* 25 10998-11007, 2009.
4. D. Damatov, J.M. Mayer, *Chem. Commun.* 52 10281-10284, 2016.
5. D. Saravanakumar, H. Abou Oualis, Y. Brahmi, A. Ayeshamariam, M. Karunanaiathy, A. Mohamed Saleem, K. Kaviyarasu, S. Sivaranjini, M. Jayachandran, *Open nano*, 4 100025, 2019.
6. C. Zhang, X. Zhang, Y. Wang, S. Xie, Y. Liu, X. Lu, Y. Tong, *New J Chem.* 38 2581-2586, 2014.
7. E. Kumar, P. Selvarajan, D. Muthuraj "synthesis and characterization of CeO₂ nanoparticles by solvothermal Route" *material Research September* 3, 2012.
8. R.K.Hailstone, A.G.Difrancesco, K.J. Reed "synthesis and characterization of CeO₂ nanoparticles" *Microsc microanal* 15 (suppl2), doi :10.1017/S1431927609096548, 2009.
9. R. Thammadihalli, *Chemistry open* 4, 146, DOI: 10.1002/open.201402046, 2015.
10. GG.Hu et.al., ZL. Direct synthesis and structure characterization of ultrafine CeO₂ nanoparticles. *Nanotechnology*, 7, 897. <http://dx.doi.org/10.1088%2F0957-4484%2F17%2F013>, 2006.
11. R.C.Deus et.al., *Simoos Materials research bulletin* 70, 416, DOI: 10/1016/J.Materresbull.2015. 05. 006, 2015.
12. Y.W. Zhang et.al., Fe doped CeO₂ nanoparticles, *J. Phys. Chem. B* 107, 10159, D. P. Jaihindh, C. C. Chen, Y. P. Fu, *RSC Adv.* 2018, 8, 6488, 2003.
13. D. Malwal, P. Gopinath, *Catal. Sci. Technol.* 6, 4458, 2016.
14. D.P. Jaihindh et.al., *RSC Adv.* 8, 6488, 2018.
15. S. Rasalingam et.al., *Applied Catalysis B: Environmental*, 148, 394, 2014.
16. H.Q.Cao et.al., *Adv. Funct. Mater.* 14, 243, 2004.
17. M. Shivaram et.al., *Mater. Res. Bull.* 48, 67, 2013.
18. W.S. Dong et.al., *Colloid Interface Sci.* 333, 734, 2009.
19. J. Zhang et.al., *RSC Adv.* 6, 1399, 2016.
20. T. K. Ghorai, *Open. J. Phys. Chem.* 1, 28
21. S.Sakthivel et.al., *Chem. Int. Ed.*, 42, 4908, 2003.
22. C.Guillard et.al., *JM, Appl. Catal., B*, 46, 319, 2003.
23. V.L. Chandraboss et.al., *Mater. Res. Bull.*, 48, 3707-3712, 2013.
24. B. Subash et.al., *Catal. Sci. Technol.*, 2, 2319, 2012.
25. G. L. J. Zhao, *New J. Chem.*, 24, 411, 2000.
26. X. Ni et.al., *Colloids Surf. A* 567, 161, 2019.
27. R. Verma, S. K. Samdarshi, *J. Phys. Chem. C* 120, 22281, 2016.
28. G. Gopakumar, V. Shantikumar Nair and M. Shanmugam, *Nanoscale, Advances*, DOI: 10.1039/d0na00158a, 2020.
29. M. Gratzel, "Dye-Sensitized Solid-State Heterojunction Solar Cells", *MRS Bulletin*, 30, 23, 2005.
30. TN. Murakami, M. Gratzel, *Inorg Chim Acta*, 361, 572, 2008.



EVALUATION OF THE POTENTIAL OF ROSELLA FLOWER ETHANOL EXTRACT (HIBISCUS SABDARIFFA) IN DEALING WITH DYSLIPIDEMIA IN MALE RATS CONSUMING A HIGH-FAT DIET

Wang Dan¹, Wienaldi²

¹Master of Clinical Medicine Study Program, Department of Clinical Medicine, Faculty of Medicine, Dentistry, and Health Sciences (FKKGIK), Universitas Prima Indonesia

²Clinical Medicine Study Program, Department of Clinical Medicine, Faculty of Medicine, Dentistry and Health Sciences (FKKGIK), Universitas Prima Indonesia

ABSTRACT

Rosella (Hibiscus sabdariffa L.) is a traditional remedy for hypertension due to its flavonoids that reduce blood viscosity. Its combination with crab shell offers a safer and more effective cholesterol-lowering alternative, primarily through anthocyanins. Dyslipidemia, a lipid metabolism disorder, involves elevated TC, LDL-C, TG, and decreased HDL-C, all linked to atherosclerosis. Management includes lifestyle changes and lipid-lowering drugs. Rosella extract effectively lowers LDL-C in rats, suggesting potential anti-dyslipidemia benefits. The study, conducted in January 2024, used an experimental Pre-test and Post-test group design. Sample size calculation determined a minimum of 4 rats per treatment group, weighing 180-200 grams and aged 2-4 months. The administration of Rosella flower extract (Hibiscus sabdariffa) in rats showed diverse responses in lipid profiles and liver function. The treatment groups exhibited increased total cholesterol and HDL, reduced LDL, and elevated total cholesterol and triglycerides. Statistical analysis confirmed significant differences between treatment groups, particularly in triglycerides. These findings also indicated a significant impact on liver function, with substantial differences in SGOT and SGPT levels. Further research is needed to explore the regulatory potential of Rosella extract on lipid metabolism and liver health.

KEYWORDS: *Rosella extract, Dyslipidemia management, Flavonoids and anthocyanins, Cholesterol-lowering effects, Experimental rat study*

BACKGROUND

Rosella (*Hibiscus sabdariffa* L.) is a member of the Malvaceae family. Rosella can grow in tropical and subtropical climates. The Rosella plant's native habitat ranges from India to Malaysia. Rosella is one of the traditional medicines used to lower blood pressure. Flavonoids, which can reduce blood viscosity, are active compounds found in the calyx of the Rosella flower (Rahadian, 2017). Combining Rosella flower calyx extract with crab shell is a safer and more effective alternative. Rosella flower calyx and crab shell have cholesterol-lowering properties, and their combination is expected to provide more excellent benefits. Anthocyanins in Rosella flower calyx have been identified as the active ingredient that lowers cholesterol levels (Pratiwi, 2014).

Dyslipidemia is a lipid metabolism disorder characterized by an increase or decrease in lipid fractions in the plasma. (Wulansari, 2020). The primary abnormalities in lipid fractions include an increase in total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), and a decrease in high-density lipoprotein cholesterol (HDL-C). In the process of atherosclerosis, all of these play important roles and are closely related, making it impossible to discuss them separately. The management of dyslipidemia patients consists of non-pharmacological and pharmacological therapies. Non-pharmacological therapy includes lifestyle changes such as physical activity, medical nutrition therapy, weight reduction, and smoking cessation. Meanwhile, pharmacological therapy involves prescribing lipid-lowering drugs (Ulilalbab and Maskanah, 2021). The single extract of Rosella flower calyx (*Hibiscus sabdariffa* L.) has an effect in lowering the levels of Low-Density Lipoprotein Cholesterol (LDL-C) in male Wistar rats (*Rattus norvegicus*) (Widyaningsih, Alif Nugroho and Ulilalbab, 2022). Therefore, researchers are interested in exploring the effectiveness of Rosella flower extract for anti-dyslipidemia (*Hibiscus sabdariffa*).

RESEARCH METHODS

The type of research conducted is experimental, with a Pre-test and Post-test group-only control design approach. This research was conducted in January 2024. The sample size for this study was calculated using the Federer formula. Based on the calculation results, it can be concluded that at least four male Wistar rats (*Rattus norvegicus*) are needed in each treatment group. The Wistar rats in this study are males weighing 180-200 grams and aged between 2-4 months.

**Table 1. Measurement Aspects of Research Variables**

No	Variable	How to Measure	Measuring Instruments	Measurement Results	Scale Measure
1.	Ethanol extract dosage of Rosella Flower (Hibiscus sabdariffa)	Measured weight and volume of extract and vehicle extract with analytical balance and measuring flask.	Analytical balances and measuring flasks.	1. Control 2. Standard	Ordinal
2.	Profile Lipid	Lipoprotein analysis can measure blood levels from cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides.	Spectroscopic	In mg/dl	Ratio
3.	Total Cholesterol Levels	A combination of the amount of LDL cholesterol, HDL cholesterol, and triglycerides in each deciliter of blood	Autocheck ®	In mg/dl	Ratio
4.	Weight	Weighed using scales	Analytical balances	In grams	Ratio

Table 2 Overview of the Treatment of Each Group

No	Test Group	Treatment
1.	Normal	Test animals were not given any particular treatment and were only given ad libitum food and drink.
2.	Control	Test animals were given 1 ml of 0.5% Na CMC suspension daily for 14 days. Food and drink are provided ad libitum.
3.	Standard	Test animals were given an oral suspension of simvastatin 5 ml/kgBB daily for 14 days. Food and drink are provided ad libitum.
4.	(25 mg/kgBB)	Test animals were given ethanol extract of Rosella Flowers (Hibiscus sabdariffa) dose 2.5 ml/kg body weight once a day for 14 days. Food and drink are provided ad libitum.
5.	Rosella Flower Ethanol Extract (Hibiscus sabdariffa) - I (200 mg/kgBB)	Test animals were given an ethanol extract of Rosella Flowers (Hibiscus sabdariffa) dose of 5 ml/kg body weight once a day for 14 days. Food and drink are given ad libitum.
6.	Rosella Flower Ethanol Extract (Hibiscus sabdariffa) – II (400 mg/kgBB)	Test animals were given an ethanol extract of Rosella Flowers (Hibiscus sabdariffa) dose of 10 ml/kg body weight daily for 14 days. Food and drink are given ad libitum.
7.	Rosella Flower Ethanol Extract (Hibiscus sabdariffa) – III (800 mg/kgBB)	Test animals were given an ethanol extract of Rosella Flowers (Hibiscus sabdariffa) dose of 15 ml/kg body weight daily for 14 days. Food and drink are given ad libitum.

Before the blood draw, the rats were satisfied at least 8 hours before the blood draw. Blood collection is done by direct withdrawal from the heart of mice as much as 1 ml. Put into a microtube and let stand $\pm$ 20 minutes. Then, the blood was centrifuged at a rate of 3000 rpm for 15 minutes to obtain the blood serum of the rats. The determination of lipid profiles is determined by the colorimetric method. Blood collection is done by direct withdrawal from the heart of mice as much as 1 ml. Put into a microtube and let stand $\pm$ 20 minutes. Then, the blood was centrifuged at a rate of 3000 rpm for 15 minutes to obtain the blood serum of the rats. The determination of SGOT and SGPT levels is based on enzymatic reactions using Dyasis kit reagents®. Data analysis of One-Way ANOVA Test: Is the data normally distributed with follow-up tests as a Post Hoc Tukey HSD test to see real differences between treatments? However, if the data is abnormally distributed, the Kruskal-Wallis test is used as an alternative.



RESULTS AND DISCUSSION

Extract Characteristics

Table 3. Phytochemical Screening Results of Rosella Flowers Ethanol Extract (*Hibiscus sabdariffa*)

Phytochemicals	Reagent	Result
Alkaloids	Bouchardart	+
Saponins	Mayer	+
Flavonoids	Dragondroff	-
	Wagner	+
	Aquadest + Alcohol 96%	-
Tannins	FeCl ₃ 5%	+
Alkaloids	Mg(s) + HCl(p)	-
	NaOH 10%	-
	H ₂ SO ₄ (p)	-
Saponins	FeCl ₃ 1%	+
Flavonoids	Salkowsky	-
	Lieberman Bouchard	+

From the table data above, it can be seen that ethanol extract Rosella Flowers (*Hibiscus sabdariffa*) contains several phytochemical compounds, including Alkaloids, Saponins, Flavonoids, Tannins, as well as Steroids and Terpenoids.

Table 4. Results of Data Normality Test with Shapiro-Wilk Test on All Research Parameters

Table 1: Results of Data Normality Test with Shapiro-Wilk Test on All Research Parameters			
Parameters		Nilai P	Distribusi Data
Weight		0.504	Usual
Total cholesterol before induction		< 0.05	Abnormal
Total cholesterol after induction		< 0.05	Abnormal
Lipid Profile After Treatment	Total cholesterol	0.536	Usual
	Triglycerides	0.003	Abnormal
	HDL levels	< 0.05	Abnormal
	LDL levels	0.254	Usual
SGOT levels		< 0.05	Abnormal
SGPT Rate		0.241	Usual

The table data above shows that the body weight, total cholesterol, and LDL levels data from the lipid profile after treatment and SGPT levels have a standard data distribution. At the same time, other parameters, including total cholesterol before and after induction, triglyceride levels, HDL levels, and SGOT levels, are abnormally distributed. Based on the distribution of these data, data with standard data distribution are analyzed with parametric statistics, while abnormal data is analyzed with non-parametric statistics.

Table 5. Comparison of Rats' Initial Body Weight in the Entire Treatment Group

Treatment Group	Weight Loss (grams)		P Value
	Mean	SD	
Usual	230.00	28.30	0.625
Standard	232.00	26.30	
Control	230.20	26.60	
Ethanol Rosella Flower Ethanol Extract (<i>Hibiscus sabdariffa</i>) - I (200 mg/ kgBB)	260.00	27.30	
Ethanol Rosella Flower Ethanol Extract (<i>Hibiscus sabdariffa</i>) – II (400 mg/ kgBB)	230.00	28.50	
Ethanol Rosella Flower Ethanol Extract (<i>Hibiscus sabdariffa</i>) – III (800 mg/ kgBB)	240.00	28.50	

From the table data above, it can be seen that the P value > 0.05 (P value = 0625), which means there is no significant difference in the initial body weight of the mice used in this study. The weight range of mice used in this study ranged from 230-260 grams, evenly distributed in each treatment group.

**Table 6. Comparison of Total Cholesterol Before and After High-Fat Diet in All Treatment Groups**

Treatment Group	Total cholesterol (mg/dL)	
	Before Induction	After Induction
Usual	112.00 (112-115)	216.80 (212-221) ^b
Standard	110.00 (110-120)	210.00 (209-245) ^a
Control	115.50 (110-118)	211.70 (210-214) ^b
Ethanol Rosella Flower Ethanol Extract (Hibiscus sabdariffa) - I (200 mg/ kgBB)	115.50 (110-120)	210.70 (208-214) ^b
Ethanol Rosella Flower Ethanol Extract (Hibiscus sabdariffa) – II (400 mg/ kgBB)	112.50 (112-118)	210.00 (210-220) ^b
Ethanol Rosella Flower Ethanol Extract (Hibiscus sabdariffa) – III (800 mg/ kgBB)	114.00 (116-120)	209.00 (209-222) ^b
P Value	0.749	0.015

Data is displayed as Median (Range). The P value is obtained from the Kruskal-Wallis analysis. Different superscripts in the same column show significant differences.

From the table data above, it can be seen that before being given a high-fat diet, the total cholesterol of rats before giving a high-fat diet in the entire treatment group did not show a significant difference (P value = 0.749). This showed that the total cholesterol data of the rats before being given a high-fat diet were uniform. However, total cholesterol in all groups of rats after the high-fat diet showed a different distribution, where only the control group, standard ethanol extract of Rosella Flowers (Hibiscus sabdariffa)-I, II, and III, showed uniform total cholesterol.

Table 7. Comparison of Lipid Profiles in the Entire Mouse Treatment Group

Treatment Group	Lipid Profile			
	Total cholesterol *	Triglycerides**	LDL*	HDL**
Usual	165.50 ± 2.50 ^a	95.00 (95-120) ^a	40.50 ± 1.55 ^a	61.70 (61-68) ^a
Standard	145.00 ± 0.45 ^b	106.40 (101-104) ^b	62.40 ± 1.29 ^b	61.40 (60-64) ^a
Control	159.14 ± 6.02 ^c	164.00 (160-169) ^c	106.40 ± 6.60 ^c	28.00 (65-40) ^b
Ethanol Rosella Flower Ethanol Extract (Hibiscus sabdariffa) - I (200 mg/ kgBB)	168.20 ± 1.50 ^d	166.40 (166-166) ^d	86.25 ± 2.25 ^d	45.40 (46-48) ^b
Ethanol Rosella Flower Ethanol Extract (Hibiscus sabdariffa) – II (400 mg/ kgBB)	166.00 ± 2.20 ^e	120.40 (119-125) ^e	65.00 ± 1.20 ^e	61.40 (61-62) ^a
Ethanol Rosella Flower Ethanol Extract (Hibiscus sabdariffa) – III (800 mg/ kgBB)	145.00 ± 0.90 ^e	110.00 (110-115)	60.50 ± 1.25 ^f	60.20 (60-61) ^a
P Value	< 0.05	0.015	< 0.05	0.015

*The data is displayed as Mean ± SD. P value obtained from One Way ANOVA analysis; **Data is displayed as Median (Range). The P value is obtained from the Kruskal-Wallis analysis. Different superscripts in the same column show significant differences

Table 7 compares lipid profiles in rats that have been given various treatments. This lipid profile includes parameters such as Total Cholesterol, Triglycerides, LDL (Low-Density Lipoprotein), and HDL (High-Density Lipoprotein). The measurement result is expressed in terms of the average value ± standard deviation for each treatment group, and the range of values is indicated in parentheses that include the minimum and maximum values.

The first treatment group, called “Normal,” had total cholesterol values of 165.50 ± 2.50 mg/dL, triglycerides 95.00 (95-120) mg/dL, LDL 40.50 ± 1.55 mg/dL, and HDL 61.70 (61-68) mg/dL. This group is used as a basis for comparison with other treatment groups. The “Standard” treatment group showed changes with lower total cholesterol values (145.00 ± 0.45 mg/dL) compared to the standard group, while triglyceride and LDL values increased. HDL remains relatively stable. The “Control” treatment group showed significant changes with significant increases in total cholesterol, triglycerides, and LDL, while HDL experienced a considerable decrease. The treatment groups “Rosella Flower Ethanol Extract (Hibiscus sabdariffa) -I,” “Rosella Flower Ethanol Extract (Hibiscus sabdariffa) -II,” and “Rosella Flower Ethanol Extract (Hibiscus sabdariffa) -III” showed variation in lipidic response, with different changes in each lipid parameter. Statistical analysis showed that the difference between treatment groups on all lipid parameters was significant (P < 0.05), except for triglyceride parameters for the treatment groups “Rosella Flower Ethanol Extract (Hibiscus sabdariffa) -II” and “Rosella Flower Ethanol Extract (Hibiscus sabdariffa) -III” (P = 0.015).



The results showed that administering ethanol extract of Rosella flowers (*Hibiscus sabdariffa*) in rats had a mixed impact on lipid profiles. The “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*)-I” treatment group showed a significant increase in total cholesterol and HDL, while the “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*)-II” group showed a decrease in LDL. On the other hand, the group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*)-III” showed an increase in total cholesterol and triglycerides. These effects indicate that Rosella flower extract may affect lipid metabolism in complex and varied ways, depending on the dosage or formulation used. While these results are exciting, more research is needed to confirm and understand the mechanisms behind such effects and evaluate potential applications in humans by considering factors such as proper dosage and duration of use.

Table 8. Comparison of SGOT and SGPT Levels in All Treatment Groups

Treatment Group	SGOT levels (U/L)	SGPT Rate (U/L)
Usual	38.50 (38-39) ^a	40.00 ± 1.50 ^a
Standard	111.00 (111-115) ^b	162.00 ± 1.50 ^b
Control	161.00 (161-165) ^c	97.35 ± 1.50 ^c
Ethanol Rosella Flower Ethanol Extract (<i>Hibiscus sabdariffa</i>) - I (200 mg/ kgBB)	115.00 (115-125) ^d	99.00 ± 3.00 ^d
Ethanol Rosella Flower Ethanol Extract (<i>Hibiscus sabdariffa</i>) – II (400 mg/ kgBB)	128.00 (128-135) ^e	110.00 ± 3.00 ^e
Ethanol Rosella Flower Ethanol Extract (<i>Hibiscus sabdariffa</i>) – III (800 mg/ kgBB)	130.00 (130-138) ^f	140.00 ± 3.00 ^b
P Value	0.006	< 0.05

*The data is displayed as Mean ± SD. P value obtained from One Way ANOVA analysis; **Data is displayed as Median (Range). The P value is obtained from the Kruskal-Wallis analysis. Different superscripts in the same column show significant differences

Table 8 compares liver enzyme levels, Serum Glutamic Oxaloacetic Transaminase (SGOT), and Serum Glutamic Pyruvic Transaminase (SGPT) levels in the rat treatment group. The enzyme levels are considered an indicator of liver health, and the measurement results include average values along with a range of values for each treatment group.

The “Normal” group showed SGOT levels of 38.50 (38-39) U/L and SGPT of 40.00 ± 1.50 U/L, reflecting normal liver conditions as a comparison group. The “Standard” group showed significant increases in both enzymes, with SGOT levels of 111.00 (111-115) U/L and SGPT of 162.00 ± 1.50 U/L. This could indicate significant liver damage as a result of standard treatment that may involve substances detrimental to the organ.

The “Control” group showed increased SGOT levels to 161.00 (161-165) U/L and SGPT to 97.35 ± 1.50 U/L. This indicates the potential for liver function abnormalities in the control group, which could be affected by specific treatments or the health conditions of mice. The treatment group “Ethanol Extract of Rosella Flowers (*Hibiscus sabdariffa*)” showed variations in the enzymatic response of the liver. Group I showed an increase in SGOT and SGPT, while Group II showed an increase in SGPT. On the other hand, group III showed a rise in SGOT and SGPT.

Statistical analysis showed significant differences in SGOT levels between treatment groups ($P = 0.006$). Similarly, differences in SGPT levels were also important ($P < 0.05$), suggesting the potential effect of Rosella flowers on rat liver health. These results indicate that Rosella flowers may regulate liver function, but more research is needed to understand the mechanism and its implications thoroughly.

DISCUSSION

The research findings indicate a significant impact of Rosella flower ethanol extract (*Hibiscus sabdariffa*) on the lipid profile of rats. Specifically, the treatment group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -I” showed a significant increase in total cholesterol and HDL, while the group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -II” showed a decrease in LDL levels. Conversely, the group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -III” showed increased total cholesterol and triglycerides. These results reflect the potential influence of the Rosella flower in regulating lipid metabolism with varied responses, depending on the extract formulation or dosage.

When examining liver enzyme responses, the group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -I” showed a significant increase in SGOT and SGPT, while the group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -II” showed an increase in SGPT. The group “Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -III” increased both enzymes. The research results suggest that administering Rosella flower extract to rats can affect liver function, especially in specific treatment groups. However, further interpretation is needed to deeply understand the causes of these enzymatic changes’ long-term impact on liver health. Phytochemistry is a category of substances found in plants that show potential for regulating human metabolism in beneficial



ways for preventing chronic and degenerative diseases. High-fat diet consumption can contribute to increased total cholesterol, LDL, and triglycerides levels while reducing HDL levels in the blood. One approach to improving lipid profiles and preventing cardiovascular complications is by consuming antioxidants. Rosella, for example, is a plant with antioxidant properties due to its content of ascorbic acid and several types of flavonoids, such as flavonol and anthocyanin pigments. Anthocyanins, the red pigments in rosella, consist of cyaniding-3-sambubroside, delphinidin-3-glucoside, and delphinidin-3-sambubroside. Additionally, there are flavonol compounds like gossypetin, hibiscetin, and quercetin in rosella, all contributing as antioxidants. These phytochemicals can provide significant benefits in maintaining lipid balance and preventing adverse impacts of excessive fat consumption.

The Hibiscus sabdariffa extract containing alkaloids also exhibits antimicrobial activity, combating bacteria such as *E. coli*, *E. cloacae*, *P. aeruginosa*, and *S. Aureus* (Nafisa *et al.*, 2021). Rosella (*Hibiscus sabdariffa*) has been traditionally known in West Africa as a plant with anti-hypertensive properties. Anthocyanins are compounds commonly found in *Hibiscus sabdariffa* water extract, and they can act as bioactive compounds with anti-hypertensive properties by inhibiting the enzyme that converts angiotensin I to angiotensin II. Furthermore, the long-term use of *Hibiscus sabdariffa* water extract does not cause side effects in hypertensive patients.

One of the compounds believed to be present in Rosella flower calyx that is beneficial in lowering blood glucose levels is flavonoids, specifically flavone derivative gossypetin (hexahydroxyflavo)-3-glucoside, which acts as an antioxidant that can inhibit damage to β -cells in the pancreatic islets that produce insulin and stimulate insulin release in pancreatic β -cells to be secreted into the blood. Additionally, flavonoids can also restore insulin receptor sensitivity in cells. The presence of saponins, which can lower blood glucose levels, works by inhibiting the action of the enzyme α -glucosidase, which is present in the intestine and functions to convert carbohydrates into glucose. This α -glucosidase inhibitor enzyme can inhibit glucose absorption in the small intestine, thus functioning as an anti-hyperglycemic agent to reduce blood glucose levels (Aprilliani and Pratiwi, 2018); (Wahyuni *et al.*, 2022).

Other studies indicate that consuming rosella tea from *Hibiscus sabdariffa* can decrease total cholesterol, LDL, and triglyceride levels. However, it does not result in an increase in HDL levels in the blood. One of the compounds that play a role in these anti-hypertensive and anti-hyperlipidemia effects is anthocyanin. Anthocyanins work by inhibiting LDL oxidation, thus contributing to the prevention of atherosclerosis. These findings highlight the potential benefits of rosella tea as a natural agent that can help manage the body's lipid profile, especially in reducing the risk of cardiovascular diseases. Therefore, rosella tea can be considered part of a healthy diet for maintaining heart health and controlling blood lipid levels.

CONCLUSION

The conclusion of this study indicates that administering Rosella flower ethanol extract (*Hibiscus sabdariffa*) to rats has varied impacts on lipid profiles and liver function. The treatment groups showed complex responses, including a significant increase in total cholesterol and HDL in "Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -I," a decrease in LDL in "Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -II," and an increase in total cholesterol and triglycerides in "Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -III." Statistical analysis validated significant differences between treatment groups ($P < 0.05$), including triglycerides in "Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -II" and "Rosella Flower Ethanol Extract (*Hibiscus sabdariffa*) -III" ($P = 0.015$). These results also showed a significant impact on liver function, with substantial differences in SGOT levels ($P = 0.006$) and SGPT levels ($P < 0.05$)—the potential regulatory effects of Rosella flower on rat lipid metabolism and liver health warrant further attention.

REFERENCES

1. Aprilliani, R. P. C. and Pratiwi, Y. (2018) "Prosiding HEFA (Health Events for All)," *Evaluasi Pengelolaan Obat Pada Tahap Perencanaan Obat Di Puskesmas Karanganyar I Kab. Demak Pada Tahun 2017*, PROSIDING, pp. 251–257.
2. Nafisa, S. *et al.* (2021) "Formulasi dan Uji Antibakteri Sediaan Gel Ekstrak Kelopak Bunga Rosela (*Hibiscus sabdariffa* L .) terhadap *Pseudomonas aeruginosa* dan *Propionibacterium acnes*," 14(1), pp. 19–25.
3. Pratiwi, A. T. (2014) "Pengaruh Ekstrak Rosella (*Hibiscus sabdariffa* Linn) dalam Menurunkan Kadar Gula Darah untuk Diabetes Melitus," 6(2), pp. 138–142.
4. Rahadian, R. (2017) "Pemanfaatan Ekstrak Kelopak Bunga Rosella (*Hibiscus Sabdariffa* L) Dan Rumput Laut (*Euchema Cottoni*) Terhadap Mutu Permen Jelly," 4(1), pp. 1–14.
5. Ulilalbab, A. and Maskanah, E. (2021) "Pemberian Serbuk Kelopak Rosella Merah yang Diseduh Mampu Mencegah Penurunan HDL Pada Sprague dawley yang Dipapar Jelantah," *J. Ilmu Kefarmasian Indones*, 19, pp. 262–265.
6. Wahyuni, D. U. *et al.* (2022) "Pengaruh Pemberian Infusa Kelopak Bunga Rosella (*Hibiscus Sabdariffa* L .) Sebagai Penurun Kadar Glukosa Darah Pada Mencit Putih Jantan (*Mus Musculus Galur Swiss-Webster*) Yang Diinduksi," (April), pp. 54–60.
7. Widyaningsih, T. D., Alif Nugroho, M. F. and Ulilalbab, A. (2022) "Optimasi Formula Wedang Uwuh Berbasis Rosella Merah sebagai Minuman Fungsional," *Amerta Nutrition*, 6(1), p. 53. doi: 10.20473/amnt.v6i1.2022.53-62.
8. Wulansari, F. (2020) "Aktivitas Water Kefir Sebagai Antidislipidemia Pada Tikus Putih Jantan Yang Diinduksi Propylthiouracil (Ptu) Dan Emulsi Lemak," *Universitas Bhakti Kencana Fakultas Farmasi Program Strata I Farmasi Bandung 2020, Laporan Tu*, pp. 5–24.



THE IMPACT OF EARLY MOBILIZATION ON CHANGES IN PAIN LEVELS OF CLIENTS AFTER SECTION CESAREA SURGERY AT ROYAL PRIMA MARELAN HOSPITAL: BEFORE AND AFTER

Liu Chao¹, Fioni²

¹Master of Clinical Medicine Study Program, Department of Clinical Medicine, Faculty of Medicine, Dentistry, and Health Sciences (FKKGIK), Universitas Prima Indonesia

²Clinical Medicine Study Program, Department of Clinical Medicine, Faculty of Medicine, Dentistry, and Health Sciences (FKKGIK), Universitas Prima Indonesia

ABSTRACT

Cesarean section (C-section) rates in Indonesia exhibit a wide range, often surpassing recommended thresholds, particularly in private healthcare facilities. Effective management of postoperative pain, including strategies like early mobilization, is crucial in enhancing wound healing outcomes. This study aimed to evaluate the impact of early mobilization on pain levels among postoperative cesarean section clients. The research employed a descriptive correlational design using a One Group Pretest-Posttest approach conducted at Royal Prima Marelan Hospital in January 2024. The study population consisted of laboring mothers planning to deliver at the hospital, averaging around 52 attendees per month over the last three months. Utilizing the Slovin formula, a sample size of 35 was determined and selected through consecutive sampling based on inclusion criteria. Bivariate statistics were employed to analyze the relationship between variables, with hypothesis testing indicating the validity of hypotheses based on a significance level of 0.05 ($p \leq 0.05$ for “meaningful” results and $p > 0.05$ for “not meaningful” results). The study used a paired t-test for bivariate analysis to assess pain scale changes pre- and post-early mobilization. The findings from the Wilcoxon Test revealed a significant difference, with Early Mobilization demonstrating a positive effect on reducing Pain Levels among inpatients at Royal Prima Marelan Hospital in 2024. Evaluation of Pain Levels in post-cesarean section clients indicated that before Early Mobilization, a majority experienced heightened pain levels, including a small proportion with severe pain. However, after Early Mobilization, while most clients reported a slight increase in pain levels, a minority experienced a more substantial increase. These outcomes suggest that Early Mobilization influences changes in pain levels among postoperative clients at Royal Prima Marelan Hospital in 2024.

KEYWORDS: Cesarean section rates, Postoperative pain management, Early mobilization impact, Pain levels assessment, Bivariate statistics analysis.

BACKGROUND

Cesarean section is a surgical procedure in which the fetus is delivered through an incision in the abdominal wall and the uterine wall, provided that the uterus is intact and the fetus weighs over 500 grams. The number of Caesarean section patients in Indonesia, especially in government hospitals, is 20-25% of total deliveries, while in private hospitals, the number is higher, around 30-80% of total deliveries. The Department of Health recommends that Caesarean section deliveries ideally not exceed 20% (Warsono, Fahmi, and Iriantono 2019). Cesarean section is the most common method of childbirth, but it is still a major surgical procedure performed on mothers who are conscious unless it's an emergency (Agustin 2013); (Aust et al. 2013).

Post-surgery, pain often arises due to stimulation of the nerves around the surgical area. This happens because body tissues are cut or disturbed during surgery, and the surrounding nerves send pain signals to the brain. Postoperative pain can vary from mild to severe, depending on the type of surgery, the individual's sensitivity to pain, and the pain management the medical team provides. The duration of postoperative pain also varies but can generally be felt for several days to weeks after surgery. In general, the most severe pain is usually felt in the first days after surgery and then begins to decrease over time. To manage postoperative pain, the medical team usually administers analgesics or painkillers, either in oral or intravenous form. In addition, other pain management techniques such as cold or hot compresses, physical therapy, and relaxation techniques can also help reduce pain intensity and improve patient comfort after surgery. (Abidin, Aceh, and Salawati 2024). Pain that arises after surgery in the intra-abdominal region (inner abdomen) can vary in intensity. About 60% of patients experienced severe pain, 25% had moderate pain, and 15% had mild pain. This variation can be influenced by various factors, including the type of surgery, the individual's sensitivity to pain, and the effectiveness of pain management provided by the medical team (Arief Mansjoer, 2010).

Pain management in postoperative patients involves two approaches, namely pharmacology using drugs and non-pharmacology without drugs. One practical non-pharmacological approach is early mobilization intervention. Early mobilization in postoperative patients is a policy that immediately moves patients from their beds and guides them to walk as quickly as possible. It aims to divert



the patient's attention from pain to physical activity. Mobilization is a basic human need for daily activities, such as moving, maintaining posture, walking, and other exercises (Nadiya and Mutiara, 2018).

Based on Nadia's research (2018), 13 respondents (32.5%) who did not mobilize early experienced poor healing of surgical wounds. The results of the chi-square test showed a value of $p(0.031) < \alpha(0.05)$, which means that there is a significant relationship between early mobilization after cesarean section (SC) and surgical wound healing in the Midwifery Room of the Regional Public House dr. Fauziah Bireuen (Nadiya and Mutiara 2018). The purpose of this study was to determine the effect before and after early mobilization on changes in pain levels in postoperative cesarean section clients.

RESEARCH METHODS

This type of research is descriptive correlational, with a Group Pretest-Posttest approach. The location of this research was Royal Prima Marelan Hospital in January 2024. The population in this study was all maternity mothers who wanted to give birth at Royal Prima General Hospital. The survey results, data from the last three months, show the average monthly number of maternity mothers who come and use the facilities of Royal Prima Hospital is ± 52 people. The number of samples uses the Slovin formula. $n = 52/1+52(0.01)^2$

$n = 34.21$, so that 35 samples were obtained.

Sample selection in this study uses non-probability sampling, namely consecutive sampling or sampling, where all existing samples that meet the inclusion criteria are taken to meet the sample size determined by the researcher.

Sample inclusion criteria, namely:

- Postoperative sectio caesarea patients treated at RSU Royal Prima Marelan
- Patients who were on-site when researchers conducted the study
- The patient's vital signs (blood pressure, pulse, temperature, and breathing) are stable.
- Patients who are willing to be respondents

Bivariate statistics is a method of data analysis to analyze the influence between two variables. Hypothesis testing to decide whether the hypothesis proposed is convincing enough to be rejected or accepted, using statistical tests used a meaning limit of 0.05 so that the $p\text{-value} \leq 0.05$, then the statistics are called "meaningful" and if $p > 0.05$, then the calculation results are "meaningless." The bivariate analysis used in this study was a paired t-test to examine differences in pain scales before and after early mobilization.

RESULTS AND DISCUSSION

Postoperative pain is a common side effect experienced by individuals who have undergone surgery, including Caesarean section. This pain can be caused by tissue adhesions resulting from the surgery. It is nearly impossible to eliminate this pain, and each person may experience varying levels of pain. Pain levels can be assessed using a facial scale with different degrees, where 0 = No pain, 1 = Slight pain, 2 = Slightly more pain, 3 = More pain, 4 = Severe pain, and 5 = Intense pain.

Table 1. Distribution of Frequency and Percentage of Pain Level of Postoperative Sectio Caesarea Clients Before Early Mobilization at Royal Prima Marelan Hospital in 2024

No	Pain Level	Sum (n)	Percentage
1	Severe pain	8	23%
2	Painful Once	12	34%
3	More Pain	15	43%
TOTAL		35	35

Based on Table 1. It is known that before early mobilization, the majority of respondents felt more pain, while the minority of respondents experienced severe pain. Immediate step-by-step mobilization is very useful in helping the healing of postoperative patients.

Table 2. Distribution of Frequency and Percentage of Early Mobilization of Postoperative Sectio Caesarea Clients at Royal Prima Marelan Hospital in 2024

No	Early Mobilization	Sum (n)	Percentage
1	Can Do Well	26	74%
2	Can't Perform Well	9	26%
TOTAL		35	100

Based on Table 2. shows the frequency distribution and percentage of Early Mobilization of clients after sectio caesarea surgery at Royal Prima Marelan Hospital in 2024. Of the total 36 respondents, 26 respondents (74%) could do Early Mobilization well, while nine (26%) could not. The overall total of respondents reached 100%.

**Table 3. Frequency and Percentage Distribution of Pain Level of Postoperative Sectio Caesarea Clients After Early Mobilization at Royal Prima Marelان Hospital in 2024**

No	Pain Level	Sum (n)	Percentage
1	More Pain	11	31%
2	Slightly More Painful	24	69%
TOTAL		35	100

Based on Table 3. presents the frequency distribution and Percentage Pain Level of postoperative sectio caesarea clients after Early Mobilization at Royal Prima Marelان Hospital in 2024. Of the total 35 respondents, 11 (31%) experienced more pain levels, while 24 (69%) experienced slightly more pain. The total percentage of all respondents was 100%.

Table 4. Pain Level Before and After Early Mobilization in Postoperative Sectio Caesarea Clients at Royal Prima Hospital

No	Pain Level	Sum (n)	Mean	SD	Min Max
1	Pre-Early Mobilization	35	3.45	0.814	3-5
2	Post-Early Mobilization	35	2.22	0.521	2-3

Based on Table 4. provides an overview of Pain Levels before and after Early Mobilization on postoperative sectio caesarea clients at Royal Prima Marelان Hospital. Before Early Mobilization (Pre-Early Mobilization), out of 35 respondents, the average Pain Level was 3.45 with a standard deviation of 0.814, and the range of values was between 3 and 5. After Early Mobilization (Post-Early Mobilization), the average Pain Level was 2.22.

Table 5. Descriptive Test Results Wilcoxon Signed Ranks Test Changes in Pain Level Before and After Early Mobilization in Postoperative Sectio Caesarea Clients at Royal Prima Marelان Hospital in 2024

No	Pain Level	Sum (n)	Mean	Z	p-value
1	Pre-Early Mobilization	35	3.41	-3.715	0.004
2	Post-Early Mobilization	35	2.32		

Based on Table 5. presents the results of the paired t-test description test related to changes in Pain Level before and after Early Mobilization on postoperative sectio caesarea clients at Royal Prima Marelان Hospital in 2024. Before Early Mobilization (Pre-Early Mobilization), the average Pain Level was 3.41; after Early Mobilization (Post-Early Mobilization), the average Pain Level decreased to 2.32. Statistical tests showed a Z value of -3.715 with a p-value of 0.004, indicating a significant difference and a positive effect of Early Mobilization on reducing Pain Levels in patients.

DISCUSSION

Cesarean section, also known as C-section, is a medical procedure for delivering a baby by making an incision in the uterine wall through the abdomen or vagina, also known as hysterotomy, to allow the baby to be born from inside the uterus. This method is typically used when a vaginal delivery is not feasible or safe for the mother or the baby (Blondeau et al., 2015). Cesarean section, or C-section, is the most common method for delivering a baby, but it remains a major surgical procedure performed on the mother while she is conscious, except in emergencies (Fauziah and Fitriana, 2018); (Nadiya and Mutiara, 2018). feel the same pain, and no two identical pain events produce the same response or feeling in a person. The experience of pain is highly individualized and influenced by various factors such as individual sensitivity, health conditions, and social context. Pain can also be a source of frustration for both patients and healthcare professionals. Patients may feel frustrated in the face of uncomfortable pain, while healthcare professionals may find it challenging to manage pain effectively or provide adequate care to patients. Pain management is essential to patient care to ensure comfort and a better quality of life (Nadiya and Mutiara 2018).

Pain is a highly individualized and subjective experience that can affect individuals of all ages. This can happen to children as well as adults. The causes can vary from disease processes, injuries, and medical procedures to surgical interventions (Kyle 2015). Based on the results of research on 35 respondents about the effect of Early Mobilization on changes in pain in postoperative sectio caesarea clients in the hospital room of Royal Prima Hospital in 2024, it is known that after being given Early Mobilization, the majority of respondents felt a little more pain and the minority of respondents felt more pain again. Pain in clients with Sectio Caesarea is caused by the uterus that often contracts because it is still in the process of returning to its original shape, and also the pain that arises from the surgical incision area (Nadiya and Mutiara 2018). Severe pain is a sequela caused by surgery on the intra-abdominal region (inner abdomen). About 60% of patients suffer from severe, 25% moderate, and 15% mild (Arief Mansjoer 2010).

The results of the Wilcoxon Test showed a Z value of -3.715 with a p-value of 0.004, indicating a significant difference and positive effect of Early Mobilization on reducing Pain Levels in inpatients at RSU Royal Prima Marelان in 2024. Mobilization is a basic human need required by individuals to perform daily activities such as joint movements, posture, walking style, exercises, and activity capabilities. Post-sectio caesarea mobilization, as described by Ferinawati and Hartati in 2019, can begin after the first 24-48 hours postoperatively. The purpose of the mobilization is to accelerate the wound healing process, improve blood circulation, prevent venous static (blood clots), support optimal respiratory function, improve digestive function, reduce the risk of postoperative



complications, restore the patient's body function as much as possible as before surgery, maintain the patient's self-concept, and prepare the patient to return home to rum (Nadiya and Mutiara 2018). The results of this study are supported by several research results conducted previously by (Nadiya and Mutiara 2018), stated that there is a relationship between Early Mobilization post section Caesarea (SC) and surgical wound healing in the Midwifery Room of the Regional Public House dr. Fauziah (Fauziah and Fitriana 2018).

CONCLUSION

Studies on Pain Levels in postoperative cesarean section clients show that before Early Mobilization, the majority of clients experienced increased pain levels, with a minority experiencing severe pain. However, after Early Mobilization, the majority of clients still experienced a slight increase in pain levels, although there was a minority who felt a more significant increase in pain. This indicates that early mobilization will influence pain levels in postoperative clients at Royal Prima Marelana Hospital in 2024.

DAFTAR PUSTAKA

1. Abidin, Zainoel, Banda Aceh, and Liza Salawati. 2021. "Profil Pasien Sectio Caesarea Di Rumah Sakit Umum Daerah Dr. Zainoel Abidin Banda Aceh Tahun 2019." *Jurnal Kedokteran Syiah Kuala* 21(1):139-43.
2. Agustin. 2013. "Jurnal Kesehatan Masyarakat Andalas." *Obesitas Sentral Dan Kadar Kolesterol Darah Total* 9(1):37-43.
3. Arief Mansjoer. 2010. *Kapita Selekta Kedokteran*. edisi 4. Jakarta: Media Aesculapius.
4. Aust, H., M. Zemlin, F. Woernle, H. Wulf, and D. Rüschi. 2013. "Sectio Caesarea in Regionalanästhesie: Pro Und Kontra Der Supplementären Sauerstoffgabe." *Anaesthesist* 62(3):201-12.
5. Blondeau, Marie José C. E., Kathelijne M. Koorengevel, A. J. Schneider, A. L. M. J. Van Der Knijff-Van Dortmont, and Wybo J. Dondorp. 2015. "Een Sectio Caesarea Tegen Haar Wil?" *Nederlands Tijdschrift Voor Geneeskunde* 159(12).
6. Fauziah, and Fitriana. 2018. "Hubungan Mobilisasi Dini Post Sectio Caesaria (SC) Dengan Proses Penyembuhan Luka Operasi Di Ruang Kebidanan RSUD. Abdul Wahab Sjahranie Samarinda Tahun 2018." *Midwifery Journal* 23-27.
7. Kyle, T. & Carman S. 2015. *Buku Praktik Keperawatan Pediatrik*. Jakarta: EGC.
8. Nadiya, Sarah, and Cut Mutiara. 2018. "Hubungan Mobilisasi Dini Post Sectio Caesarea (SC) Dengan Penyembuhan Luka Operasi Di Ruang Kebidanan RSUD Dr. Fauziah Kecamatan Kota Juang Kabupaten Bireuen." *Journal of Healthcare Technology and Medicine* 4(2):187.
9. Warsono, Warsono, Faradisa Yuanita Fahmi, and Galuh Iriantono. 2019. "Pengaruh Pemberian Teknik Relaksasi Benson Terhadap Intensitas Nyeri Pasien Post Sectio Caesarea Di RS PKU Muhammadiyah Cepu." *Jurnal Ilmu Keperawatan Medikal Bedah* 2(1):44.



AYURVEDIC MANAGEMENT OF *DUSHTA VRANA* VIS-À-VIS VENOUS ULCER – A CASE STUDY

**Dr Harsha M Kencharadder¹ Dr Poornima Jalawadi² Dr Meghana D³
Dr Raveendranatha B⁴**

¹Second year PG Scholar, Department of PG and Ph.D Studies in Shalya tantra, JSS Ayurveda Medical College & Hospital, Mysore.

²Associate Professor, Department of PG and Ph.D Studies in Shalya tantra, JSS Ayurveda Medical College & Hospital, Mysore

³Second year PG Scholar, Department of PG and Ph.D Studies in Shalya tantra, JSS Ayurveda Medical College & Hospital, Mysore.

⁴Second year PG Scholar, Department of PG and Ph.D Studies in Shalya tantra, JSS Ayurveda Medical College & Hospital, Mysore.

ABSTRACT

Venous ulcer is the complication of varicose veins or deep vein thrombosis. It is one of the most serious chronic venous insufficiency complications. The overall incidence rate is 0.76% in men and 1.42% in women¹. This is the commonest ulcer of the leg. The basic cause of venous ulcer is abnormal venous hypertension in the lower-third of the leg, ankle and dorsum of the foot due to damaged venous valves that prevent backflow of blood.² Treating venous ulcers is a difficult task though a very good number of treatments modalities are available in allied sciences. In Ayurveda, this condition is considered as Dushtavrana. It can be managed with the specific shodhana therapy. So, the same treatment protocol was used to treat the case discussed here, present case study deals with a male patient aged 63 years, having scab like ulcers in the left lower limb since 6 months. The patient was N/K/C/O Diabetes mellitus, Hypertension and any other systemic disorder. The wound was managed on Ayurvedic treatment modalities. This treatment resulted in complete wound healing.

KEYWORDS: *Dushtavrana, Venous ulcer, Shodhana therapy, Varicose vein, Deep vein thrombosis*

INTRODUCTION

Vrana in Ayurveda is defined as a structural deformity in the skin and deeper structures associated with ruja, srava etc and caused either by the vitiation of the doshas or by trauma³. Vrana is basically of 2 types- Dushtavrana and Shudhavrana.

Shudhavrana (acute ulcer) is easily treatable, whereas Dushtavrana is a chronic ulcer, mostly unresponsive to any treatment. Venous ulcer can be considered as Dushtavrana. Acharya Sushruta has mentioned Shashtiupakrama for the management of Vrana. These upakrama pacify vranashopha, and prevent further deterioration, does vranashodhana and vranaropana. Raktamokshana is one among the treatment modalities for management for Dushtavrana. Virechana is specially indicated in the chronic non healing ulcers.

CASE REPORT

A gentle man aged 63 years, came to our hospital with the complaints of swelling, discoloration, discharge and ulcer with scab in left the lower limb since 6 months.

History of Presenting Illness

As per the statement of the patient, he was apparently healthy 10 years ago. Then he gradually noticed discoloration in the left lower limb above the ankle joint, which he was neglected since 10 years. Later he developed itching, then scratch developed and then scab like lesion in the left lower limb about 70% of leg was covered with scab with foul smell since 6 months so he consulted a physician where they opened up the lesion and dressing was done and advised for amputation but patient refused to get the treatment. Patient also had history of tortuous and dilated veins since 10 yrs. He also experienced pricking sensation and numbness in the left lower limb and pain used to aggravate on long standing hours and reduces on taking rest and limb elevation. So he visited our hospital for further management.



Family History- No relevant history.

Personal History

Sleep-disturbed, Appetite- reduced, Bowel- regular, Habits- no addictions BP-140/80.

PR-78bpm, weight-70kgs, Height-170cms

His laboratory investigations are as follows

HB%-12.2 mg/dl, WBC-11000, Urea-22mg/dl, Creatinine-0.6mg/dl, Urine routine – albumin-nil, sugar-nil, pus cells-3to4, CRP-1:16

Systemic Examination

CVS: S1 S2 heard CNS: Conscious and oriented time, place and person RS: NVBS PA : Soft and non tender

Local Examination

1) Left Lower Limb

a) Inspection: Blackish skin colour change (from 5cm below the knee joint covering entire limb) and hair loss noted below the knee joint but no erythema

swelling- present(non pitting)

b) Palpation: Raise of temperature; dorsalispedis, posterior tibial pulse-present, Anterior

Tibial pulse - present, Popliteal pulse - present, Femoral pulse - present

c) Sensation: Monofilament test- diminished sensation. Vibration (tuning fork)- diminished.,

2) Ulcer Examination

Inspection

Site – Anterior aspect of left limb 7 cm below the knee joint, Size & shape- 2.5x3cm, irregular in shape, 3mm depth, number –multiple, Onset- chronic, Edge and margin- blackish, inflamed, scab, irregular border with sloping edge, Floor – pale, slough, Base-exudate present with no fixity to the underlying tissues with Induration, Discharge- yellowish

According to wagner's ulcer classification system, grade 2

Palpation

Skin temperature – raised temperature

Capillary filling time -2 sec

Tenderness-present

Induration : Seen in the skin surrounding the ulcer

SampraptiGhataka

Hetu – Long hours of standing SFJ: GRADE III INCOMPETENCE.

GSV: INCOMPETENT TILL UPPER THIRD. GSV ANTERIOR TRIBUTARY

DILATED AND DILATED TORTUOUS.

INCOMPETENT PERFORATORS

PurvaRupa- Vaivarnya, Suptata,Ruja

Dosha - Vata and Pitta

Dushya - Rasa, Rakta

Srotas - Rasavaha, Raktavaha

RogaMarga -Bahya

Rogibala – Avara

Hetubala - madhyama

Agni –Samagni

Koshta-Krura

CHIKITSA

Then wound was treated with Ayurvedic line of management mentioned by AcharyaSushruta. Treatment protocol includes Jaloukacharana (raktamokshan), Kashayaseka and Snehapana followed by Virechana. These were given to convert Dushtavrana into Shuddhavrana. Oral medications and daily wound dressing with vranaharinitaila and removal of scab on alternate days.



TIME PERIOD	MEDICINE and TREATMENT	DOSE AND ANUPANA
3 days From 12/11/23 to 14/11/23	1)Tab Agnitundivati 2) Tab Chitrakadivati 3) Wound dressing with Vranaharinitaila	250mg bd(warm water) 250mg bd(warm water)
6days From 15/11/23 to 20/11/23	3) continue along with following 4)AragvadaMahatiktakaGhritha(snehapana) 5) Panchavalkalakawatha(kashayaseka) 6) Jaloukaavacharana (2 leech around the wound alternate days)	From 30ml to 160ml in Arohanakrama with a pinch of saindhavalavana
3 days From 21/11/23 to 23/11/23	3,5, and 6 continue 7) Sarvangaabhyanga with Manjishtaditaila followed by Bhashpasweda	
1 day On 24/11/23	3 and 7 continue 8) Virechana with Nimbaamrutadierandataila(50ml) + Trivruthleha(50gms)	Warm water

After virechana Patient was adviced to follow Samsarjanakrama for 3 days and discharged with following oral medicines with daily dressing.

1. Tab Varicolyte 1-0-1 After food
 2. Varicolyte gel for external application
 3. Cap Grab 1-0-1 After food
 - 4.TabNishamalaki 1-1-1 Before food
 5. SypMahamanjishtadikashaya 15ml-0-15ml with 30ml of water Before food
 - 6.syp PatolaKaturohinyadikashaya 15ml-0-15ml with 30ml of water Before food
- All the medicines for 10 days

Follow up after treatment

The patient was called for follow-up after treatment on every alternate day for wound management, with continuation of mahamanjishtadikashayam and Tab Varicolyteas internal medicine. The patient was thoroughly educated for hygiene, to follow PathyaAhara and Vihara. By the end of 45days , now the patient is having healthy and healing status and reduced wound size is almost on the verge of complete healing. This was a case managed completely on Classical Ayurveda treatment modality which prevented the

patient into going from Below Knee Amputation and thus saving patients limb.

DISCUSSION

Initially patient was given with Deepana and Pachana drugs to increase Agnibala.

Then snehapana has started with Aragwadhamahatiktakaghrithafrom 30ml to 160ml. Rationality behind choosing this gritha is that solidification(scab) due to kapha and discoloration due to pitta, so here it balances both kapha and pitta dosha. Jaloukavacharana was done to improve the local circulation and to do sthanikashodhana. Panchavalkalakashaya is done to cleanse the local impurities.DuringvishramakalaAbhyanga was carried out with Manjishtaditaila as Manjishta is known as Blood purifier. Virechana is adopted as it is one among Shashtiupakrama and it is specially indicated in adhokaya and deerghakaalanubandhi vrana.⁴

After shodhana patient adviced to take shaman oushadhies like

- Tab. Varicolyte – It helps in strengthening venous valve stimulates venous return (blood circulation) and naturally aids in conditions of venous insufficiency.
- Tab. Grab - Offers anti microbial& anti-inflammatory property which helps ininfectious diseases.
- Patolalatrohinyadikashayam- is usedfor chronic skin sensitivities, rashes, itching,scaling and discharge; skin pigmentation;sluggish metabolic function; dull, lifeless skinprone to infection.⁵
- Tab. Nishaamalaki- Antidiabetic, Anti-inflammatory, Antipruritics⁶



1st day



After 20 days of treatment



After 45 days of treatment

CONCLUSION

Venous ulcer patient as a complication loses his limb. But by adopting Ayurvedic management can save limb and prevents patient going Amputation. These shasthiupakramas adopted at appropriate time can save the limb from being amputated and it will have a huge impact on patient's day today living.

REFERENCES

1. Deepa patil. *An integrated approach in the treatment of varicose ulcer*. Pubmed central. 2013.
2. S.DAS. *A Concise textbook of surgery*. 4th Ed. New Delhi: JAYPEE;2010.
3. K.R.SrikanthaMurty. *Sushruta Samhita*. Vol.2. Pg no 4 Varanasi: Chaukambhaorientalia; 2017
4. K.R.SrikanthaMurty. *Sushruta Samhita*. Vol.2. Pg no 12 Varanasi: Chaukambhaorientalia; 2017
5. Hari Sadashiva Shastri (ed) *Ashtanga Hridaya of Acharya Vagbhata*. Varnasi: Chaukamba Sanskrit Sansthan; 2011;p540
6. Hari Sadashiva Shastri (ed) *Ashtanga Hridaya of Acharya Vagbhata*. Varnasi: Chaukamba Sanskrit Sansthan; 2011;p943



PROJECT SAVE: AS A STRATEGY IN IMPROVING LITERACY THROUGH VOCABULARY INTEGRATION AMONG GRADE 8 LEARNERS

Rose Anne Nequinto Calinagan

Schools Division Office of Laguna, District of Santa Cruz, Pedro Guevara Memorial National High School

Article DOI: <https://doi.org/10.36713/epra16170>

DOI No: 10.36713/epra16170

ABSTRACT

This study aimed to investigate if the vocabulary integration before discussion will be effective in improving literacy level of Grade 8 learners. Specifically, it answered the following research questions: (1) What is the level of the participants' performance in the pre-test? (2) What is the level of the participants' performance in the post test? (3) Is there a significant difference between the pre-test and post-test of the participants before and after the implementation of the vocabulary integration? (4) Based on the findings, what actions can be planned and implemented to improve the participants' literacy level.

The participants were 2 groups of Grade 8 learners. They were selected through purposive sampling which entails that the following criteria were met: (1) Grade 8 group of students with the least average in MPS in MELC number one which is "Determine the meaning of words and expressions that reflect the local culture by noting context clues." (2) Most members of the class are struggling reader based on Phil-Iri result S.Y 2022-2023. A teacher-made pre-test was administered before presenting this proposed strategy, followed by a posttest after its utilization. Mean (M) and Standard Deviation (SD) were utilized to determine the level of students' performance in scaling before and after applying Project SAVE. To determine the significant difference of students' literacy level before and after applying Project SAVE, T- test for two dependent means (paired t-test) was used.

The results showed that out of 83 students no one got excellent score, 14 very satisfactory and 34 satisfactory score on pretest as compared to posttest, 34 learners achieved excellent score, 35 very satisfactory and 13 satisfactory. The mean score increased significantly from satisfactory to very satisfactory, as well as the standard deviation. Therefore, it can be concluded that the implementation of Project SAVE using SIM has a positive impact on the learners' literacy level. Thus, it is recommended for other Grade 8 learners and or other Grade levels.

KEYWORDS: Project SAVE; Strategy for Learners Literacy Improvement.

CONTEXT AND RATIONALE

Vocabulary development is a process of acquiring new words to use in daily life, and more specifically, the basis for learning any language. Vocabulary improvement focuses on helping students understand the meaning of new words and concepts in numerous situations and across all academic core areas. Giving learners explicit instruction on key terms from texts and demonstrating independent learning techniques are two key components of vocabulary development training. For students to be able to comprehend texts that are more complex and at grade level as they get older, both oral and written vocabulary development must improve (Kamil et al., 2008; Loftus & Coyne, 2013).

Vocabulary instruction has been designated by the National Institute of Child Health and Human Development's National Reading Panel as a crucial ability that children must master to improve their reading performance (NICHD, 2000). In fact, there is compelling evidence that vocabulary education helps students' speaking and listening vocabulary as well as their reading comprehension and writing quality (Joshi, 2006; Kame'enui & Baumann, 2012). For a child to succeed in school, having a strong vocabulary, including both oral and written vocabulary, is essential (Kamil et al., 2008).

In the 2018 Programme for International Student Assessment (PISA), the Philippines received the lowest reading comprehension score out of 79 participating nations and economies. (Philippine Star, December 3, 2019)

According to World Bank, (July 2022) Philippines' literacy rate declines, from 97.95 percent to 96.28 percent. Nash and Snowling (2006) study shows that students struggle with reading comprehension because they lack the spoken vocabulary necessary for comprehending and remembering texts in their subject areas. Lack of vocabulary knowledge can hinder a student's ability to build reading comprehension skills. Reading comprehension and vocabulary knowledge are closely related; to improve understanding,



students must be able to define the key terms they will be reading. Vocabulary knowledge, along with background knowledge, provides students a better chance of understanding the text they read. In addition, to improve reading comprehension and fluency, vocabulary knowledge helps readers connect their existing background information to the content they are reading.

Thus, the purpose of this study is to improve the literacy level of Grade 8 learners through vocabulary integration.

INNOVATION, INTERVENTION, AND STRATEGY

This Action Research proposed to implement Project SAVE: (Strategic Activities for Vocabulary Enhancement) to ensure the improvement of learners' literacy level through vocabulary integration among the identified Grade 8 learners with the least MPS result of MELC 1 and with the most identified struggling readers based on Phil-IRI results. The researcher thought of a strategic instructional materials and teaching approach of using word wall and in which unlocking of unfamiliar words or vocabulary found in the lesson will be discussed by the teacher before the start of the lesson so that learners will easily comprehend the content of the topic.

The researcher developed Strategic Instructional Material that contains unfamiliar words per topic. According to Impas, 2021, interactive strategic instructional materials is an effective learning material to improve the performance of the learners.

ACTION RESEARCH QUESTIONS

The present study seeks to investigate if integrating vocabulary before discussion will be effective in improving literacy level of learners.

Specifically, it seeks to answer the following question:

1. What is the level of the participants' performance in the pretest?
2. What is the level of the participants' performance in the posttest?
3. Is there a significant difference between the pre-test and posttest of the participants before and after the implementation of the vocabulary integration?
4. Based on the findings, what actions can be planned and implemented to improve the participants' literacy level.

CONCEPTUAL FRAMEWORK

The researcher considered the idea that through the application of the proposed strategy the Project SAVE, through using of SIM, the literacy level of identified Grade 8 learners was developed.

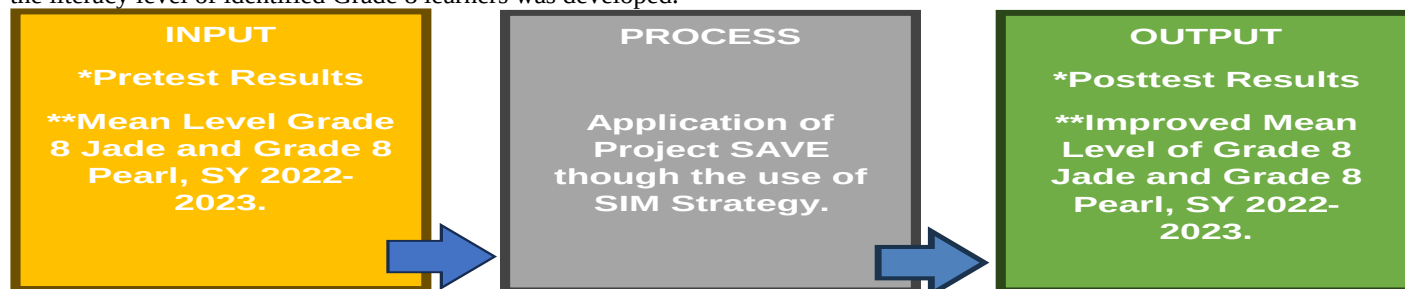


Figure 1. It shows the process of how the study was conducted. After the administration of pretest, Project SAVE through SIM was used. Post-test results showed that all learners got improved scores.

ACTION RESEARCH METHODS

a. Participants and/or other Sources of Data and Information

The participants of this study will include 2 groups of Grade 8 learners. They will be selected through purposive sampling which entails that the following criteria are met:

1. Grade 8 group of students with the least average in MPS in MELC number one which is "Determine the meaning of words and expressions that reflect the local culture by noting context clues."
2. Most members of the class are struggling reader based on Phil-Iri result S.Y 2022-2023

b. Data Gathering Methods

To describe the literacy progress of learners throughout the implementation of the suggested intervention material and strategy, data will be collected through a series of pen-and-paper and pre-tests and post-test about the target Most Essential Learning Competency.

DISCUSSION OF RESULTS AND REFLECTION

This chapter shows the presentation, analysis and interpretation of the data based of the research questions.

**Table 1: Level of the participants' performance in the pre-test.**

Score Range	PRETEST		Verbal interpretation
	f	Percentage	
41 - 50	0	0.00%	Excellent
31 - 40	14	16.87%	Very Satisfactory
21 - 30	34	40.96%	Satisfactory
11 - 20	29	34.94%	Fairly Satisfactory
0 - 10	6	7.23%	Poor
Total	83	100.00%	
Mean: 22.36		SD: 8.15	
Verbal Interpretation: Satisfactory			

Table 1 shows the literacy level of Grade 8 learners before the implementation of Project SAVE using Strategic Instructional Materials. And the result shows that the Mean is 22.36 percent and standard deviation is 8.15 percent which is interpreted as satisfactory performance of 83 Grade 8 learners. Moreover, none of the learners got excellent score, 14 very satisfactory score, 34 satisfactory, 29 fairly satisfactory and 6 garnered poor score.

Table 2 shows the literacy level of Grade 8 learners after the implementation of Project SAVE using Strategic Instructional Materials. And the result shows that the Mean is 37.43 percent and Standard Deviation is 6.92 percent which is interpreted as Very Satisfactory performance of 83 Grade 8 learners. Moreover, 34 learners garnered excellent score, 35 garnered very satisfactory score, 13 garnered satisfactory, 1 garnered fairly satisfactory score and 0 garnered poor score.

Table 2: Level of the participants' performance in the posttest.

Score Range	POSTTEST		Verbal interpretation
	f	Percentage	
41 - 50	34	40.96%	Excellent
31 - 40	35	42.17%	Very Satisfactory
21 - 30	13	15.66%	Satisfactory
11 - 20	1	1.20%	Fairly Satisfactory
0 - 10	0	0.00%	Poor
Total	83	100.00%	
Mean: 37.43		SD: 6.92	
Verbal Interpretation: Very Satisfactory			

Table 3: Significant Difference between the Pretest and Posttest of the Participants Before and After the Implementation of the Vocabulary Integration using Strategic Instructional Materials.

PRETEST	POSTTEST	df	Computed t-value	P-value	Interpretation
Mean	Mean				
22.36	37.43	82	63.3251	<0.00001	Significant
*p<0.05					

The result shows the significant difference between students'

Literacy level before and after the implementation of Project SAVE using SIM at $p < 0.05$. The students' performance garnered a mean of 22.36 before the implementation of Project SAVE using SIM which is lower than the mean of 37.43 with the aid of Project SAVE using SIM. There is a 15.07 increase in mean with the implementation of Project SAVE using SIM which proved that vocabulary integration improved the literacy level of learners. The computed t-value of 63.3251 exceeded the critical t-value of 2.00 at this level of significance using the degrees of freedom equal to 60.

From the findings, we can infer that at 0.05 level of significance, the null hypothesis "There is no significant difference between the literacy level of Grade 8 learners before and after the implementation of the Project SAVE using SIM" is rejected. Thus, the alternative should be accepted which incites that there is a **significant difference** between them.



RECOMMENDATIONS

The findings led to the following recommendations:

1. For other G 8 learners to have a better understanding of the topics, the researcher highly recommends to conduct vocabulary integration before discussion. It would be a big help for the retention of the topics among learners.
2. This printed instructional materials may be used in remedial classes, and different learning modalities.
3. This strategy may be adapted in different learning areas. It will be significant in the teaching and learning process if students can unlock difficulties or unfamiliar words before discussion.

REFLECTION

Action research provides the researcher the chance to apply what the researcher has learned the way she teaches. Additionally, action research allows her the ability to evaluate his own methods and learner's skills in order to determine what works and what doesn't. The researcher's knowledge and teaching and learning skills have improved through action research.

Both the process and the results of our own action research will teach us a lot. We can obtain a better understanding of our own teaching, the students' learning, and their confidence in our work by conducting our own action research.

ACTION PLAN

The result of this research will be disseminated and utilized following the activities below.

DISSEMINATION ACTIVITIES	July 2023	Aug. 2023	Sept. 2023	Oct. 2023	Nov. 2023
1. Reporting and Sharing the Result through LAC Session					
2. Rolling Out the Result to other Grade Levels or Section					
3. Publishing and continuous sharing with other educators.					

FINANCIAL REPORT

There was no financial statement since this is a "low-cost strategy". The printing of a few materials was shouldered by the researcher.

REFERENCES

1. Cronsberry, Jennifer (2004). *Word Walls: A support for Literary in Secondary School Classrooms*
2. Davis, F. B. (1944). *Fundamental factors of comprehension in reading*. *Psychometrika*, 9, 185– 197.
3. Davis, F. B. (1968). *Research in comprehension in reading*. *Psychometrika*, 9, 185–197.
4. Huang, H. C. (2014). *Online versus paper-based instruction: Comparing two strategy training modules for improving reading comprehension*. *RELC Journal*, 45(2), 165-180.
5. Inquirer. (2022, September 13). *Rays of Hope-Inquirer Opinion* Joshi, R. M. (2006). *Vocabulary: A critical component of comprehension*. *Reading and Writing Quarterly*, 21(3), 209-219. doi:10.1080/10573560590949278
6. Kamil, M. L., Borman, G. D., Dole, J., Kral, C. C., Salinger, T., & Torgesen, J. (2008). *Improving adolescent literacy: Effective classroom and intervention practices: A Practice Guide* (NCEE #2008-4027). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education
7. Kame'enui, E. J., & Baumann, J. F. (2012). *Vocabulary instruction: Research to practice* (2nd ed.). New York, NY: Guilford Press.
8. Kamil, M. L., Borman, G. D., Dole, J., Kral, C. C., Salinger, T., & Torgesen, J. (2008). *Improving adolescent literacy: Effective classroom and intervention practices: A Practice Guide* (NCEE #2008-4027). Washington, DC: National Center for Education Evaluation and Regional Assistance, Institute of Education Sciences, U.S. Department of Education.
9. Loftus, S. M., & Coyne, M. D. (2013). *Vocabulary instruction within a multi-tier approach*. *Reading & Writing: Overcoming Learning Difficulties*, 29(1), 4
10. Nash and Snowling (2006). *Vocabulary dimension A study of the efficacy of two forms of vocabulary intervention (definition method and the context method)*.
11. National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel: Reports of the subgroups*. Washington, DC: National Institute of Child Health and Human Development Clearinghouse.
12. National Institute of Child Health and Human Development [NICHD]. (2000). *Report of the National Reading Panel: Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* (NIH Publication No. 00-4754). Washington, DC: U.S. Government Printing Office.



13. Philstar. (2019, December 3). *Philippines Lowest in Reading Comprehension among 79 countries. UN Ranks Filipinos as most Literate in Southeast Asia.*
14. Whitehurst, G. J., & Fischel, J. E. (2000). *Reading and language impairments in conditions of poverty. Speech and language impairments in children: Causes, characteristics, intervention, and outcome*, 53-71.



STUDENT EXPRESSION DETECTION IN E-LEARNING PLATFORMS

**K. Sai Bhavya Sri¹, K. Sai Swetha², K. Bhavani³, M. Venkata Sahitya⁴,
Naga Babu Pachhala⁵**

^{1,2,3,4}Students, ⁵Assistant Professor

¹Department of Information Technology

¹Vasireddy Venkatadri Institute of Technology, Guntur, India.

Article DOI: <https://doi.org/10.36713/epra16128>

DOI No: 10.36713/epra16128

ABSTRACT

Our research suggests a deep learning method for determining how engaged students are with their online courses. Our method makes use of convolutional neural networks (CNNs) to interpret facial expressions that are recorded via webcams during online conversations. To provide the best possible model input, we preprocess face photos and select a varied dataset. The CNN architecture captures both spatial and temporal dependencies, enhancing engagement level detection accuracy. Our model performs well in classifying expressions that indicate curious, distracted, enthusiastic, observant, uninterested through training and validation. In conclusion, that the online learning experience may be enhanced by using deep learning algorithms for engagement detection, making it more advantageous and successful for students.

KEYWORDS – CNN, Webcams, Engagement level, Online learning, Deep Learning, Facial expressions

I. INTRODUCTION

The emergence of online education has completely changed how people can access educational possibilities, providing unprecedented flexibility and accessibility. Nonetheless, evaluating student participation is a significant difficulty for teachers in this digital age. Online classrooms don't have the same instant feedback systems as traditional classroom settings, which make it easier for teachers to assess student involvement and reactions.

Our study explores the field of deep learning to provide a novel way for gauging student participation in online courses in response to this difficulty. We want to use facial expression recognition to predict students' involvement levels during virtual learning sessions, taking use of the advances in deep learning, especially in computer vision.

In addition to addressing the pressing need for efficient engagement assessment in online courses, this research establishes the groundwork for the creation of intelligent systems capable of customizing instructional strategies in response to each student's unique reaction. Our goal is to build a dynamic and interactive learning environment that encourages active participation, collaboration, and knowledge retention by incorporating deep learning algorithms into the foundation of online education. This deep learning project emphasize the value of employing facial expression detection to evaluate students' degree of participation in online courses

II. OBJECTIVES

1. Create a deep learning technique to identify facial emotions in online courses by utilizing CNNs.
2. Select a varied collection of images and prepare them for the best possible model input.
3. Create a CNN architecture that can recognize the temporal and spatial relationships found in expressions.
4. To effectively distinguish different engagement levels, train and evaluate the model.
5. Assess how well the approach enhances the quality of online learning.
6. Examine possibilities for e-learning platform integration.
7. Adjust the model to make it more accurate and user-friendly.

III. LITERATURE SURVEY

[1] Student engagement is considered to be synonymous with educational quality and is positively correlated with a student's perseverance, satisfaction, learning efficiency, and degree completion.

[2] Kahu mentioned that student engagement is a reflection of a student's internal psychological state, which includes behavior,



cognition and emotion.

[3] The face is the most expressive and communicative part of a human being.

[4-5] A face alignment is performed, and the aligned image crops the face to obtain the entire face area as input. In the training process of the macro-expression detection model, an attention mechanism is added to allow the model to focus only on the facial regions that are helpful for the emotion classification results and enhance the generalization ability of the model.

[6] In Whitehill proposed an approach that recognizes engagement from student's facial expressions. The approach uses Gabor features and SVM algorithm to identify engagement as students interacted with cognitive skills training software. The authors obtained labels from videos annotated by human judges

[7] Then, the authors in used computer vision and machine learning techniques to identify the affect of students in a school computer laboratory, where the students were interacting with an educational game aimed to explain fundamental concepts of classical mechanics.

[8] Unauthorized Access: Using malware to gain access to data for a deep learning project without proper authorization is illegal and unethical. It violates the privacy rights of individuals and the terms of service of the online platform.

[9] In the authors proposed a system that identifies and monitors student's emotion and gives feedback in real-time in order to improve the e-learning environment for a greater content delivery. The system uses moving pattern of eyes and head to deduce relevant information to understand students' mood in an e-learning environment

[10] developed a Facial Emotion Recognition System (FERS), which recognizes the emotional states and motivation of students in videoconference type e-learning. The system uses 4 machine learning algorithms (SVM, KNN, Random Forest and Classification & Regression Trees).

[11] A Convolutional Neural Network (CNN) is a deep artificial neural network that can identify visual patterns from input image with minimal pre-processing compared to other image classification algorithms. This means that the network learns the filters that in traditional algorithms were hand-engineered.

[12] Pooling Layer reduces the dimensionality of each feature map but retains the most important information.

IV. METHODOLOGY

During this project work the approach followed can be described in the following steps. They are

1. Data Collection
2. Data Preprocessing
3. Model Selection
4. Model Training and evaluation

Data Collection

For the data collection process, the dataset is collected from the Kaggle, the dataset is FER (Facial Expression Recognition). The data consists of 48x48 pixel grayscale images of faces. From this data we have collected the appropriated that needed for our project and placed under 7 labels named as Apprehensive, Curious, Distracted, Enthusiastic, Irritated, Observant,



Fig.1: Labels

Data Preprocessing

In deep learning projects, data preparation is an essential phase that entails getting the raw data ready for model training. It includes a range of procedures and methods designed to enhance the efficiency and efficacy of the learning algorithms by cleansing, converting, and organizing the data.

In this project the crucial data processing steps are

Resizing: Resizing is a popular preprocessing method utilized in many deep learning tasks, especially in computer vision applications. Before supplying photos to the model for training or inference, resizing entails adjusting their dimensions to a uniform size. The resizing helps in the standardization of the input and reduce overfitting.

Grayscale Conversion of images: Grayscale color photos are converted, which lowers the dimensionality of the data and makes processing easier. Only intensity information is present in grayscale photos, which can be sufficient for some tasks and reduce computer complexity.



Model Selection

The model or algorithm used in this project is Convolution Neural Networks (CNNs) which is well known for the processing of the images. As the project mostly relies on the image processing to identify the engagement level of the student, CNN algorithm is taken to train the data samples.

Algorithm

Start:

Import necessary libraries

Initialize Model:

Create a Sequential model.

Add Convolutional Layers:

Create a Sequential model

Add a Conv2D layer:

- Filters: 16
- Kernel size: (3, 3)
- Activation: ReLU
- Strides: (1, 1)
- Input shape: (48, 48, 1)

Add a MaxPooling2D layer (default parameters)

Add a Conv2D layer:

- Filters: 32
- Kernel size: (3, 3)
- Activation: ReLU
- Strides: (1, 1)

Add a MaxPooling2D layer (default parameters)

Add a Conv2D layer:

- Filters: 16
- Kernel size: (3, 3)
- Activation: ReLU
- Strides: (1, 1)

Add a MaxPooling2D layer (default parameters)

Flatten the output

Add a Dense layer with 256 units and ReLU activation

Add a Dense output layer with 7 units and softmax activation

Compile the model:

- Optimizer: Adam
- Loss: Sparse categorical cross-entropy
- Metrics: Accuracy

Train the model on the training dataset

Evaluate the model on the test dataset

Display the test accuracy

Pooling Layers: Convolutional layers are usually followed by pooling layers in order to minimize the spatial dimensions of the feature maps without sacrificing the most crucial information. The pooling operation performed is max pooling, which reduces the feature map.

Activation Function: The CNN model gains non-linearity from activation functions, which helps it recognize intricate patterns and correlations in the data. The activation function used is ReLU (Rectified Linear Unit).

Flattening layer: Feature maps are flattened into a one-dimensional vector before being passed from the convolutional layers to the fully connected layers.

Fully Connected Layers: Dense layer serves as the final part of the network where the learned features are reflected as predictions or decisions.

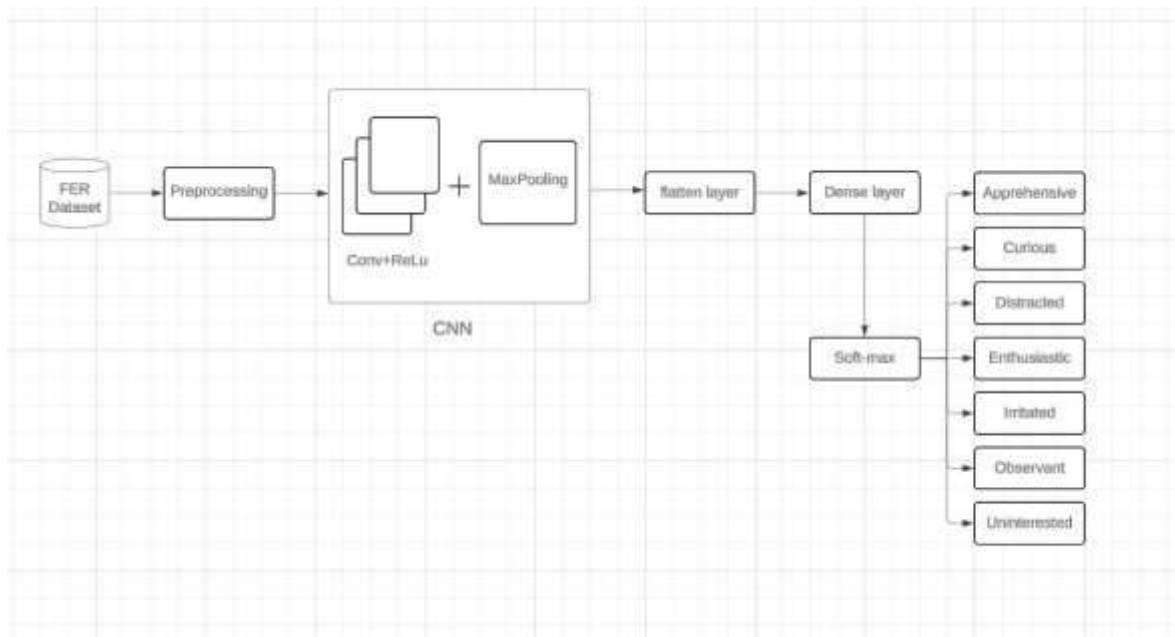


Fig.2: System Architecture

V. RESULTS

And our output screens are as follows:

1. Login for Student and Faculty



Fig.3: Home Page



Fig.4: Login Page

2. Select whether to detect Single Image or Live Detection(using webcam or system camera)

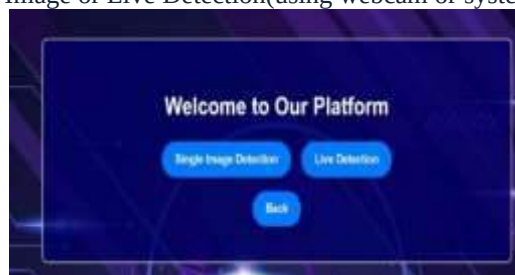
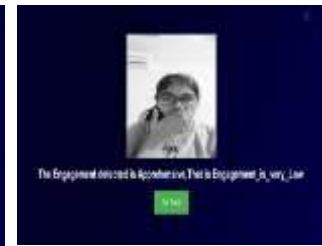


Fig.5: Selection

- **Expression Detection of Static Image**

**Fig.6: Distracted****Fig.7: Enthusiastic****Fig.8: Observant****Fig.9: Apprehensive**

The figures 6,7,8,9 represents the expressions of the Static images.

- **Expression Detection using Live-Cam:**

**Fig.10: Curious****Fig.11: Irritated****Fig.12: Enthusiastic**

- **Faculty dashboard:**

The faculty dashboard gives teachers a thorough picture of how well their online students are performing and how engaged they are. It provides several features to help with efficient instruction and progress tracking for students. The following are some salient characteristics Engagement metrics, Tracking of student's performance. All things considered, the faculty dashboard is a useful tool that helps teachers oversee their online courses, keep tabs on their students' progress, and offer tailored assistance to improve the learning process.

**Fig.13: Faculty Dashboard**

VI. CONCLUSION

In brief, our CNN system employs facial feature analysis to measure student involvement, delivering real-time information classified into output labels such as apprehensive, curious, irritated, uninterested, observant, enthusiastic, and distracted Teachers can maximize student involvement by dynamically adapting their teaching tactics by collecting tiny details. With the help of this cutting-edge strategy, teachers may design meaningful learning experiences that are individualized for each student, completely changing the dynamics of the classroom and improving student results. Our research seeks to rethink conventional educational paradigms for the contemporary period by fusing cutting-edge technology and pedagogical skills.

VII. FUTURE SCOPE

Feedback systems: Self-directed learning and metacognitive awareness may be encouraged by putting in place feedback systems that let students evaluate their degrees of engagement and get tailored advice on how to become more attentive.

Parental Involvement: Using family engagement programs or parent-teacher communication platforms, parents can participate in the tracking and analysis of student engagement data, which can encourage teamwork to promote learning at home and in the classroom.



Multimodal Analysis: Investigating the incorporation of extra data modalities, including textual or audio inputs, in addition to face features may offer a more thorough comprehension of student participation and improve prediction accuracy.

VIII. GRAPHS

The model's performance is monitored by the accuracy graph, and training convergence is shown by the loss graph. The precision graph illustrates how well the model can recognize pertinent instances. Faculty can improve student learning experiences by optimizing engagement prediction models through the analysis of these graphs.

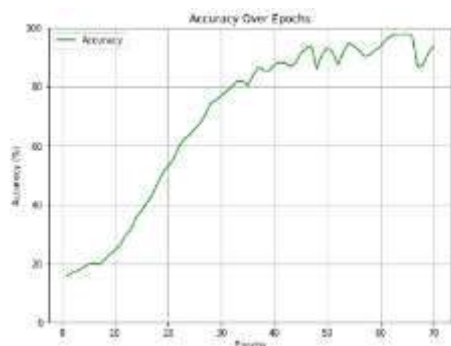


Fig.14: Accuracy

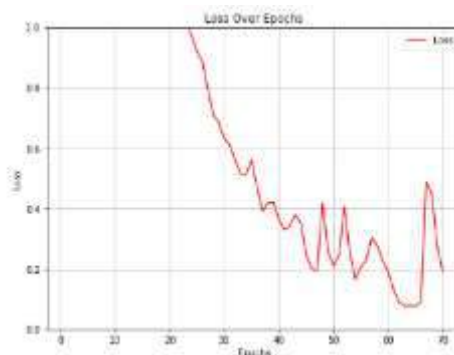


Fig.15: Loss

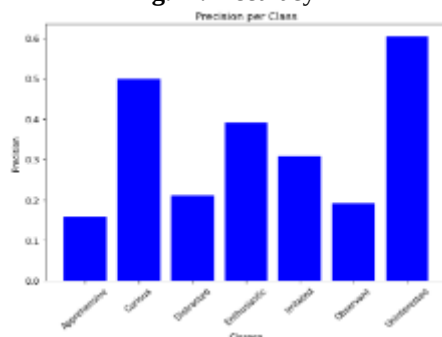


Fig.16: Precision

Model: "sequential_1"		
Layer (Type)	Output Shape	Param #
conv2d_3 (Conv2D)	(none, 48, 48, 16)	144
max_pooling2d_5 (MaxPooling2D)	(none, 24, 24, 16)	0
conv2d_4 (Conv2D)	(none, 32, 32, 32)	4608
max_pooling2d_6 (MaxPooling2D)	(none, 16, 16, 32)	0
conv2d_5 (Conv2D)	(none, 8, 8, 16)	4608
max_pooling2d_7 (MaxPooling2D)	(none, 4, 4, 16)	0
flatten_1 (Flatten)	(none, 256)	0
dense_3 (Dense)	(none, 256)	65792
dense_4 (Dense)	(none, 7)	1799
Total params: 77,815		
Trainable params: 77,815		
Non-trainable params: 0		

Fig.17: Model Summary

IX. REFERENCES

1. G. D. Kuh, "What student affairs professionals need to know about student engagement," *Journal of College Student Development*, vol. 50, no. 6, pp. 683-706, 2009.
2. E. R. Kahu, "Framing student engagement in higher education," *Studies in Higher Education*, vol. 38, no. 5, pp. 758-773, 2013.
3. R. G. Harper, A. N. Wiens, and J. D. Matarazzo, *Nonverbal communication: the state of the art*. New York: Wiley, 1978.
4. P.-Y. Yang, S.-Y. Jhong, and C.-H. Hsia, "Green coffee beans classification using attention-based features and knowledge transfer," *IEEE Int. Conference on Consumer Electronics- Taiwan*, pp. 1-2, 2021.
5. P. Wang, H.-W. Tseng, T.-C. Chen, and C.-H. Hsia, "Deep convolutional neural network for coffee bean inspection," *Sensors and Materials*, vol. 33, no. 7(1), pp. 2299-2310, 2021.
6. J. Whitehill, Z. Serpell, Y.-C. Lin, A. Foster, and J. R. Movellan, "The Faces of Engagement: Automatic Recognition of Student Engagement from Facial Expressions," *IEEE Transactions on Affective Computing*, vol. 5, no 1, p. 86-98, janv. 2014.
7. N. Bosch, S. D'Mello, R. Baker, J. Ocumpaugh, V. Shute, M. Ventura, L. Wang and W. Zhao, "Automatic Detection of Learning-Centered Affective States in the Wild," in *Proceedings of the 20th International Conference on Intelligent User Interfaces - IUI '15*, Atlanta, Georgia, USA, 2015, p. 379-388.
8. Pachhala, N, Jothilakshmi, S & Battula, BP 2021, 'A Comprehensive Survey on Identification of Malware Types and Malware Classification Using Machine Learning Techniques,' *Proceedings of 2021 2nd International Conference on Smart Electronics and Communication (ICOSEC)*, Trichy, India, pp. 1207-1214, doi: 10.1109/ICOSEC51865.2021.9591763.
9. Krithika L.B and Lakshmi Priya GG, "Student Emotion Recognition System (SERS) for e-learning Improvement Based on Learner Concentration Metric," *Procedia Computer Science*, vol. 85, p. 767-776, 2016.
10. U. Ayvaz, H. Gürüler, and M. O. Devrim, "USE OF FACIAL EMOTION RECOGNITION IN E-LEARNING SYSTEMS," *Information Technologies and Learning Tools*, vol. 60, no 4, p. 95, sept. 2017.
11. onlinecourse.com/tutorial/machine-learning/convolution-neural-network. Accessed 20 June 2019.
12. ujjwalkarn.me/2016/08/11/intuitive-explanation-convnets/. Accessed 05 July 2019



A DESCRIPTIVE STUDY TO ASSESS THE LEVEL OF KNOWLEDGE REGARDING PREVALENCE OF WARNING SIGNS OF ALZHEIMER DISEASE AMONG ELDERLY PEOPLE AT SELECTED NIRASHRIT VRIDH AASHRAY GRIH, JABALPUR

Mithun Kumar Kurmi¹

¹Nursing Tutor, Community Health Nursing Department, Govt. Nursing College SSMC, Rewa (M.P)

ABSTRACT

A descriptive study was conducted on 30 elderly people selected by convenience sampling to assess their knowledge about warning sign of Alzheimer disease (AD) at Nirashrit Vridh Aashray Grih, Jabalpur. Over all knowledge score shows that 15 elderly peoples (50%) scored between 13-18 revealed poor knowledge towards warning sign of AD. Three elderly people scored 19-24% shows good knowledge whereas 11 elderly people scored between 13-18% shows average knowledge. Only 1 elderly people scored between 0-6% shows very poor knowledge. Here it can be interpreted that highest percentage 50% of elderly people had poor knowledge regarding warning signs of AD. Percentage wise distribution of elderly people according to their age group shows that majority (43.33%) of the elderly peoples was in the age group of above 70 years of age. Percentage wise distribution of elderly people according to their gender reveals that most (67.67%) of the elderly people were females. Percentage wise distribution of elderly people according to their education status depicts that highest percentage (33.33%) of them was in the higher secondary school education. Fifty percentage of elderly people had family history of Alzheimer diseases & the remaining 50% of them were in the group of no family history of Alzheimer disease. Percentage wise distribution of elderly peoples to having a previous information on Alzheimer disease (53.33%) was exposed. Percentage wise distribution of elderly people according to their source of information reveals that majority (63.33%) of them had knowledge from health personnel's.

KEYWORDS: Descriptive study, Elderly people, Knowledge assessment, Warning signs, Alzheimer's disease (AD), Convenience sampling, Demographic distribution, Information sources

INTRODUCTION

Memory is an integral part of our identity, encapsulating our experiences, emotions, and connections. As Kevin Arnold poignantly states, memories are cherished, forming the essence of who we are. However, the aging process often brings challenges, particularly with conditions like Alzheimer's disease, which erode these cherished memories and cognitive abilities. In today's technological era, where advancements have been exponential, diseases associated with old age, such as Alzheimer's, have seen a corresponding increase.

Alzheimer's disease stands as a formidable adversary in the realm of modern healthcare, exacting a heavy toll on both patients and their families. This neurodegenerative condition progressively diminishes cognitive functions, leading to memory loss, language impairment, and behavioral changes. While age is the primary risk factor, environmental, dietary, and inflammatory factors also influence its progression. Understanding the complex interplay of genetic, neurological, and environmental factors is crucial in tackling this debilitating disease.

Distinguishing Alzheimer's disease from other forms of dementia is essential for effective diagnosis and treatment. While Alzheimer's is the most prevalent form of dementia, its symptoms, including memory loss, disorientation, and mood swings, can overlap with other conditions. Delving deeper into its pathophysiology reveals intricate neurological changes, including the accumulation of beta-amyloid proteins, leading to nerve cell death. Despite its prevalence and devastating impact, Alzheimer's is not an inevitable consequence of aging, underscoring the urgency for comprehensive research and intervention strategies.

The global burden of Alzheimer's disease is staggering, with projections indicating a significant rise in cases worldwide. India, in particular, faces a looming crisis, with a rapidly aging population and a surge in dementia cases anticipated. Initiatives such as those led by the Alzheimer's and Related Disorders Society of India (ARDSI) aim to raise awareness and advocate for better care and support systems. However, widespread misconceptions and stigma persist, hindering progress in addressing this public health challenge.



Efforts to combat Alzheimer's disease must encompass early detection, comprehensive care, and support for affected individuals and their caregivers. With the prevalence of dementia expected to escalate in the coming decades, concerted action is imperative to alleviate the socioeconomic burden and ensure dignified and compassionate care for those impacted by this relentless disease. Through collaborative research, education, and advocacy, society can strive towards a future where Alzheimer's disease no longer robs individuals of their memories, identities, and dignity.

OBJECTIVE

- ❖ To Assess the level of knowledge regarding prevalence of warning signs of Alzheimer disease among elderly people.
- ❖ To Compare the knowledge of old age people regarding AD with their selected demographic variables.
- ❖ To Find the association between the level of knowledge on the prevalence of warning signs with AD selected demographic variables.

RESEARCH HYPOTHESIS

H1:- There will be significantly low level of knowledge regarding prevalence of warning signs of Alzheimer disease among elderly people at selected Nirashrit Vridh Aashray Grih, Jabalpur.

H2 :- There will be significant association between selected socio-demographic variable and level of knowledge regarding prevalence of warning signs of Alzheimer disease among elderly people at selected Nirashrit Vridh Aashray Grih, Jabalpur.

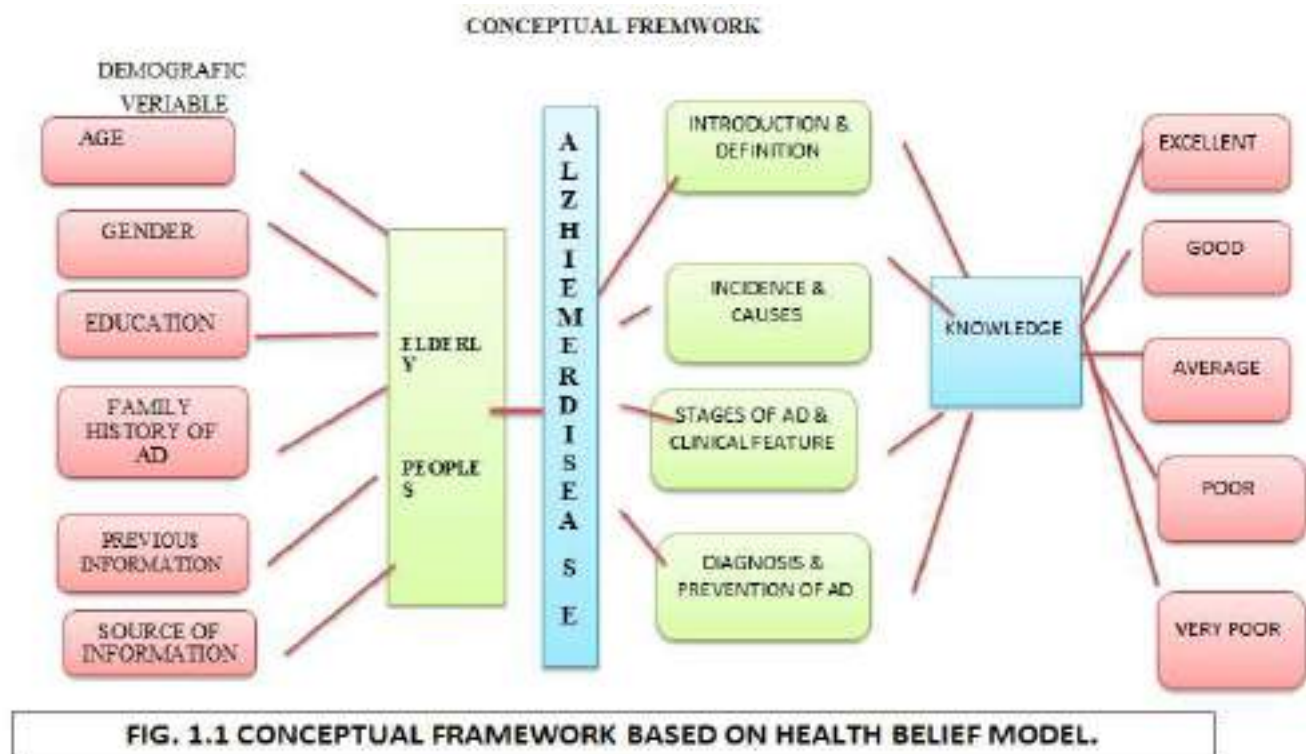
LIMITATION

- The study was limited to the particular old age home the generation can be made to a large population.
- The study was limited only to the elderly peoples in selected old age home at Jabalpur.
- The study was limited to only knowledge aspect, the study could be conducted to evaluate the attitude & practice aspect.

DELIMITATION

The study will be limited to the elderly people who are-

- Between the age group of above 60 years with both male and female.
- Residing in Nirashrit Vridh Aashray Grih, Jabalpur.
- Present during the period of Data Collection.
- Willing to participate study.
- Able to understand Hindi.





In this study the review of literature is classified under four category i.e.

1. Studies early warning sign of Alzheimer's disease.
2. Studies on risk factor of Alzheimer disease.
3. Studies on home care management of Alzheimer's disease.
4. Studies on adults knowledge on Alzheimer's disease.

METHODOLOGY

The methodology of research indicates the general of organizing the procedure of gathering the data for the purpose of investigation.

The methodology of the study include research design research approach sampling technique, development of the tool, data collection procedure and method of analysis based on the statement and the study.

Research methodology is away to systematically solve the research problem. It involves systematic procedure by which the researcher starts from initial identification of research problem to its final conclusion.

The methodology of research refers to controlled investigation of the way of obtaining, organizing, and analyzing data. Methodological studies address the development, validation, and evaluation of research tools or techniques.(politand Hunger, 1999)

The methodology of research indicates the general patterns of organizing the procedure of tethering valid and reliable data for the purpose of investigation. (Kothari 2004).

The methodology of this study include research design research approach sampling technique, development of tools, data collection procedure and method of analysis based on the statement and objective of study.

The objective of the methodology section is to promulgate to reader what the researcher did, to solve the research problem or to report the research question. The section deals with the major methodological decision and often affects rationales for these sections.

RESEARCH DESIGN & APPROACH

The research design is the plan, structure, & strategy of investigation of answering the research question is the overall plan or blueprint the researchers select to carry out their study.

Research design is a plan for the research study providing the overall frame work for the data collection. **Polit and hungler (1999)** State that research design incorporates he most important methodological decision that a researcher makes in conducting a research study.

The research design used for this study is simple descriptive research design.

Research design is a systematic enquire that uses disciplined method to answering the research question or solve problem (Polit&Beck,2004).

Research approach indicates the basic procedure for conducting the research study. Research approach mainly depends on the existing problem, the objective framed for the study, the method of collecting data & its analysis.

non-experimental research design/descriptive research design was selection as a research design & approach for study.



THE SCHEMATIC REPRESENTATION OF THE STUDY DESIGN SHOWS THE
STUDY CONDUCTED IN FLOW CHART|

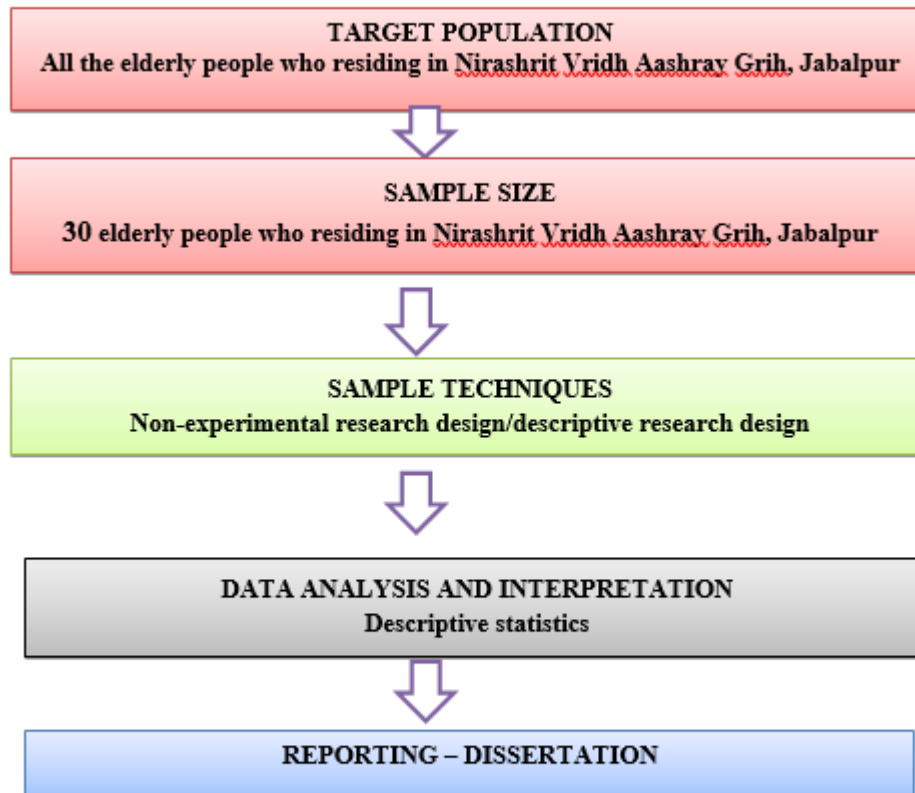


Figure 2:- Schematic Representation of Research Process

SETTING OF THE STUDY

The physical location in which data collection takes place in the study is known as setting. The study was conducted in Nirashrit Vridh Aashray Grih, Jabalpur.

POPULATION

The term population includes all the person, events and object under the study.

(Kulkarni A.P, 2003)

Polit & hungler (1999) define a population as the totality of all subjects that confirm to a set of specification, comprising and the entire group of persons that is of interest to the researcher and to whom the research results can be generalized.

The population for the present study was the all elderly people in Nirashrit Vridh Aashray Grih, Jabalpur.

SAMPLEANDSAMPLETECHNIQUE

SAMPLE

The sample including selecting group of people event behavior or other element with which to conduct study.

(Kulkarni A. P, 2003)

Lobiodo-wood and Haber (1998) describe a sample as a portion or a subset of the research population selected to participate in a study, representing the research population.

The sample of the present study was all the elderly people in Nirashrit Vridh Aashray Grih, Sastri Nagar Jabalpur.



Sample size

Sample size 30 elderly people who residing in Nirashrit Vridh Aashray Grih, Jabalpur.

SAMPLE TECHNIQUE

The sample technique for the present study is convenience sampling technique.

Sampling Technique is a taking sample from the entire population representing the whole participates in the study.

Convenience Sampling

Convenience sampling is also referred to as accidental or incidental & involves choosing readily available people or objects for a study.

Criteria for Selecting the Sample

- **Inclusion Criteria**

The age group above 60 year who will be-

Residing in Nirashrit Vridh Aashray Grih, Sastri Nagar Jabalpur.

- Available during the data collection.

- Willing to participate of the study.

Method of Data Collection

The data collection method was face to face interview with notes taking by one of the researchers. Face to face interview was used because personal experience and testimonies gives the researcher more and detailed information. (Polkinghorne2005),

Development of the tool: Multiple choice questionnaires are prepared to assess the knowledge of elderly peoples regarding prevalence of warning sign of Alzheimer Disease.

The tools consist of two section that are section-A and section -B.

SECTION – A

It consist of demographic characteristics of elderly people such as age, sex, education, income, residence, source of information regarding prevalence of warning sign of Alzheimer disease.

SECTION- B

It consists of knowledge item regarding prevalence of warning sign of Alzheimer disease among elderly peoples.

Validity is a criterion for evaluating the quality of measure or an instrument. A measure is valid if it accurately measures what it is supposed to measure. Content validity refers to the extent to which an instrument adequately encompasses the pertinent range of subject matter.

The prepared data collection tool along with statement of the problem, objectives, operational definitions, blue print, and criteria rating scale designed for validation were submitted to experts for content validity. They all are belonging to Mental Health nursing. The experts were requested to judge the items for relevance, clarity, appropriateness of the title, and content area against the criterion rating scale, which had column for 'agree,' 'disagree,' and 'remarks.' The tool was modified as per the recommendations of the experts. The items were developed in Hindi.

ETHICAL CONSIDERATION

The researcher had taken permission from the obtained from Supervisor of Nirashrit Vridh Aashray Grih, Jabalpur. Consent was taken from the elderly people before data collection.

RELIABILITY OF THE TOOL

There liability of an instrument is the degree of consistency with which it measures an attribute it is supposed to be measuring.

Reliability of a research instrument is the extent to which the instrument yields the same results or repeated measures.

The tool was administered to five elderly people other than the main study sample to establish the reliability. The internal consistency was computed using Karl Pearson's Correlation Coefficient formula and with split half technique.

$$R = 2r \div 1(n-1)$$



R: Reliability coefficient of whole test

R: Reliability coefficient of correlation of half test

A value of 0.83 for structured knowledge questionnaire was obtained. Hence, the tool was considered to be moderately reliable. After validation, tool modified according to suggestion of Expert's & prepared the final tool.

PILOTSTUDY

A pilot study is a small scale version or trial run, done in preparation for a major study.

The main objective of the pilot study was to assess the feasibility, practicability, and adequacy of measurement. The purpose of the study was explained to them prior to the test and an informed consent was obtained to get their cooperation and prompt answers. Pilot study was conducted in a similar way as the final data collection.

Pre-testing is the process of measuring the effectiveness of an instrument. The purpose is to verify the clarity and adequacy of the items. The purpose of the pre-test is to reveal problems relating to answering, completing, and to point out weakness if any in the administration and distribution of the instrument.

The pilot study was conducted in Nirashrit Vridh Aashray Grih, Jabalpur from 28/09/2013 to 06/10/2013 the investigator obtained permission from the of Secretary officer in Nirashrit Vridh Aashray Grih, Jabalpur prior to the study. The data was collected from five elderly people. The respondents were assured of the confidentiality of their identity and responses. And assessed the reliability of tool by using split half method & by using Karl Pearson's correlation, tool was found to be reliable.

The tool was pre-tested by administering to five elderly people in Nirashrit Vridh Aashray Grih, Jabalpur who met the criteria, elderly people of Nirashrit Vridh Aashray Grih. The responses by the sample revealed the clarity and appropriateness of the items in the tool. The time taken to complete the tool was 30 minutes. No modification was made.

Data collection procedure

Prior collection of data, permission was obtained from Supervisor of Nirashrit Vridh Aashray Grih, Jabalpur. The investigator was personally & explains the need & importance of study to the elderly peoples. Data were collected by distributing questionnaire convenience technique.

PLANNED DATA ANALYSIS

The data was analyzed by descriptive & inferential Statistics. The collected data was organized tabulated and analyzed by using descriptive statistic i.e. percentage and mean. The data was presented in the tables & figures.

ANALYSIS & INTERPRETATION OF DATA

Analysis & interpretation of data are based on objectives of the study. The data are presented under following section:

Section 1- Percentage wise distribution of elderly people according to their demographic variables.

Section 2- Level of knowledge of elderly people regarding warning sign of AD.

Section 3- Comparison of knowledge of elderly people regarding warning sign of AD with their demographic variables.

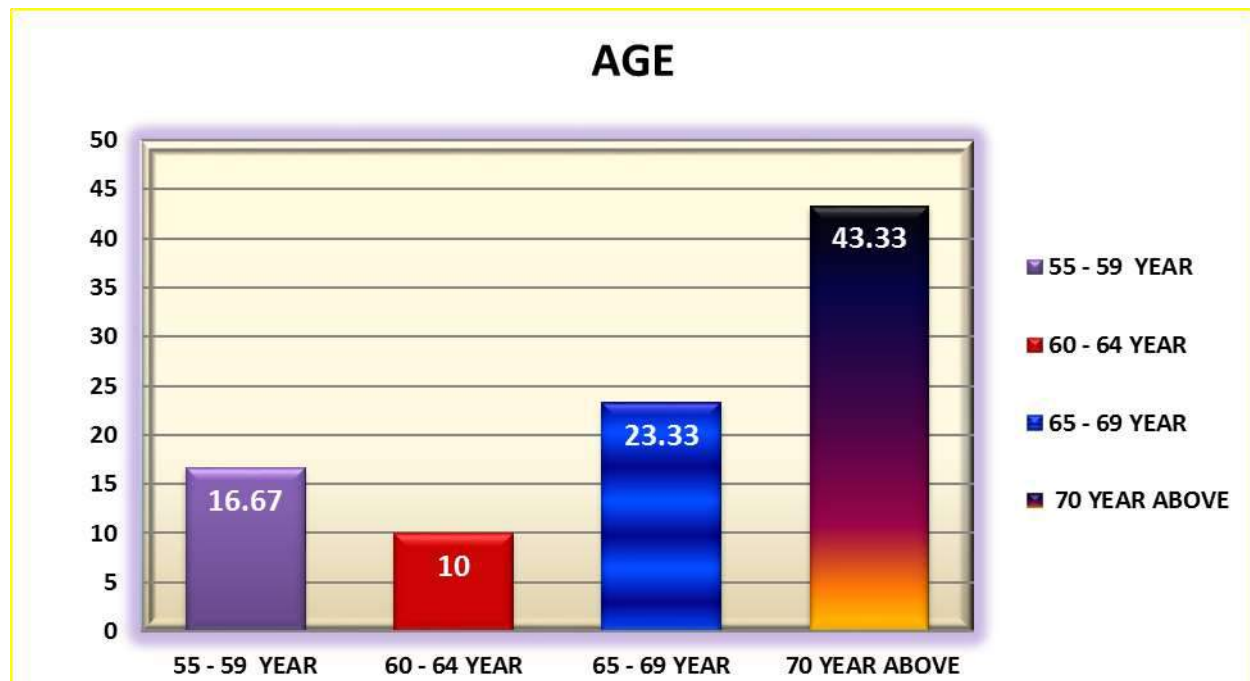


Figure 3: Percentage wise distribution of elderly people according to their age group shows that majority (43.33%) of elderly people were in the group of above 70 years of age & 23.33% of them were in the group of 60 to 64 years & 16.67% of them were in the group of 55 to 59 years. It might be due to the average age group of above 70 years of age

Section 2- Level of Knowledge of elderly people regarding warning sign of AD

TableNo:1 Showing Level of knowledge regarding warning sign of AD

Table No.1: Showing Level of Knowledge Regarding warning sign of AID				
S.NO.	LEVEL OF KNOWLEDGE		NO.	PERCENTAGE
1.	Very poor	(0-6%)	1	3.33
2.	Poor	(7-12%)	15	50.00
3.	Average	(13-18%)	11	36.67
4.	Good	(19-24%)	3	10
5.	Excellent	(25-30%)	0	0
	TOTAL		30	100

Overall knowledge score shows that 15 elderly people 50% scored between 13-18% which shows poor knowledge towards sign of AD. Whereas, 3 elderly people score 19-24% shows good knowledge. And 11 elderly people scored between 13-18% which shows average knowledge. Only 1 elderly person scored between 0-6% shows very poor knowledge.

Here it can be interpreted that highest percentage 50% of elderly people had poor knowledge regarding warning sign of AD. Hence Hypothesis **H1 is accepted**.

Section 3 - Comparison of knowledge of elderly people regarding warning sign of AD with their demographic variables

Gender wise distribution of elderly people related to their knowledge score regarding warning sign of AD.

S.NO.	GENDER	NO OF RESPONDENT	MEAN	SD	MEAN%
1.	Male	11	12.09	2.98	42.95%
2.	Female	19	13.85	4.52	46.08%
	Overall	30	25.93	7.5	89.03

Gender wise distribution of mean, SD and mean% of knowledge score of elderly people that the highest mean score (13.85+4.52) which is 46.08% of total score was obtained by the elders from female & lowest mean score (12.09+2.98) which is 42.95% of total score was obtained by the elderly from males. Hence it can be interpreted that female people having more knowledge **Table 2**



DISCUSSION

A descriptive design with cross sectional survey conducted to “assess the level of knowledge & warning sign of AD among elderly peoples age group above 55 years “on the 20/03/2014 to 05/04/2014. This was analysis & the findings were presented in the form of tables & grapes in chapter-IV. This chapter attempts to discuss to finding the present study as per the objectives.

The findings are discussed under the following heading:

- Demographic characteristics of the sample.
- Comparison of the score of elderly with demographic variables.

Demographic Characteristics of the sample

According to their age group shows that majority (43.33%) of the elderly people was in the age group of above 70 years & 16.67% of them were in the age group of 55 to 59 years. Finding were contradictory to the present study, who reported that 30% of the old age people were in the age group of 65-69 years.

Majorities (66.67%) of the elderly peoples were females & (33.33%) were males. This was entirely findings that males were 62% and females were 38%.

Highest percentage (33.33%) of them was in the higher secondary school education. The lowest percentage (16.67%) was illiterate. According to their family history (50.00%) of them in the family history of Alzheimer disease & the remaining 50.00% of them in the no family history of Alzheimer disease, regarding previous information on Alzheimer disease, highest percentage (53.33%) was exposed & 46.67% of them were not exposed.

Majority (63.33%), of them got knowledge from health personnel's, whereas lowest 3.33% got knowledge from friends.

Comparison of the score of elderly with demographic variables Age wise distribution mean, SD and mean percentage of knowledge score of elderly peoples with regards to age shows that the higher mean scores (14.87+ 3.40) which is 49.51% of the total scores was obtained by the elder people in the age group of above 70 years . The lower mean score (9.67+ 4.32) which is 22.31% of the total score was for the elderly people in the age group of 65- 69 year. Whereas the middle score obtained was (14+ 3.74) which is 46.67% & (10+ 1) which is 33.3% . It is revealed that the highest percentage of score obtained by the age group of above 70 years Table 3.1.

Gender wise distribution of mean , SD and mean % of knowledge score of elderly peoples that the highest mean score (13.+ 4.52) which is 46.08 % of total score was obtained by the elders from female & lowest mean score (12.09+ 2.98) which is 42.95% of total score was obtained by the elders from males. Hence it can be interpreted that female people having more knowledge Table 3.2. Education wise distribution of mean SD & of knowledge scores of the elderly peoples with regard to education shoes that the highest mean score (16.2+ 2.740) which is 53.94% was obtained by them who were studied higher education .Then the score (12.37+ 4.596) obtained by those who studied secondary classes and that was 41.19% . Then score (11.75+ 3.651) obtained by those who were studied primary classes that was 39.12%. The lowest mean score (10.25+ 1.258) which is 34.13% was obtained by who were illiterate .It is revealed that highest percentage was of elderly peoples were studied higher secondary class Table 3.3.

Family history of AD wise distributed of mean, SD & mean % of knowledge score of elderly peoples shows that the highest mean score (13.46+ 3.96) which is 44.82% of total score was obtained by the elderly peoples from having a no family history of AD and lowest mean score (12.94+ 4.28) which is 43.09 of total score was obtained by the elderly people from having a family history of AD. Hence it can be interpreted that highest percentage of no family history of AD .

Previous information of AD wise distribution of mean, SD & mean% of knowledge score of elderly people shoes that the highest mean score (14.21+ 3.59) which is 47.31% of total score was obtained by the elderly peoples from having a no previous information of AD and lowest mean score (12.31+ 4.34) which is 40.99% of total score was obtained by the elderly people having a previous information of AD. Hence it can be interpreted that highest percentage of no previous information of AD.

Distributed of mean, SD & mean % of elderly people knowledge score according to their source of information related to warning sign of AD that highest mean score was (14.26+ 4.29) which is 47.48% of total score was obtained by the elders who had received information from health personnel's & lowest mean score was (11+ 0.81) which is 36.63% of total score was obtained information from family members. The middle mean score (13.5+ 3.65) which is 43.29% of total score was obtained information from friends then the mean score was (11+ 3.46) which is 36.63% of total score was obtained information from mass media or T.V. Hence it can be interpreted that the highest percentage 47.48% elderly peoples got information from health personnels.



SUMMARY

A description survey was done to assess the knowledge on warning sign of AD among elderly peoples age group above 55 years in Nirashrit Vridh Aashray Grih, Jabalpur & the obtained data has analyzed by using descriptive & inferential statics presented in chapter IV.

Based on the finding of the study it can be summarized that: *Highest percentage (43.33%) of the mother was in the age group of above 70 years.

- Highest percentage (66.67%) of the female's elders.
- Highest percentage of 33.33% of them had studied of high secondary school.
- Majority (50%) of the elderly peoples were from no having a family history of AD.
- Majority (53.33%) of the elderly peoples were from having previous information about AD.
- Most (63.33%) of them received information health personnel's.

CONCLUSION

From the finding of the present study it can be concluded that highest percentage of elderly people were above 70 years & above had secondary majority of them were belong to old age home in Nirashrit Vridh Aashray Grih, Jabalpur.

Most of elder received information from health personnel's & most them had studied of high secondary school.

Overall mean, SD & mean % revealed that elderly peoples having poor knowledge of AD.

RECOMMENDATION

Keeping in view finding in the present study the following recommendation were made since the study was carried out in a small sample. The result can be used only as a guide of for further studies.

- The study can be repeated by taking a large sample in other part of the country.
- A similar study can be conducted on assessment of knowledge regarding AD among high risk population for primary prevention.
- An experimental study can be carried out to find out the effectiveness of the style practice on prevention of AD.

LIMITATION

- The study was limited to the particular old age home the generation can be made to a large population.
- The study was limited only to the elderly peoples in selected old age home at Jabalpur.
- The study was limited to only knowledge aspect, the study could be conducted to evaluate the attitude & practice aspect.

IMPLICATION

After analyzing the gathered information, the researcher came to know that there was inadequate knowledge regarding Alzheimer's disease and STP had a significant role in improving the knowledge, the finding of the study have implication or nursing education nursing, nursing research & nursing practice.

NURSING EDUCATION

1. The study proved that the regarding Alzheimer disease is effective in gaining the knowledge, so this will enhance the students to import the knowledge of risk factors, sign & symptom & preventive strategies of the disease.
2. The study will be helpful for the students to realize their role in primary prevention of the Alzheimer disease among high risk population.
3. During basic nursing education course, students may give clinical sentiments on Alzheimer disease.
4. The health care providers are the key personnel in improving education to the client there is a need for in service education programme for health care providers for preparing then to function effectively as a counsellor for Client.

NURSING PRACTISE

Along with the changing scenario of health care delivery system the emphasis is shifted from care oriented approach regarding Alzheimer disease. This study stresses that there is a need of involvement of nursing staff in planning and conducting education programmes and also there is need of students nurses to involve in the education programs.

1. The studies reveal that there is a need of educational programme on Alzheimer disease among elderly patients.
2. Also reveal there is need of nurse to involve in the education programme on Alzheimer disease elderly patients.
3. Nurses working in hospital setting will be able to find out the high risk population and provide comprehensive health education about the disease.



4. Good education with appropriate approaches will help the risk personnel to attempt for lifestyle changes and prevention of Alzheimer's disease.

NURSING RESEARCH

In India few very studies are conducted among elderly peoples regarding knowledge on Alzheimer disease.

1. Studies revealed that Alzheimer disease is more prevalent in elderly people.
2. The present study reveals that there is a lack of adequate knowledge Alzheimer disease elderly peoples.
3. This study enlightens that there is a need for educational programmers in the schools or Community based educational programmer to improve the knowledge regarding Alzheimer disease.
4. This study motivates other investigation to conduct further studies regarding the topic to Find out the risk behavior of population.

This study motivates other researcher to conduct further study to evaluate the practice on Lifestyle change for prevention of Alzheimer disease.

BIBLIOGRAPHY

1. Alzheimer's Association. Alzheimer's disease facts and figures 2009:5(3):7-9.
2. Anne BE, relph LC, jannet P.A.MJ Alzheimer disease odemen 200015(1)Pp:27-35.
3. Ayolan L, Ariyan P A. knowledge of Alzheimer's disease in four ethic groups of older adults. *International journal of geriatric psychiatry*, 2004 jan;9(1):51-57.
4. Abraham S, Logie R.H, and Mendez L.G. Visual short term memory binding deficits in familial Alzheimer's disease. *Brain*, 2010 sept ;133(9):2072-80.
5. Alifestyle of Alzheimer'spt's India time 2010 nov 29.
6. Alzheimer disease is no more then you think Alzheimer socity of B.C. (editorial) rising tide 2011 jan 4.
7. Buckwalter KC, Gerdner L A, and Reed D. Impact of a psycho educational intervention on caregiver response to behavioral problems. 2002 Nov; 51(6) :363-74
8. Buchner DM, Barlow WE, and Gibbons LE. Exercise plus behavioral management of patients with Alzheimer's diseases, a randomized controlled trial. *JAMA*, 2003 oct ;290(15): 2005
9. Boustani M, Damush T M, and Callohan C M. Development and Implementation of non pharmacological protocols for management of patients with Alzheimer's disease. *Gerontologist*, 2004 August : 44(4) : 548-53.
10. Back G H, cheong H K, and Kim J. systematic review of health behavioral risk and cognitive health in older adults. *Arch Neurol*, 2010 march ;22(2): 174-87.
11. Blay SL, Furtado A, Peluso ET. Knowledge and beliefs about help-seeking behavior and helpfulness of interventions for Alzheimer's disease. 2008 sep;12(5):577-86.
12. Blay SL, Toledo pisapeluso E. Public stigma: the communities tolerance of Alzheimer disease. *Am J Geriatr Psychiatry*. 2010 feb ;18(2):163-71.
13. Bowirrat A, Treven, Prevalence of Alzheimer's type dementia in an elderly arab population. *European journal of neurology* 2001 8(2): 119-123.
14. Carpenter BD, Zoller SM, Balsis S, Otilingam PG, Gatz M Demographic and contextual factor related to knowledge about Alzheimer's disease. *Am J Alzheimers Dis other Dement*. 2011 Mar;26(2):12
15. Dennis M P, Glitlin L N, Hauck W, and Winter L. Maintenance of effects of home environmental skill building programme for caregivers of individuals with Alzheimer's and related disorders. *Gerontologist*, 2005 March;60(3):368-74.
16. DROTHY MERENESS: Essential for psychiatric nursing : The C.V. Mosby company; Ed 8th 1970; 173.
17. Edwards R M, and plant MA. Knowledge about Alzheimer's disease among Baccalaureate nursing student. *Journal of Nursing Education*, 2004 March 31;1192(3): 127-135.
18. Fays, Hamilton L, and Rockwood. Misplacing objects in mild to moderate Alzheimer's disease. *J Neurol Neurosurg psychiatry*, 2009 sept;80(9):960-65.
19. Feroughan M. Ferahani ZG, Shariapanani M. vaeziejad M. risk factor of Alzheimer disease among Iranian population *curr Alzheimer res* 2008; 5(1); 70-72.
20. GAIL W. STUART & MICHELET. LARAIA: Principle of practice of psychiatric nursing; Elsevier; Ed 8th 2005: 453-458.
21. Holzer. C, Warshaw.G. Cluess to early dementia in out patient setting. *Arch Neurol*, 2000 Nov; 9(10):1066-70.
22. Jaffe E G, grina K. memory loss and aging cause treatment and help for memory problem 2009 june; available from www.dawn.co.
23. Kothari C.R (2004) Research Methodology, 2nd Edition, New Age international Private Limited Publisher, Jalender, Pp:58.
24. alpan & Sadocks: synopsis of psychiatry : B.I. Waverly; Ed 8th : 1998; 328-330.
25. K.P. Neeraja: Essentials of mental Health Nursing; Jay pee brothers; vol1 2003:73-548.
26. LESTER GRINSPOON, M.D. :Psychiatric up date: Voll.3rd;1984:82-269.
27. Marieb ME essential of human anatomy and physiology 8th ed. India person education; Pp:221-265.
28. Lynda A. Anderson, Kristine L. Day, renee L. Beard, peter S. Reed, Bei Wu. The public's perceptions about cognitive health and Alzheimer's disease Among the U.S. Population: A National Review. Available from <http://gerontologist.oxfordjournals.org/content/49/S1/S3>.
29. Low LF, Anstey KJ. Dementia literacy: recognition and belief on dementia of the Australian public. 2009 jan; 5(1): 43-9.



30. Lushsinger JA, Mayeux R, Reitz C, and Tang MX. A summary riskscore for the prediction in elderly persons. *Arch Neurol*, 2010 July; 67(7): 835-41
31. NOREEN CAVAN FRISCH & LAWRENCEE. FRISCH: *Psychiatric mental Health nursing*; William brottmiller (Delmar); 1998: 541-548.
32. Perla W. knowledge about symptoms of Alzheimer disease correlates relationship to help seeking behavior. *International J ger psychiatric* 2003. Pp: 1029-1036.
33. R. Sreevani *A guide to Mental Health Nursing*; Jitendar P Vij; Ed 3rd; 2010: 244-248.
34. STUARTSUNDEEN: *Principles & practice of psychiatric nursing*; The C. V. Mosby Company; 1979: 138.
35. S. Nambi: *psychiatric for nurses*; jay pee brothers first edition: 1998: 109.
36. Shenonli Margaret H, Dirksen S. *medical surgical nursing* 6th ed. Missouri, mosby; 2004. Pp: 1586-1598.
37. Schwalwn S. forsti H. Alzheimer disease knowledge and attitudes in a representative survey *J. neuro psychiatry* 2008; Pp: 35-7.
38. Sullinan k. conor of providing education about Alzheimer disease. *Aging mental health* 2001 Feb; 5(1) Pp: 5-13.
39. Schwalwn S. for sti H. Alzheimer disease knowledge and attitudes in a representative survey. 2008; 22(1): 35-7
40. Saldanha D, Maj Raghunandamani, Srivasthavkalpana, Goyalsunil, Bhattacharya D. An epidemiological study of dementia under the aegis of mental health program. Maharashtra. Pune chapter. *Indian journal of psychiatry* 2010 P131-132.
41. Sullivan, Karen A. Muscat, Tracey M & Mulgrew, Kate E. knowledge of Alzheimer's disease amongst patients, carers, and non-carers adults: Mis conceptions, knowledge gaps, and correct beliefs. *Topics in Geriatric Rehabilitation*, 2007; 23(2): 148-159.
42. Thompson DG, Hyman D, Takgi AK, Valverde I, Thompson WL. Impact on Alzheimer disease education programme, gerental and geredu 2000 Jun. 20 (3) 25-40.
43. Vas CJ, Pinto C, Panicker D, Deshpande N, Scahdeva S. *int psycho geniatrics* 2001 Dec. ; 13(4); Pp: 389-393.
44. Verma Benner Carson : *Mental Health Nursing* : Saunders; Ed 2nd ; 2000; 927-948.
45. Wilson. Kneisl: *psychiatric nursing*; The Benjamin/Cummings; Ed 5th 1996; 224-232. Sons; Ed 2nd; vol-II; 2003: 868-873.
46. Werner P. Knowledge about Symptoms of Alzheimer's disease correlates and relationships to have seeking behavior. *International journal of Geriatric Psychiatry*, 2003 Nov; 18(11): 1029-35.

WEBSITES & E-JOURNALS

1. <https://www.ncbi.nlm.nih.gov/pubmed/26141491>
2. <https://www.journals.elsevier.com/alzheimers-and-dementia/most-cited-articles>
3. <https://jamanetwork.com/journals/jama/article-abstract/418446>
4. <https://www.hindawi.com/journals/ijad/>
5. <https://www.journals.elsevier.com/alzheimers-and-dementia>
6. <http://www.nia.nih.gov/health/alzheimers>
7. https://www.alz.org/help-support/resources/virtual_library/favorite_links
8. <https://researchonline.jcu.edu.au/31456/>
9. <https://www.bartleby.com/topics/Alzheimers-Disease-Essay>
10. <http://www.thesisexperts.com/thesis-alzheimer.shtml>

JOURNALS

1. Gelfand DM, Feldman L. E. *stimating the prevalence of school refusal and school-related fears*. 2010;
2. *Journal of the American Academy of Child & Adolescent Psychiatry* Volume 40, Issue 2, February 2001,
3. *Journal of the American Academy of Child & Adolescent Psychiatry* Volume 41, Issue 3, March 2002.
4. *The times of India*, Bhopal edition, Incidence of child rapes in India.
5. Wilson & Kneish, *Psychiatry Nursing*, 5th edition.



STUDY OF VELOCITY DISTRIBUTION OVER A NON-LINEAR STRETCHING IN PRESENCE OF VISCO-ELASTIC LIQUIDS

Dr. Naveen Kumar N P

Department of Mathematics, Government First Grade College, Malleshwaram 18th Cross, Bangalore-560012

Article DOI: <https://doi.org/10.36713/epra16208>

DOI No: 10.36713/epra16208

ABSTRACT

The study deals with the investigation of velocity of a boundary layer flow of a visco-elastic liquid over a non-linear stretching sheet. For analyzing velocity profiles have been employed for reducing the nonlinear model equation to a system of ordinary differential equations by employing analytical method velocity distribution are studied.

It is found that with the increase of magnetic field intensity the fluid velocity at a particular point of the sheet the fluid velocity decreases.

KEY WORDS: Visco-elastic, Newtonian fluid, viscosity

INTRODUCTION

In reality most of liquids are non-Newtonian in nature, which are abundantly used in many industrial applications, such as in the manufacture of plastic films and artificial fibers, aerodynamic extrusion of plastic sheets, cooling of metallic sheets in a cooling bath, crystal growing, liquid film condensation process, continuous polymer sheet extrusion, heat treated materials traveling between a feed roll, wind up roll or on a conveyer belt, geothermal reservoirs and petroleum industries. In view of this, the study of visco-elastic boundary layer flow problem has been further channelized to non-Newtonian fluid flow. Hence in this paper investigate the non-Newtonian visco-elastic boundary layer flow past a stretching sheet and velocity distribution characteristics are examined for two different kinds of function λ visco-elastic parameter and v_c velocity component.

MATHEMATICAL FORMULATION

We consider a steady, two-dimensional boundary layer flow of an incompressible liquid subjected to a transverse effect (see the Fig. 2). The liquid is at rest and the motion is affected by pulling the sheet on both ends with equal forces parallel to the sheet and a speed u , which varies quadratically with distance from the slit as $u = cx + dx^2$.

The steady, two-dimensional conservation of mass and the momentum boundary layer equations for the quadratically stretching sheet problem involving non-Newtonian liquids are:

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0, \quad (1)$$

$$u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = \nu \frac{\partial^2 u}{\partial y^2} + \nu \lambda^* \left(u \frac{\partial^3 u}{\partial x \partial y^2} + v \frac{\partial^3 u}{\partial y^3} \right), \quad (2)$$

Subject to the boundary conditions:

$$\left. \begin{aligned} u &= cx + dx^2 & \text{at } y &= 0, \\ v &= v_c + \delta x & \text{at } y &= 0, \\ u &= 0 & \text{as } y &\rightarrow \infty. \end{aligned} \right\} \quad (3)$$



Here u and v are the components of the liquid velocity in the x and y directions, respectively, μ is the dynamic viscosity and ν is the kinematic viscosity. Further, we assume d and δ quite small that facilitates the assumption of a weakly two-dimensional flow and λ^* the visco-elastic parameter.

We now make the equations and boundary conditions dimensionless using the following definition:

$$(X, Y) = \sqrt{\frac{c}{\nu}}(x, y), \quad (U, V, V_c) = \frac{(u, v, v_c)}{\sqrt{c\nu}},$$

$$\beta^* = \frac{d}{c} \sqrt{\frac{\nu}{c}}, \quad \delta^* = \frac{\delta}{2c}.$$
(4)

Equations (1) and (2) take the non-dimensional form as follows:

$$\frac{\partial U}{\partial X} + \frac{\partial V}{\partial Y} = 0, \quad (5)$$

$$U \frac{\partial U}{\partial X} + V \frac{\partial U}{\partial Y} = \frac{\partial^2 U}{\partial Y^2} + \lambda_1 \left(U \frac{\partial^3 U}{\partial X \partial Y^2} + V \frac{\partial^3 U}{\partial Y^3} \right),$$
(6)

Where $\lambda_1 = \frac{\lambda^*}{c}$ (visco-elastic parameter).

Introducing the stream function $\psi(X, Y)$ as

$$U = \frac{\partial \psi}{\partial Y}, \quad V = -\frac{\partial \psi}{\partial X}, \quad (7)$$

we get from equation (6) the following equation:

$$\frac{\partial^3 \psi}{\partial Y^3} + \frac{\partial \psi}{\partial X} \frac{\partial^2 \psi}{\partial Y^2} - \frac{\partial \psi}{\partial Y} \frac{\partial^2 \psi}{\partial X \partial Y} + \lambda_1 \left(\frac{\partial \psi}{\partial Y} \frac{\partial^4 \psi}{\partial X \partial Y^3} - \frac{\partial \psi}{\partial X} \frac{\partial^4 \psi}{\partial Y^4} \right) = 0.$$
(8)

The boundary conditions to be satisfied by ψ can be obtained from the equations (3), (4) and (7) as:

$$\left. \begin{aligned} \frac{\partial \psi}{\partial Y} &= X + \beta^* X^2 & \text{at } Y &= 0, \\ -\frac{\partial \psi}{\partial X} &= 2V_c + 2\delta^* X & \text{at } Y &= 0, \\ \frac{\partial \psi}{\partial Y} &= 0 & \text{as } Y &\rightarrow \infty. \end{aligned} \right\} \quad (9)$$



In order to convert the partial differential equation (8) in to ordinary differential equations the following similarity transformation are used:

$$\psi = Xf(Y) - \beta^* X^2 f'(Y), \quad (10)$$

Substituting equation (10) in the equation (8), we get the ordinary differential equation in the form:

$$f''' + ff'' - (f')^2 + \lambda_1 (ff''' - ff''') = 0, \quad (11)$$

Where λ_1 is the dimensionless visco-elastic parameter.

The boundary conditions, for solving equation (11) for f , can be obtained from equations (9) in the form:

$$f(0) = -2V_c, \quad f'(0) = 1, \quad f'(\infty) = 0. \quad (12)$$

The solution of equation (11) subject to (12) is

$$f(Y) = \frac{1}{s}(1 - e^{-sY}) - 2V_c, \quad (13)$$

Where 's' satisfies the equation

$$s^3(\lambda_1 V_c) - s^2(1 + \lambda_1) - (sV_c - 1) = 0. \quad (14)$$

In the above equation put $\lambda_1 = 0$ the equation (14) reduces to $s^2 + sV_c - 1 = 0$ which is same as the equation we used in the Newtonian liquids.

Substituting equation (10) into equation (7), we can get velocity components U and V as:

$$U = Xf'(Y) - \beta^* X^2 f''(Y), \quad (15)$$

$$V = -f(Y) + 2\beta^* Xf'(Y). \quad (16)$$

Having obtained the velocity distribution we discuss the heat transport in the aforementioned forced convective flow due a stretching sheet.

RESULTS AND DISCUSSION

A boundary layer problem for momentum in viscoelastic liquid flow over a stretching sheet is examined in this paper. Parameter s which is function of the V_c and λ_1 (see table 1) contributes to the slope of above exponentially decreasing velocity profiles. Thus 's' is an important parameter in the present study.

It is clear from equation 14 that s , which is function of the V_c and λ_1 see the table 1 contributes to the slope of above exponentially decreasing velocity profiles. Thus 's' is an important parameter in the present study. From Figs. 3 and 4 it is evident that s is an increasing function of V_c and λ_1 thus implying that increasing V_c and λ_1 gives us steeper gradients in the axial and transverse velocity profiles.

CONCLUSION

The effect of two different kinds of function λ visco-elastic parameter and V_c velocity component studied in this paper increasing of the visco-elastic and velocity component which will contributes to the slope of exponentially decreasing velocity distribution in the flow region the strength of viscosity should be as mild as possible which will increase the speed of the flow of the liquid.

=

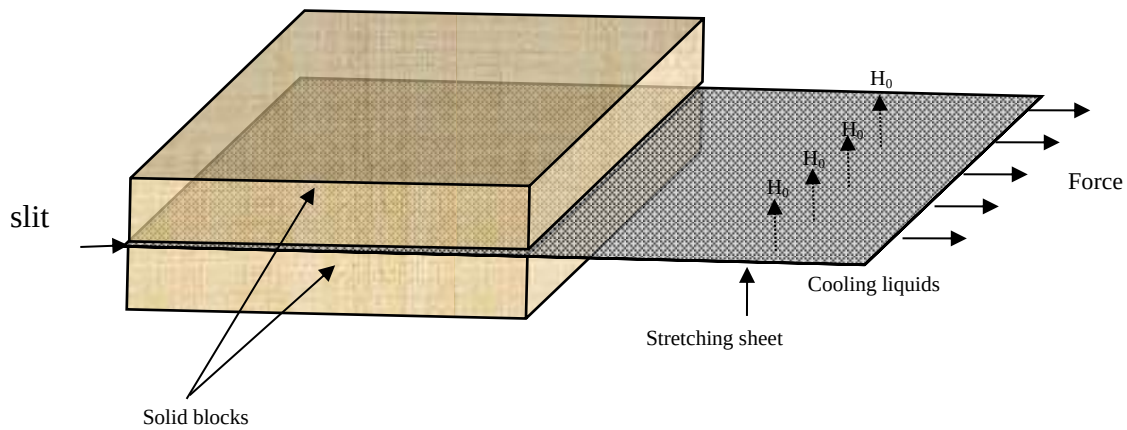


Fig. 1 : Schematic of the 3-D stretching sheet problem.

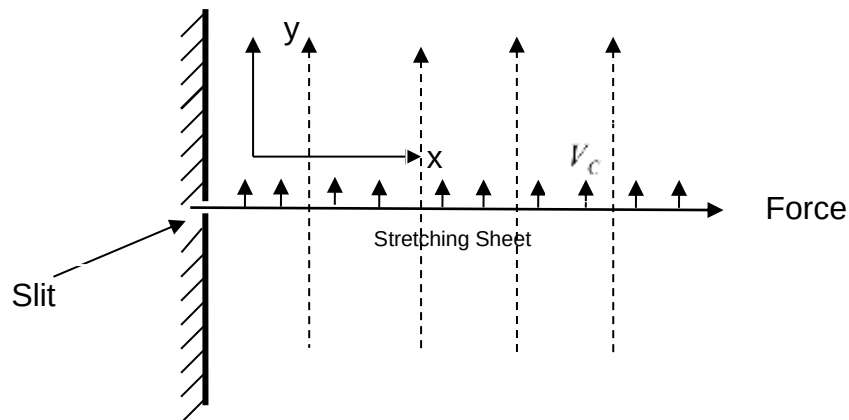
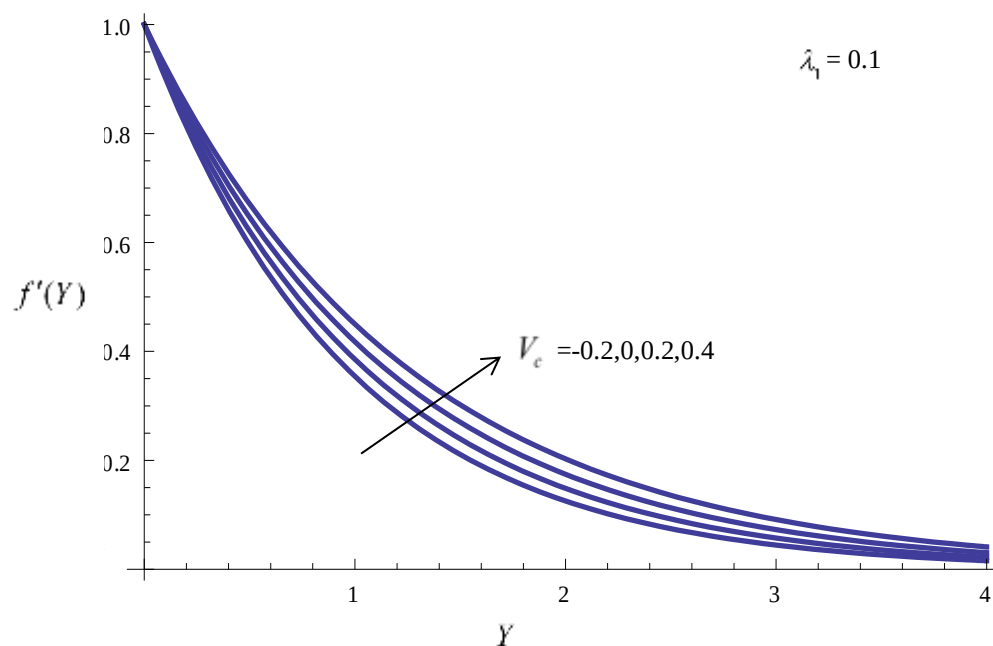
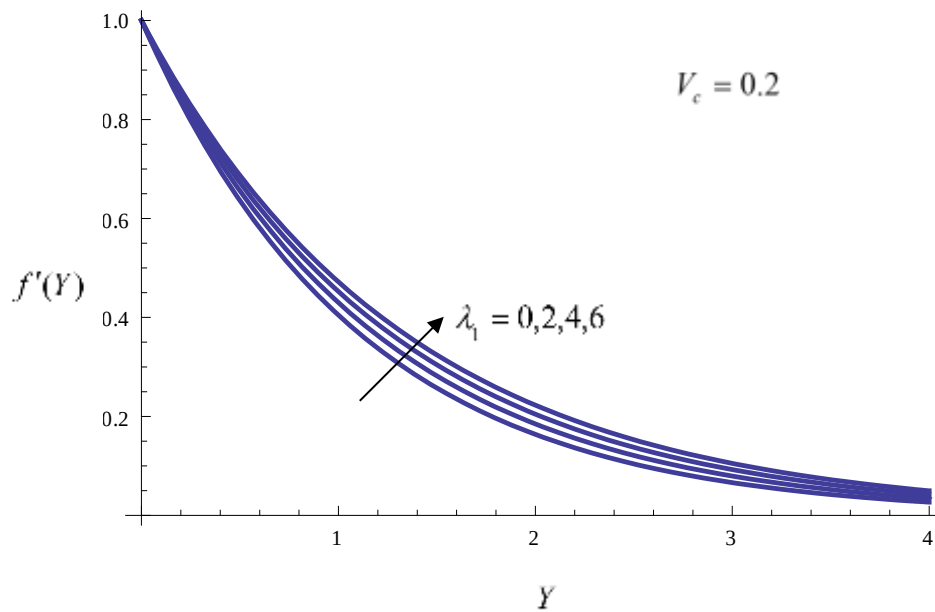


Fig. 2 : Schematic of the 2-D stretching sheet problem.



**Fig. 4:** Effect of λ_1 on velocity profile $f'(Y)$.**Table 1** Values of s for different values λ_1 and V_c

λ_1	V_c	s
0	0.2	0.904988
0.1		0.873176
0.2		0.844208
0.3		0.817719
0.4		0.793399
0.5		0.770987
0	-0.2	1.10499
0.1		1.03802
0.2		0.982586
0.3		0.935613
0.4		0.895085
0.5		0.859613
V_c	λ_1	s
-0.4	0.1	1.12539
-0.2		1.03802
0		0.953463
0.2		0.873176
0.4		0.798309
-0.4	0.3	0.992148
-0.2		0.935613
0		0.877058
0.2		0.817719
0.4		0.758983



REFERENCE

1. Sakiadis, B. C. Boundary-layer behavior on continuous solid surfaces I: The boundary layer on a equations for two dimensional and axis-symmetric flow, *A.I.Ch.E. Journal*, 7, 1961a, 26.
2. Hayat, T., Qasim, M. and Abbas, Z. Three-dimensional flow of an elastic-viscous fluid with mass transfer, *Int. Journal of Numerical methods in fluids*, 66, 2011, 194.
3. Abbas, Z., Hayat, T. Sajid, M. and Asghar, S. Unsteady flow of a second grade fluid film over an unsteady stretching sheet, *Mathematical and computer modelling*, 48, 2008, 518.
4. Abel, M. S., Mahantesh, M. N. Vajaravelu, K. and Chiu-on Ng. Heat transfer over a non-linearly stretching sheet with non-uniform heat source and variable wall temperature, *Int. Journal of Heat and Mass transfer*, 54, 2011, 4960.
5. Hady, F. M., R. A. Mohamed, and Hillal M. ElShehabey. "Thermal Radiation, Heat Source/Sink and Work Done by Deformation Impacts on MHD Viscoelastic Fluid over a Nonlinear Stretching Sheet." *World Journal of Mechanics* 04, 2013, 203.
6. Mishra and Sujata Panda. Mixed convective radioactive heat transfer in a particle-laden boundary layer fluid over an exponentially stretching permeable surface. In *AIP Conference Proceedings*, vol. 2435, 2022, 145.
7. A Samanta, Wave dynamics of a visco-elastic liquid, *International Journal of Engg.Science*, Vol.193, 2023, 103954.



FORECASTING THE FUTURE: A COMPARATIVE ANALYSIS OF ML AND DL MODELS IN SUPPLY CHAIN DEMAND PREDICTION

¹Rishi Varsha Poranki, ²Kalyani Pattima, ³Meghana Yalagala,

⁴Namitha Suraboina, ⁵K. Thrilochana Devi

¹⁻⁵Vasireddy Venkatadri Institute of Technology, Nambur, Guntur, Andhra Pradesh

Article DOI: <https://doi.org/10.36713/epra16211>

DOI No: 10.36713/epra16211

ABSTRACT

Supply chain demand forecasting is a strategic process aimed at predicting future customer demand for products within the broader framework of a supply chain. This involves forecasting the anticipated quantity of goods or services that customers will purchase and seamlessly integrating this insight into the overall supply chain management. The primary goal is to synchronize production, procurement, and distribution activities with expected demand, thereby optimizing inventory costs, minimizing instances of under stocking or overstocking, reducing waste, and ultimately enhancing overall supply chain efficiency. The emphasis is on leveraging advanced technologies, including deep learning techniques such as CNN, LSTM, CNN+LSTM, GRU, and machine learning techniques like Linear Regression and XGBoost, to achieve accurate predictions. By implementing these algorithms, businesses can construct a robust forecasting system capable of monitoring changes in demand and aligning supply accordingly. This proactive approach empowers retailers to enhance their inventory and planning efficiency, ultimately contributing to increased customer satisfaction.

KEY WORDS: Machine Learning, Deep Learning, XG Boost, Linear Regression, CNN, LSTM, CNN+LSTM, GRU

1. INTRODUCTION

Demand Forecasting is the process in which historical sales data is used to develop an estimate of expected customer demand in the future. Supply chain demand forecasting is a critical aspect of supply chain management that involves predicting the future demand for products or services within a supply chain. Forecasting is an essential aspect of business planning and management, as it allows companies to foresee future demand, allocate resources effectively, and reduce costs. Precise sales predictions can result in higher revenue, improved customer satisfaction, and well-informed decision-making. Additionally, supply chain demand forecasting plays a crucial role in strategic decision-making and resource allocation across various sectors. In industries with seasonal demand patterns or volatile market conditions, accurate forecasting enables organizations to optimize production schedules, manage inventory levels efficiently, and minimize the risk of stockouts or excess inventory.

2. LITERATURE SURVEY

LightGBM, an improved GBDT model, was used for Wal-Mart sales forecasting. The experimental results show that the RMSE is 0.641, which is significantly better than Logistic Regression (0.803) and SVM (0.732) [1]

A study utilizes RNN, LSTM, and GRU models for precise power consumption prediction in IoT and big data settings, revealing that the ensemble model combining the three models achieves the highest accuracy rate of 98.43% [2]

The choice of an appropriate forecasting model remains a concerning point. In this context, this research aims to analyse the performance of the CatBoost Gradient boosting model for the prediction of the amount of raw materials required for a meal delivery company that operates in multiple cities having multiple centres [3]

This model showed a better performance of up to 3.2% over a statistical benchmark (the quantile autoregressive model with exogenous variables, QAR-X), being better than the MQ-DRNN without temporal scaling by 6% [4]

Directed Acute Graph Neural Network, consisting of a layer of Convolutional Neural Networks and BiLSTM, showed high predictive performance as a revenue prediction method for e-commerce [5]

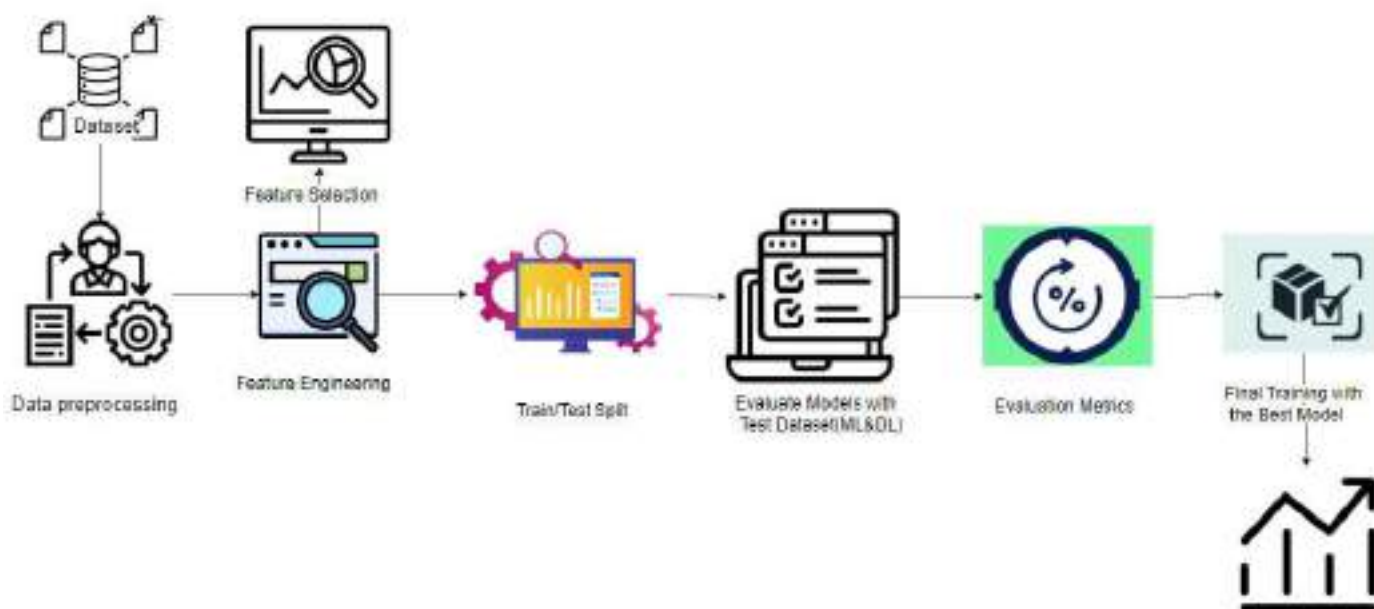


3. PURPOSE OF THE STUDY

The purpose of the study is to minimize both overstocking and understocking issues to improve the sales. This efficiency leads to cost savings, streamlined processes, and better resource utilization

4. PROPOSED MODEL

The proposed system involves working with a dataset, which includes 5 years of sales data for 50 different items across 10 different stores. Our goal is to predict the sales for these items at these stores over a period of 3 months. To achieve the sales prediction goals, we are employing a variety of machine learning and deep learning techniques to forecast future sales trends. Specifically, the machine learning techniques we plan to utilize include Linear Regression and XGBoost. In terms of deep learning, we are exploring the use of LSTM, CNN, LSTM+CNN, and GRU models. The main aim is to compare these models and identify the best-performing one for sales prediction. To compare different models, and evaluate the accuracy of predictions, RMSE(Root Mean Squared Error), R2(R-squared), MAE(Mean Absolute Error), MAPE(Mean Absolute Percentage Error) & MSE(Mean Squared Error) metrics are used for forecasting. By applying various accuracy metrics, it will give a better forecasting and decreases the error. Additionally, we have developed a user interface that allows forecasting of sales on a weekly, monthly, daily, and yearly basis. This feature is designed to assist retailers in optimizing their inventory and increasing overall revenue. The visualizations will help the retailers for better understanding and management.



5. METHODOLOGY

5.1 DATASET

Datasets play a vital role in research, analysis, model development, and decision-making across diverse fields. They serve as foundational building blocks for extracting data-driven insights and fostering innovation. The dataset under consideration comprises a train and test dataset. The train dataset consists of 913,000 records with attributes including date, store, item, and sales, while the test dataset consists of 45,000 records with attributes such as id, item, store, and date. This dataset was sourced from Kaggle and provides valuable information on sales from the years 2013 to 2017.

5.2 DATA PREPROCESSING

The initial dataset comprised 4 attributes. Data preprocessing, the foundational step in data preparation, encompasses actions like data cleaning, transformation, and organization to make the data suitable for analysis. This includes tasks such as handling missing values, encoding categorical data, scaling numerical features, and eliminating outliers to enhance data quality and model performance. In our data preprocessing efforts, we placed a strong emphasis on addressing issues related to missing and null values to ensure the overall data quality. We also executed tasks like renaming columns and removing redundant attributes to streamline the dataset. Additionally, we converted categorical variables into binary numeric values to ensure compatibility with analytical models.

5.3 FEATURE ENGINEERING

In this study, extensive feature engineering techniques were applied to enhance the predictive capabilities of the models for sales forecasting. Date-related features were systematically extracted from the 'date' column, which was converted to datetime format to facilitate manipulation. These features included 'weekday', 'dayofyear', 'year', 'month', 'day', 'week', and 'quarter', providing insights into



the temporal patterns and seasonal trends within the dataset. Additionally, features such as 'daily_avg', 'monthly_avg', and 'mean_store_item_month' were computed to capture the average sales behavior at different granularities, including daily, monthly, and monthly averages per store and item. These engineered features aim to encapsulate the underlying patterns and relationships present in the data, empowering the models to better capture and predict sales fluctuations over time. By incorporating these meticulously crafted features into the model training process, we aimed to improve the models' accuracy and robustness in forecasting sales, thereby contributing to more effective decision-making processes for inventory management and business operations.

5.4 ALGORITHMS USED

5.4.1 LINEAR REGRESSION

Linear Regression is a statistical technique that models the relationship between a dependent variable (demand) and one or more independent variables (predictors), such as historical sales data, market trends, and promotional activities. The model is trained using historical sales data to learn the underlying patterns and relationships, and then used to predict future demand based on new input data.

```
[ ] #Linear Regression Model
    model_lr = LinearRegression()

[ ] #prediction on test data
    model_lr_preds_test = model_lr.predict(x_test)
```

5.4.2 XGBOOST

The XGBoost (Extreme Gradient Boosting) algorithm has emerged as a powerful tool for demand-driven supply chain forecasting due to its exceptional predictive performance and flexibility. In our research, we implemented the XGBoost model to forecast future demand for products in the supply chain management context. The XGBoost algorithm operates by constructing an ensemble of weak prediction models, typically decision trees, in a sequential manner. Each subsequent model corrects the errors made by the previous models, resulting in a strong predictive model. Through extensive experimentation, we observed that the XGBoost model consistently delivered superior results in terms of accuracy and reliability compared to traditional machine learning algorithms.

```
[ ] model_xgb=XGBmodel(x_train_v2, x_val_v2,y_train_v2,y_val_v2)

[ ] #Prediction on test data
    model_xgb_preds_test = model_xgb.predict(xgb.DMatrix(x_test_v2))
```

5.4.3 CNN (CONVOLUTIONAL NEURAL NETWORK)

In our research, we employed a CNN architecture specifically designed for time-series forecasting to predict future product demand in the supply chain management domain. The CNN model's capability to automatically learn hierarchical representations of sequential data renders it highly suitable for demand forecasting tasks, empowering supply chain professionals to make data-driven decisions in inventory management and production planning.

```
[ ] #predicting on test data
    y_pred_cnn = model_cnn.predict(x_test_v2)
```

5.4.4 LSTM

The LSTM model's unique architecture includes memory cells and gates that enable it to retain information over extended time periods, making it particularly well-suited for modeling time-series data with complex temporal dynamics. The LSTM model's capability to learn from historical sales data and adapt to changing market conditions empowers supply chain professionals. Through experimental evaluation, we observed that the LSTM model consistently delivered accurate predictions of future demand.

```
[ ] #predicting on test data
    y_pred_lstm = model_lstm.predict(x_test_v2)
```

5.4.5 GRU

The GRU model is a type of recurrent neural network (RNN) architecture designed to capture temporal dependencies in sequential data



while addressing some of the limitations of traditional RNNs, such as vanishing gradients. The GRU model's architecture includes gated mechanisms that regulate the flow of information within the network, allowing it to selectively retain and update information over time. We configured the GRU model with reduced units to optimize computational efficiency while maintaining predictive performance.

```
[ ] #predicting on test data
    y_pred_gru = model_gru.predict(x_test_v2)
```

5.4.6 CNN+LSTM

In our research, we proposed a hybrid CNN+LSTM model tailored for demand-driven supply chain forecasting, which combines the strengths of both Convolutional Neural Networks (CNNs) and Long Short-Term Memory (LSTM) networks. By integrating both CNN and LSTM layers, the hybrid model can effectively capture both local and global patterns in the time-series data, leading to more accurate demand forecasts.

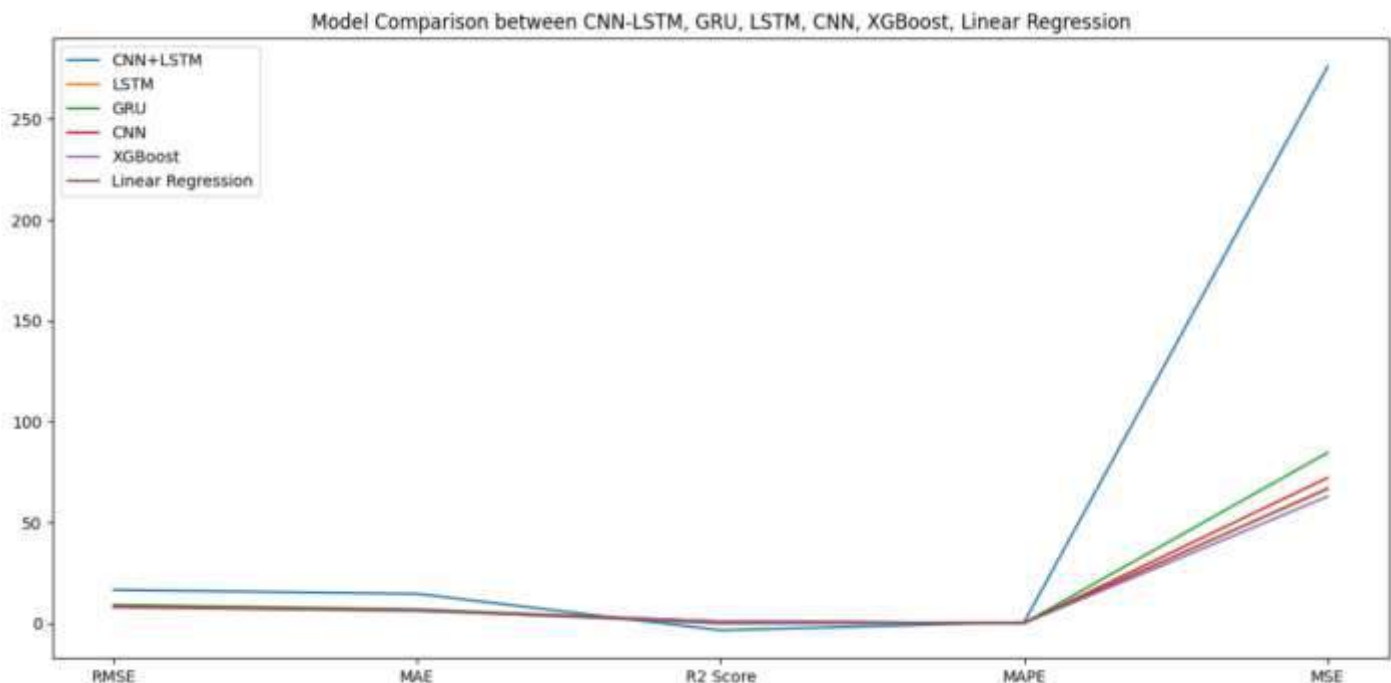
```
[ ] y_pred_cnn_lstm = model_cnn_lstm.predict(x_test_v2_series_sub)
```

6. COMPARITIVE ANALYSIS

We thoroughly explored a range of machine learning and deep learning techniques to identify the most effective model for predicting sales. Among the models considered, including Linear Regression, XGBoost, CNN, LSTM, LSTM+CNN, and GRU, LSTM emerged as the top performer. The decision to prioritize LSTM was based on its ability to effectively capture long-term dependencies in sequential data, crucial for forecasting future sales in supply chain management.

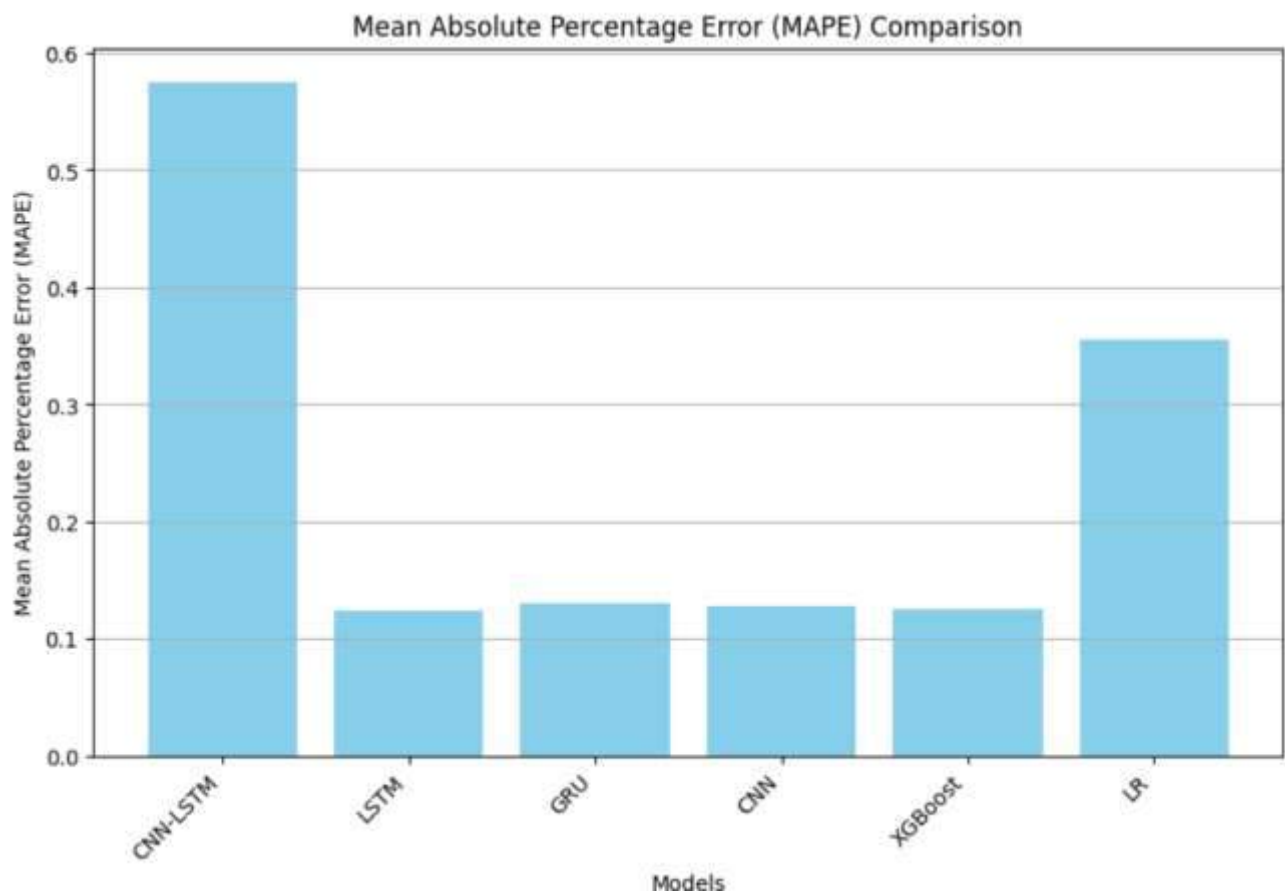
7. RESULTS AND ANALYSIS

7.1 MODELS COMPARISON





7.2 BAR CHART ACCORDING TO MEAN ABSOLUTE PERCENTAGE ERROR (MAPE)



7.3 USER INTERFACE

DEMAND FORECASTING

START DATE: 01-01-2018

END DATE: 31-12-2018

ITEM: 1

STORE: 1

☐ MONTHLY ☐ YEARLY ☐ WEEKLY ☐ DAILY

Get Forecast



7.4 FORECASTS OF 3 MONTHS

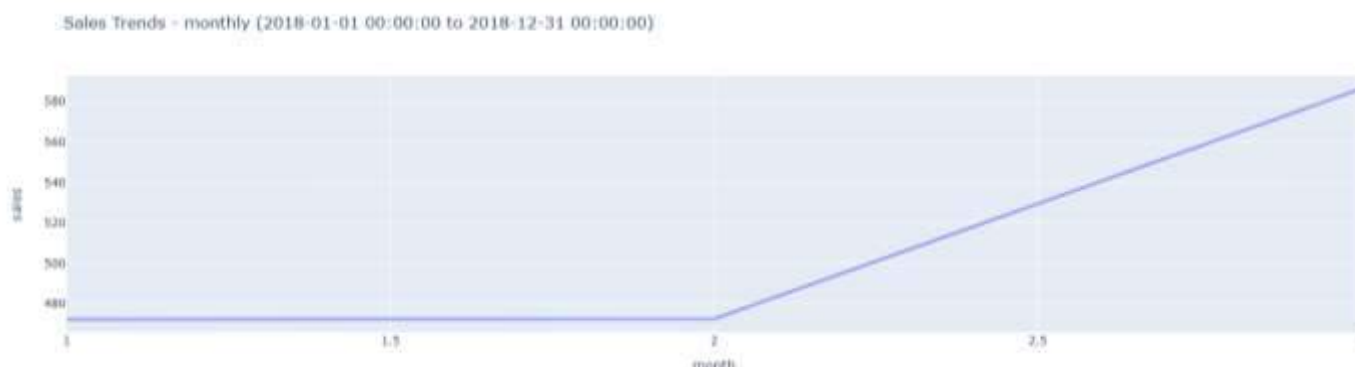


Figure1. Time Series Line Chart

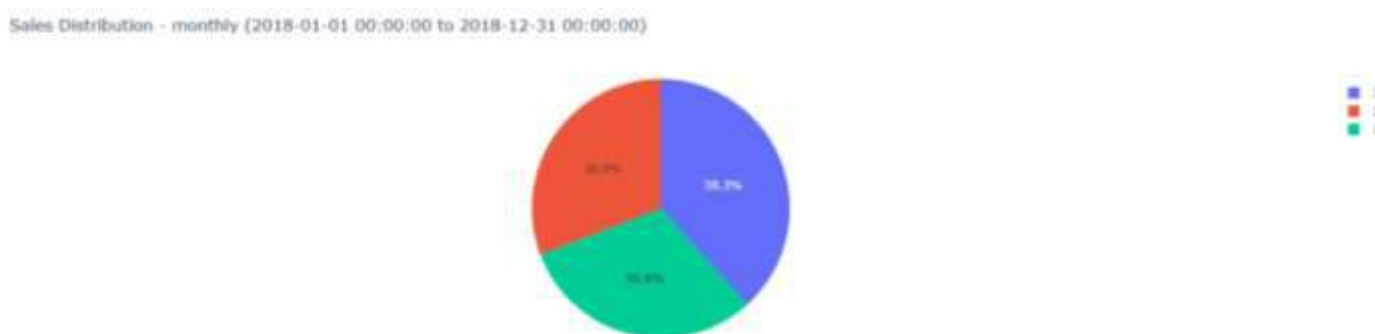


Figure2. Pie Chart

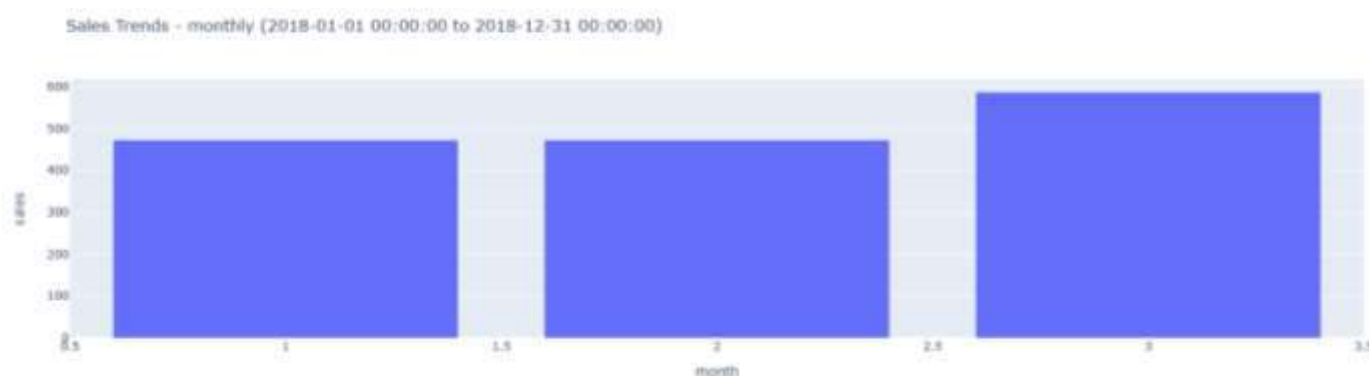


Figure3. Bar Graph

8.CONCLUSION

In conclusion, demand-driven supply chain forecasting in supply chain management has yielded highly impressive outcomes. The six models we employed, both from deep learning and machine learning - namely XGBoost, Linear Regression, CNN, LSTM, CNN+LSTM, and GRU - have displayed robust performance, boasting notably low error rates. XGBoost stood out with an outstanding MAPE score of 0.1248 among machine learning models, while LSTM stood out with an exceptional MAPE score of 0.1243 among deep learning models. We consider LSTM as the best model. By using a user interface with the help of the best model, we predicted the sales of the upcoming 3 months. The forecasts are visualized on a daily, weekly, monthly, and yearly basis. These visualizations will assist the supply chain in eliminating overstocking and understocking issues.

9. FUTURE WORK

Future enhancements to this project could involve leveraging sentiment analysis of customer feedback and social media data to



refine sales forecasts for highly engaging products. Additionally, integrating sustainability metrics such as carbon emissions and waste generation into supply chain forecasting could help mitigate environmental impact. Furthermore, employing demand-driven forecasting to offer personalized product recommendations to customers based on their past purchases, preferences, and online behavior using machine learning algorithms could enhance the overall customer experience.

10. REFERENCES

1. Deng, T., Zhao, Y., Wang, S., & Yu, H. (2021, January). Sales Forecasting Based on LightGBM. In 2021 IEEE International Conference on Consumer Electronics and Computer Engineering (ICCECE) IEEE.
2. Kim M, Lee S, Jeong T. Time Series Prediction Methodology and Ensemble Model Using Real-World Data. Electronics. 2023
3. Pujara, A., Pattabiraman, V., & Parvathi, R. (2022). Food Demand Forecast for Online Food Delivery Service Using CatBoost Model. In 3rd EAI International Conference on Big Data Innovation for Sustainable Cognitive Computing. Springer, Cham.
4. Ramírez, F. G. (2021). Neural Multi-Quantile Forecasting for Optimal Inventory Management.
5. Petroșanu D-M, Pîrjan A, Căruțașu G, Tăbușcă A, Zirra D-L, Perju-Mitran A. E-Commerce Sales Revenues Forecasting by Means of Dynamically Designing, Developing and Validating a Directed Acyclic Graph (DAG) Network for Deep Learning. Electronics. 2022
6. Babai, M. Z., Boylan, J. E., & Rostami-Tabar, B. (2022). Demand forecasting in supply chains: a review of aggregation and hierarchical approaches. International Journal of Production Research
7. Pereira, M. M., & Frazzon, E. M. (2021). A data-driven approach to adaptive synchronization of demand and supply in omni-channel retail supply chains. International Journal of Information Management
8. Seitz, A., Grunow, M., & Akkerman, R. (2020). Data driven supply allocation to individual customers considering forecast bias. International Journal of Production Economics
9. Jr, P., Leal, J. E., & Thomé, A. M. T. (2016). A maturity model for demand-driven supply chains in the consumer product goods industry. International Journal of Production Economics
10. Chase, C. W. (2013). Demand-driven forecasting: a structured approach to forecasting. John Wiley & Sons.



PROCEDURES FOR CARRYING OUT BIOLOGICAL CONTROL MEASURES AGAINST OWLET MOTHS IN THE POTATO BIOTOPE OF THE AGROBIOCENOSIS OF KARAKALPAKSTAN

Toreniyazov E.Sh.¹, Rozimova A.P.²

¹*Doctor of Agricultural Sciences, Professor*

²*Assistant, Karakalpakstan Institute of Agriculture and Agrotechnologies*

Article DOI: <https://doi.org/10.36713/epra15833>

DOI No: 10.36713/epra15833

ANNOTATION

The results of the studies conducted on the types, bioecology of pests that cause damage to potato varieties grown in Karakalpakstan and biological control measures against them are presented.

KEY WORDS: *Plant, variety, seedling, harvest, pest, rodents, owlet moths, biology, dynamics, trichogram, biological usefulness.*

JUSTIFICATION OF THE RELEVANCE OF THE TOPIC

Potato (*Solanum tuberosum* L.) is considered one of the agricultural crops in Karakalpakstan, which has been expanding its cultivation area in recent years, measures to increase the potato growing area to 10,000 hectares were determined and orders were given to all districts. The plant type belongs to the tomato-like breed and according to morphological characteristics and differences in biological development it has been determined that early-ripening dosimpalek, zarafshon latona, Belarus, Priekul, average-ripening Condor, Marfona, Umid, Picasso, Sante and late-ripening Diamond, Cardinal varieties will yield up to 40-50 tons per hectare when they are planted in their period and the provided agrotechnical tools are used.

Today, the yield from potato fields is a little low, and in some farms, there are cases of a sharp decrease, and the results of the research conducted in this regard show that the cultivated varieties, applied agrotechnical measures are not organized on the basis of scientific research, and at the same time, the biotope of potatoes is prone to and it is taken into account that the quality and quantity of the harvested crop will be damaged by pests migrating from other stations. That is why, taking into account the changes in the abiotic and biotic factors of the agrobiocenosis of the area, determining the planting dates of potato varieties, application of measures against pests that spread in the field and reduce the quality and quantity of the crop due to the effect of feeding on the generative and vegetative bodies of the plant based on science-based terms and methods is the most urgent issue today. In this regard, it is required to carry out countermeasures on a biological basis using the effects of entomophagous species, which are considered to be the main biotic factors in the field biocenosis.

METHODS USED FOR THE RESEARCH

Methods presented by B.J.Azimov, B.B.Azimov, V.I.Zuev, T.E.Ostonakulov and others were used to obtain a yield from potato varieties planted in different periods. Methods of B.P.Adeshkeevich, Sh.T.Khodzhaev, V.I.Tansky were used to determine the types of pests in the biotope, and to carry out countermeasures to eliminate the level of harm they cause, and B.A.Dospehov's method was used to conduct experiments.

RESULTS OF THE RESEARCH

One of the important signs of the biologically different side of the potato plant, the tubers from the root are used as planting material and as food. The number of vegetative bodies is large, the stem spreads on the surface of the ground or grows vertically, improving the microclimate in the field, due to a number of generative bodies and the effect of better development of flowers, it creates an opportunity for the insects living in the biotope to gather in the field and develop and multiply in favorable conditions. Including early varieties are planted in the second ten days of March, mid-early varieties are planted at the end of May, late varieties are planted until July, the emergence of young seedlings in the field, the harvest of late-planted varieties is preserved in the fields until November, and most types of pests, which are the main elements of the biocenosis that it accumulates in the fields and has an adverse effect on the growth and development of the plant is given in full in the results of the scientific work. (Ostonakulov T.E. et al., 2002; Khodjaev, 2015; Toreniyazov et al. 2018).

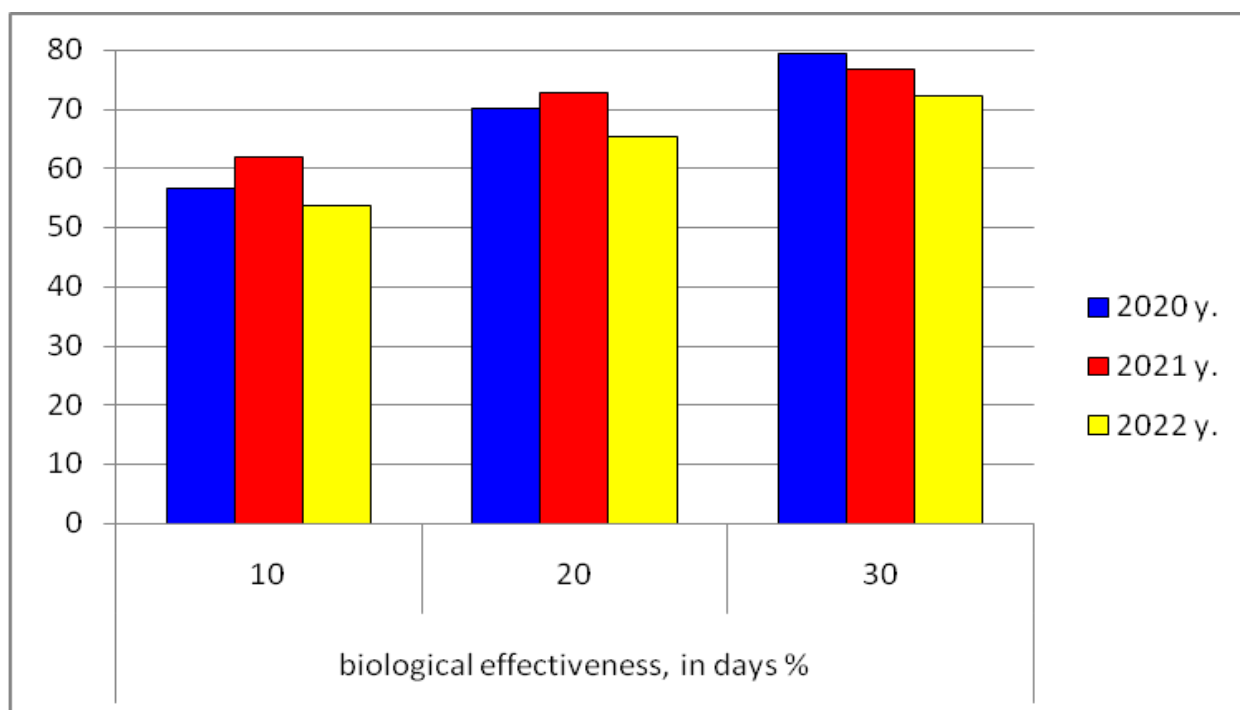
Such research has been continued, taking into account the planting dates of early, medium and late varieties of potatoes of Karakalpakstan agrobiocenosis, the growth of vegetative and generative bodies, as a result of our research conducted in 2020-



2023, the spread of many types of pests in the fields and crops was found to be extremely harmful. Among these types, European mole cricket (*Gryllotalpa gryllotalpa* L.), the wireworm (*Agriotes meticulosus* Cond.), turnip moth (*Agrotis segetum* Dan.), the heart and dart (*Agrotis exclamationis* L.), the red-head (*Epicauta erythrocephala* Asall.), potato moth (*Phthorimaea operculella* Zel. 1, *Gryllotalpa gryllotalpa* L.), and potato flea beetle (*Psylliodes affinis*) were found to be widespread pests which cause damage. Among the pests, worms of the turnip moth and the heart and dart species were determined to be dangerous species that cuts off the root neck from the sprouting of potatoes until the emergence of 5-7 true leaves, gnaws the stems and leaves, leaving them behind in their growth, reducing the number of plants and causing damage.

When studying the types, morphological signs of the phases, development bioecology, dynamics, and the level of harmfulness of the pest, it was determined that a turnip moth gives a full generation three times, and a heart and dart gives two full generations. During the vegetation period, offspring developed in potato varieties, 5-6-year-old larvae are collected in the fields of late-ripening varieties from September and overwinter on the 15-20 cm surface of the soil. Depending on the rise in air temperature with the arrival of spring, when it constantly exceeds + 5°C, 5 cm of the soil, turning into a cocoon, useful heat is 50°C (the lower limit for the turnip moths is 10°C, for the heart and dart 11°C), when they gather, butterflies fly and lay eggs on young seedlings.

Observations were made by placing pheromone traps of 2 per hectare in order to determine overwintering of pests in the conditions of the northern districts of our Republic. In this way, it was determined through the males falling on the pheromone that the adult offspring of the pest flew out in the second and third ten days of April, and it was taken into account that the laying of eggs started when the plants were checked. In such fields, when the number of eggs of the turnip moths reached 16,3-18,6 per 100 plants, and the type of heart and dart reached 14,9-18,2, *Trichogramma entomophagus*, grown in a biolaboratory using special methods, was distributed at the rate of 200,000 per hectare, and its biological usefulness was determined (Picture 1).

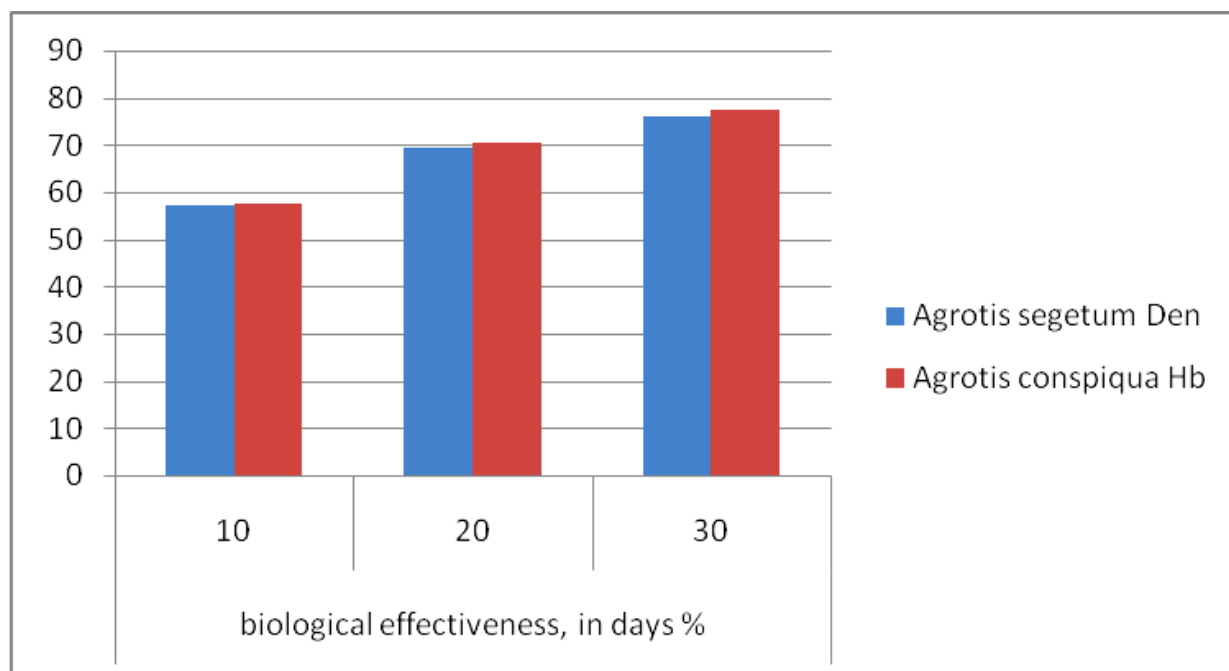


Picture 1. Biological usefulness of *Trichogramma* against the eggs of rodents in potato fields in the agrobiocenosis of Karakalpakstan Shimbay, Nukus districts

Taking into account the fact that the appearance of the eggs of the owl moth is scheduled for some days, and the trichogram host lays eggs on the eggs laid in one day and develops, 60,000 entomophagous for the first time, after 3-4 days, 80,000 in the same field, and after 5-7 days 60,000 were distributed.

The trichogramma grown in the biolaboratory against the eggs of the rodent species spread in potato fields was spread on the basis of the given recommendations, when the number of eggs of the turnip moth in the fields is on average 17.8 per 100 plants, and the biological effectiveness of the biological control measure after 10 days is 57.3%, and after 30 days it was determined that 76, 1% of the pest eggs that appeared in the fields were killed.

Against the heart and dart type, which started to lay eggs in potato fields, it was found that the biological usefulness of trichogramma, distributed when the number of eggs was 15,9, increased from 57,7% to 77,5%, and seedlings were saved from damage.



Picture 2. Biological usefulness of Trichogramma against the eggs of rodents in potato fields in the agrobiocenosis of Karakalpakstan Shimbay, Nukus districts

During the experiments, after trichogramma, which was grown in the bio-laboratory, was spread to the potato fields, in addition to destroying the eggs of the moths, its number gradually increased until the growing season, and it became a beneficial biological factor to keep the number of future pests at a lower level.

CONCLUSION

It was determined that the main reason for the lower than expected yield of the potato varieties planted in the conditions of Karakalpakstan, as a result of the agrotechnical measures used for planting and harvesting in the early, middle and late periods, is the contribution of the pests spread in the biotope. It was found out that among these gnawing species, the species of turnip moth and the heart and dart appear in the stages of sprouting and gnaw young seedlings and leaves, which have an adverse effect on the growth and development of the plant. Taking into account the bioecology of the development of pests in the region, it has been scientifically confirmed that the application of Trichogramma entomophagine, grown in biolaboratories, is one of the most biologically beneficial methods, as soon as they overwinter and begin to develop in the spring months.

RECOMMENDATIONS FOR PRODUCTION

From the time of sprouting of potato seedlings, until harvesting, it is necessary to look at 100 plants (selecting 5 plants from 20 places) diagonally or in a checker pattern every 8-10 days. In order to correctly determine the time of egg-laying of turnip moth and heart and dart butterflies in the field, put 2 pheromone traps per hectare, and carry out daily control tasks. When 2-3 butterflies fall on the pheromone traps every day, it is necessary to apply the method of distribution in three times (60x80x60 thousand pieces) from the trichogramma entomophagus reproduced in the biolaboratory at the rate of 200,000 per hectare.

REFERENCES

1. Adashkevich B.P. *Biological protection of cruciferous vegetable crops from harmful insects*. -Tashkent: "FAN", 1983. P. 180-188.
2. Azimov B.J., Azimov B.B. *Methodology of conducting experiments in vegetable growing, rice growing and potato growing*. -Tashkent: OME, 2002. P. 11.
3. Dospheov B. A. *Methodology of field experience*. - M.: Kolos, 1985. P. 351.
4. Zuev V.I. *Recommendations for growing potatoes on saline soils*. -Tashkent. MAWR. 2003. P. 9.
5. Ostanakulov T.E., Avezov Sh. *Test works of field experiments, methodical manual*. -Tashkent: 2002. P. 101.
6. Tansky V.I. *Biological basis of insect harmfulness*. - M. "Agropromizdat", 1988. P 182-198.
7. Toreniyazov E.Sh., Khodjaev Sh.T., Kholmurodov E.A. *Protection of plants*. Tashkent: "NAVRUZ" -2018. P. 876.
8. Khojaev Sh.T. *Modern methods and means of integrated protection of plants from pests*. "Navroz" publishing house - 2015. P. 552.



STUDY OF VELOCITY DISTRIBUTIONS FOR A HYDROMAGNETIC FLOW OVER A NON-LINEAR STRETCHING SHEET

Naveen Kumar N P^a, Dinesh P A^b, Dinesh Kumar S T^c

^a Department of Mathematics, Government First Grade College, Malleshwaram 18th Cross, Bangalore-560012. India.

^b Department of Mathematics, MSRIT, Bangalore. Karnataka.

^c Department of Mathematics, Government Science College, Chitradurga, Karnataka.

ABSTRACT

The study deals with the investigation of velocity of a boundary layer flow of a Newtonian liquid over an non-linear stretching sheet in presence of magnetic field. For analyzing velocity profiles have been employed for reducing the nonlinear model equation to a system of ordinary differential equations by employing analytical method velocity distribution are studied. It is found that with the increase of magnetic field intensity the fluid velocity at a particular point of the sheet the fluid velocity decreases.

KEY WORDS : Stretching sheet, Magnetic field, Stream function

INTRODUCTION

Polymer extrusion processes involve the stretching of thin films by equal and opposite forces, the entire system housed in cooling liquids. The rate of cooling and the nature of the coolant determine the property of the thin film. In this paper we study the non-linear flow of a Newtonian liquid due to a sheet that is stretched between two solid blocks (Fig. 1) and velocity distribution in the boundary layer flow of the stretching sheet.

MATHEMATICAL FORMULATION

We consider a steady two-dimensional boundary layer flow of an incompressible liquid subjected to a transverse magnetic field (see the Fig. 1). The liquid is at rest and the motion is effected by pulling the sheet on both ends with equal forces parallel to the sheet and a speed u , which varies quadratically with distance from the slit as $u = cx + dx^2$. The flow field is subjected to a transverse uniform magnetic field H_0 is imposed in the vertical direction y-axis. It is assumed that magnetic field is negligibly small.

The steady two-dimensional conservation of mass and the momentum boundary layer equations for the quadratically stretching sheet problem involving Newtonian liquids with transverse magnetic field are:

$$\frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} = 0, \quad (1)$$

$$u \frac{\partial u}{\partial x} + v \frac{\partial u}{\partial y} = \nu \frac{\partial^2 u}{\partial y^2} - \mu_m^2 \sigma H_0^2 u, \quad (2)$$

where x and y represent horizontal and transverse directions respectively and u, v are components of the liquid velocity in x and y directions, μ is the dynamic viscosity, H_0 is the magnetic field and ν is the kinematic viscosity.

The boundary conditions are considered as :

$$\left. \begin{aligned} u &= cx + dx^2 & \text{at } y &= 0, \\ v &= v_c + \delta x & \text{at } y &= 0, \\ u &= 0 & \text{as } y &\rightarrow \infty. \end{aligned} \right\} \quad (3)$$



We assume c , d and δ is quite small that facilitates the assumption of a weakly two-dimensional flow. The constant v_c represents suction velocity across the stretching sheet when $v_c < 0$, it is blowing velocity when $v_c > 0$ and it represents impermeability of the wall when $v_c = 0$.

We now make the equations and boundary conditions dimensionless using the following

$$(X, Y) = \sqrt{\frac{c}{\nu}}(x, y), \quad (U, V, V_c) = \frac{(u, v, v_c)}{\sqrt{c\nu}},$$

$$\beta^* = \frac{d}{c} \sqrt{\frac{\nu}{c}}, \quad \delta^* = \frac{\delta}{2c},$$
(4)

substituting dimensionless quantity (4) in the equations (1) and (2) and it takes the non-dimensional form as follows:

$$\frac{\partial U}{\partial X} + \frac{\partial V}{\partial Y} = 0, \quad (5)$$

$$U \frac{\partial U}{\partial X} + V \frac{\partial U}{\partial Y} = \frac{\partial^2 U}{\partial Y^2} - QU, \quad (6)$$

where $Q = \frac{\mu_m^2 \sigma H_0^2}{c}$ is a Chandrasekhar number ($M_n = \sqrt{Q}$ is called Hartmann number),

Now we introducing the stream function $\psi(X, Y)$ as

$$U = \frac{\partial \psi}{\partial Y}, \quad V = -\frac{\partial \psi}{\partial X}, \quad (7)$$

which satisfies the continuity equation (5), by substituting (7) in (6) we get following partial differential equation

$$\frac{\partial^3 \psi}{\partial Y^3} + \frac{\partial \psi}{\partial X} \frac{\partial^2 \psi}{\partial Y^2} - \frac{\partial \psi}{\partial Y} \frac{\partial^2 \psi}{\partial X \partial Y} - Q \frac{\partial \psi}{\partial Y} = 0. \quad (8)$$

Similarly, substituting (7) in the boundary condition (3) using dimensionless quantities (4) which obtained in the following form :

$$\left. \begin{aligned} \frac{\partial \psi}{\partial Y} &= X + \beta^* X^2 & \text{at } Y = 0, \\ -\frac{\partial \psi}{\partial X} &= 2V_c + 2\delta^* X & \text{at } Y = 0, \\ \frac{\partial \psi}{\partial Y} &= 0 & \text{as } Y \rightarrow \infty. \end{aligned} \right\} \quad (9)$$

The solution to equation (8) subject to equations (9) may be taken as

$$\psi = Xf(Y) - \beta^* X^2 f'(Y). \quad (10)$$

Substituting equation (10) into equation (8) obtain the following ordinary differential equation

$$f''' + ff'' - (f')^2 - Qf' = 0. \quad (11)$$

The boundary conditions for solving equation (11) for dimensionless stream function f , can be obtained from equations (9) in the form



$$f(0) = -2V_c, \quad f'(0) = 1, \quad f'(\infty) = 0. \quad (12)$$

The solution of equations (11) subject to (12) is

$$f(Y) = \frac{1}{s}(1 - e^{-sY}) - 2V_c, \quad (13)$$

where 's' is given by

$$s = -V_c + \sqrt{V_c^2 + (1+Q)}. \quad (14)$$

Substituting equation (10) into equation (7), we can get velocity components U and V as

$$U = Xf'(Y) - \beta^* X^2 f''(Y), \quad (15)$$

$$V = -f(Y) + 2\beta^* Xf'(Y). \quad (16)$$

Above equation is shows that velocity distribution convective flow due a stretching sheet in presence of a transverse magnetic field.

RESULTS AND DISCUSSION

In this problem we investigate the velocity distribution in a Newtonian liquid over a stretching sheet in the presence of a transverse magnetic field. Similarity solution is obtained for the velocity distribution. It is clear from equation (14) that s , which is function of the V_c and Chandrasekhar number Q contributes to the slope of the exponentially decreasing velocity profiles. Thus 's' is an important parameter in the present study. From the fig 3 it is apparent that the transverse velocity profile decays faster than the axial velocity profile for increasing V_c . The effect of magnetic field is to provide rigidity to the electrically conducting liquid.

CONCLUSION

The effect of magnetic field is to provide rigidity to the electrically conducting liquid and the magnetic field is perpendicular to the velocity field.

The effect of Chandrasekhar number Q is to increase the velocity distribution in the flow region the strength of external magnetic field should be as mild as possible for effective cooling of the stretching sheet.

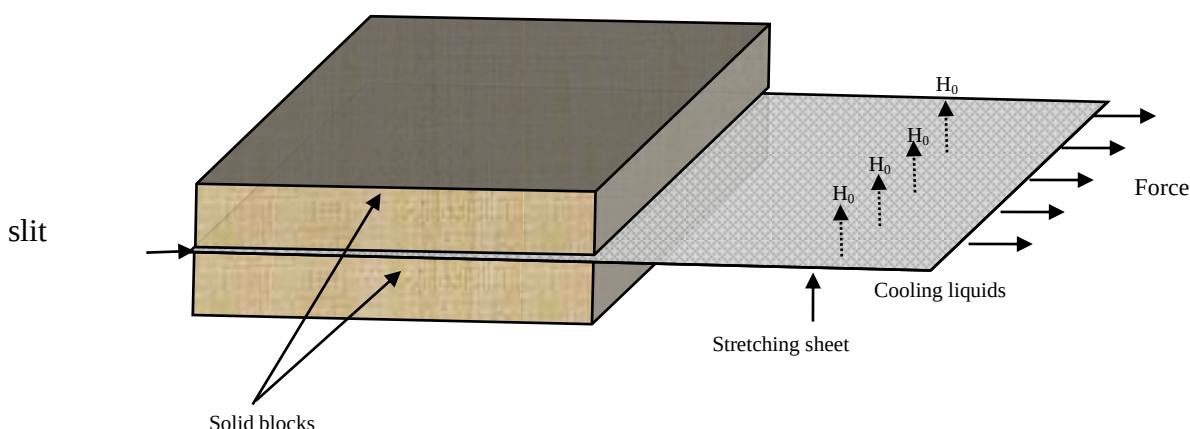
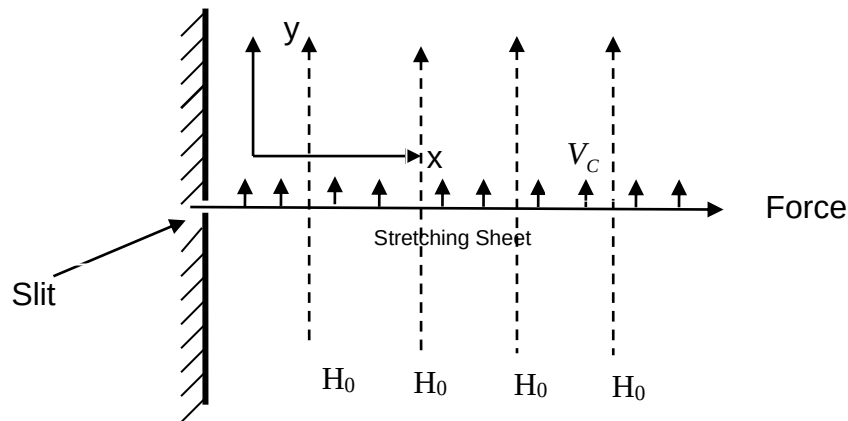
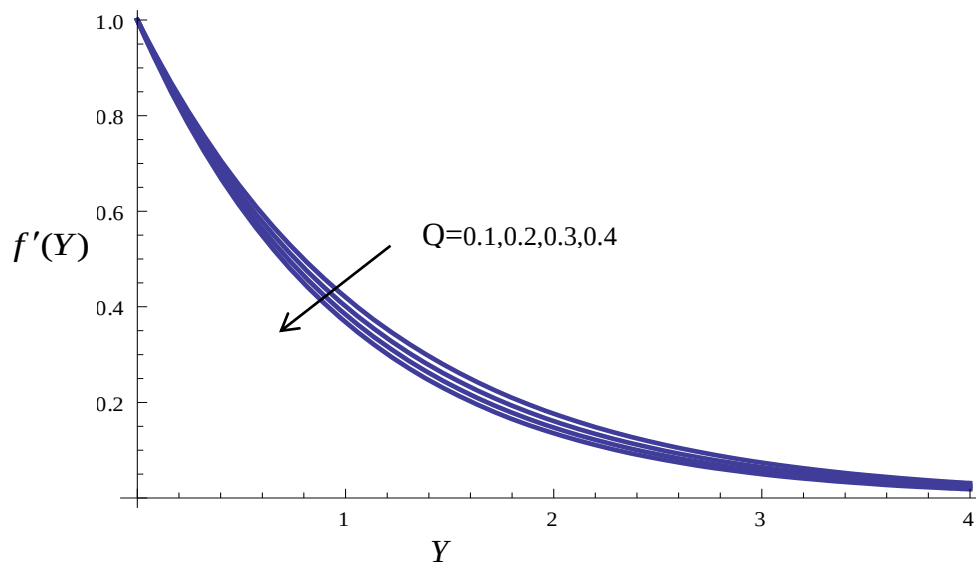


Fig. 1 : Schematic of the 3-D stretching sheet problem.

**Fig. 2 :** Schematic of the 2-D stretching sheet problem.**Fig. 3 :** Effect of Q on velocity profile $f'(Y)$.**REFERENCES**

1. Sakiadis, B. C. Boundary-layer behavior on continuous solid surfaces I: The boundary layer on a equations for two dimensional and axi-symmetric flow, *A.I.Ch.E. Journal*, **7**, 1961a, 26.
2. Hayat, T., Qasim, M. and Abbas, Z. Three-dimensional flow of an elastico-viscous fluid with mass transfer, *Int. Journal of Numerical methods in fluids*, **66**, 2011, 194.
3. Abbas, Z., Hayat, T. Sajid, M. and Asghar, S. Unsteady flow of a second grade fluid film over an unsteady stretching sheet, *Mathematical and computer modelling*, **48**, 2008, 518.
4. Abel, M. S., Mahantesh, M. N. Vajravelu, K. and Chiu-on Ng. Heat transfer over a non-linearly stretching sheet with non-uniform heat source and variable wall temperature, *Int. Journal of Heat and Mass transfer*, **54**, 2011, 4960.
5. Hady, F. M., R. A. Mohamed, and Hillal M. ElShehaby. "Thermal Radiation, Heat Source/Sink and Work Done by Deformation Impacts on MHD Viscoelastic Fluid over a Nonlinear Stretching Sheet." *World Journal of Mechanics* **04**, 2013, 203.
6. Mishra, and Sujata Panda. Mixed convective radiative heat transfer in a particle-laden boundary layer fluid over an exponentially stretching permeable surface. In *AIP Conference Proceedings*, vol. 2435, 2022, 145.
7. A Samanta, Wave dynamics of a viscoelastic liquid, *International Journal of Engg.Science*, Vol.193, 2023, 103954.



FARMGUIDE USING AI TECHNIQUES

G. Kavya Siri¹, B. Madhavi², A. Bhavani³, A. Lakshmi Sowjanya⁴,
A.V.S. Sudhakar Rao⁵

^{1,2,3,4}Students, ⁵Associate Professor

¹Department of Information Technology

¹Vasireddy Venkatadri Institute of Technology, Guntur, India.

Article DOI: <https://doi.org/10.36713/epra16229>

DOI No: 10.36713/epra16229

ABSTRACT

Farming is one of the major sectors that influences a country's economic growth. In country like India, majority of the population is dependent on agriculture for their livelihood. Many new technologies, such as Machine Learning and Deep Learning, are being implemented into agriculture so that it is easier for farmers to grow and maximize their yield. In this project, we present a website in which the following applications are implemented, Crop recommendation, Fertilizer recommendation and plant disease detection. In the crop recommendation application, the user can provide the soil data from their side and the application will recommend top three crops which are suitable for their land. For the fertilizer recommendation application, the user can input the soil data and the type of crop they are growing, and the application will predict what the soil lacks or has excess of and will recommend required fertilizer. For the last application, that is the plant disease detection application, the user can input an image of a diseased plant leaf, and the application will detect the disease. To implement this application we are using the XG Boost, Random Forest, and CNN algorithms.

KEYWORDS – Crop Recommendation, Fertilizer Recommendation, Disease detection, XG Boost, Random Forest, CNN

I. INTRODUCTION

In the ever-growing global agricultural landscape, the need for efficient and sustainable food production has never been more critical. Traditional farming faces challenges from climate change to resource limitations. Enter machine learning, a transformative force in agriculture. It provides innovative solutions to boost farm yield, optimize resource use, and ensure food security. These tools enable data-driven decisions based on real-time information about weather, soil conditions, and crop health. By Applying machine learning and Deep Learning algorithms, farmers can adapt and optimize practices for higher crop yields, reduced wastage, and minimal environmental impact.

By integrating AI-driven solutions into farming operations, FarmGuide seeks to address key challenges faced by farmers while improving productivity, sustainability, and efficiency. This project harnesses technologies such as machine learning and deep learning to provide decision support for crop management.

This project aims to aid Indian farmers by integrating Machine Learning and Deep Learning technologies into agriculture through a website offering three key applications: Crop recommendation, Fertilizer recommendation, and Plant disease detection. The Crop recommendation tool utilizes soil data provided by users to suggest the top three suitable crops for their land. The Fertilizer recommendation tool predicts soil deficiencies or excesses based on input soil data and crop type, providing tailored fertilizer recommendations. Lastly, the Plant disease detection application enables users to upload images of diseased plant leaves, with XGBoost, RandomForest, and CNN algorithms employed to accurately identify the disease. Through these applications, the project seeks to enhance the farming practices.

II. OBJECTIVES

1. Develop a system where users can input soil data to receive recommendations for the top three crops suitable for their land. This aims to assist farmers in making informed decisions about which crops to cultivate based on their specific soil conditions.
2. Create an application that utilizes soil data and the type of crop being grown to predict nutrient deficiencies or excesses in the soil. The objective is to provide personalized fertilizer recommendations to optimize crop yield and minimize resource



wastage.

3. Implement a system capable of identifying diseases in plants by analyzing images of diseased plant leaves. This objective seeks to aid farmers in early detection and management of plant diseases, thereby reducing crop losses and ensuring healthier yields.
4. Utilizing machine learning algorithms such as XG Boost and Random Forest, as well as deep learning techniques such as Convolutional Neural Networks (CNN), to develop accurate and efficient models for crop and fertilizer recommendations, as well as plant disease detection. This objective aims to leverage advanced technologies to improve the effectiveness and reliability of agricultural decision support systems.
5. Design and develop a user-friendly website to host the aforementioned applications, making them accessible to farmers and agricultural stakeholders. The objective is to create an intuitive platform where users can easily input data and receive actionable insights to optimize their farming practices.
6. Adjust the model to make it more accurate and user-friendly.

III. LITERATURE SURVEY

1. Sharma, N., & Sharma, A. (2019). "Crop Recommendation System: A Review." *International Journal of Innovative Technology and Exploring Engineering*, 8(11), 2194-2198. This study reviews various crop recommendation systems implemented using machine learning techniques and highlights their effectiveness in improving crop selection for farmers.
2. Singh, A., & Patel, S. (2020). "Fertilizer Recommendation System using Machine Learning." *International Journal of Recent Technology and Engineering*, 9(2), 7128-7134. The paper discusses the development of a fertilizer recommendation system based on machine learning algorithms, emphasizing its role in optimizing nutrient management and enhancing crop productivity.
3. Meena, P., & Mehrotra, D. (2021). "A Review on Plant Disease Detection Techniques." *International Journal of Computer Applications*, 179(44), 1-5. This review article provides insights into various techniques and algorithms used for plant disease detection, including computer vision-based approaches and machine learning models.
4. Khare, P., et al. (2019). "Improvement of Prediction Accuracy in Agriculture Using XGBoost Algorithm." *International Journal of Computer Applications*, 182(31), 42-48. The study demonstrates the application of the XGBoost algorithm in agriculture for crop yield prediction and discusses its advantages in handling large-scale datasets and achieving high prediction accuracy.
5. Priyadarshini, S., & Sumathi, R. (2020). "Crop Recommendation System Using Machine Learning Algorithms." *2020 International Conference on Emerging Trends in Information Technology and Engineering (ICETITE)*, 1-5. This paper presents a crop recommendation system based on the Random Forest algorithm, highlighting its effectiveness in recommending suitable crops based on soil and climate conditions.
6. Mohanty, S. P., et al. (2016). "Using Deep Learning for Image-Based Plant Disease Detection." *Frontiers in Plant Science*, 7, 1419. The research explores the use of Convolutional Neural Networks (CNNs) for plant disease detection from images, demonstrating the efficacy of deep learning techniques in accurately identifying plant diseases.

IV. METHODOLOGY

During this project work the approach followed can be described in the following steps. They are

1. Data Collection
2. Data Preprocessing
3. Model Development
4. Website Development
5. Integration
6. Testing
7. Deployment
8. Monitoring & Maintenance

Data Collection

Gather relevant datasets for training machine learning models. This includes soil data, crop yield data, fertilizer composition data, and a dataset of images of diseased plant leaves along with their corresponding diseases.

Data Preprocessing

Clean and preprocess the collected data to remove outliers, handle missing values, and normalize the data for consistency. For image data, perform image preprocessing techniques such as resizing, normalization, and augmentation.



Model Development

Develop machine learning models for crop recommendation and fertilizer recommendation using algorithms like XG Boost and Random Forest. Train the models using the preprocessed soil data and crop information.

Develop deep learning model for disease detection using convolutional neural networks (CNN) and train the model using preprocessed leaf images of infected plants.

Website Development

Design and develop a user-friendly website with interfaces for each application: crop recommendation, fertilizer recommendation, and plant disease detection. Implement features for users to input soil data, select crop types, upload images of diseased plant leaves, and receive recommendations and diagnosis results.

Integration

Integrate the trained machine learning and deep learning models into the website's backend. Develop APIs or scripts to handle user inputs, invoke the appropriate models, and generate recommendations or diagnosis results.

Testing

Test the functionality and performance of the website and its applications. Conduct unit tests, integration tests, and user acceptance tests to ensure that the system functions correctly and provides accurate recommendations and diagnoses.

Deployment

Deploy the website and its applications on a web hosting platform or server. Ensure that the website is accessible to users over the internet and that it can handle concurrent user requests and data processing tasks.

Monitoring & Maintenance

Clean Implement monitoring tools to track website performance, user interactions, and model accuracy over time. Regularly update the models with new data and improvements to ensure the effectiveness of recommendations and diagnoses. Provide ongoing maintenance and support for the website, addressing any issues or bugs that arise and incorporating user feedback for further enhancements.

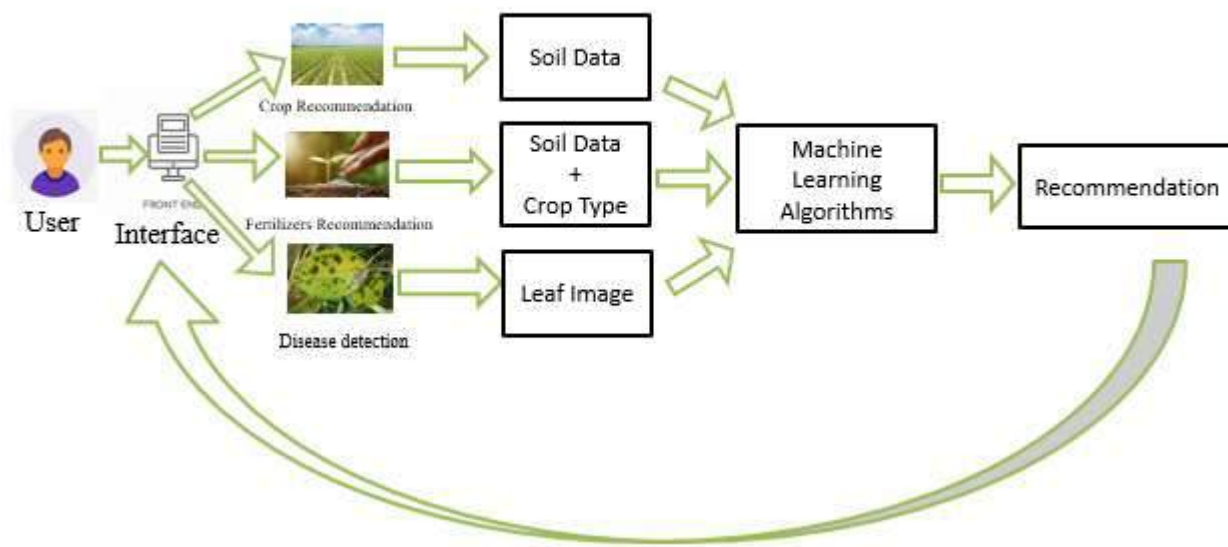


Fig.1: System Architecture



V. RESULTS

Our output screens are as follows:

1. Welcome Page



Fig.2: Welcome Page

2. Input page for Crop Recommendation



Fig.3: Input page for Crop Recommendation



3. Crop Recommendation



Fig.4: Crop recommendation

4. Input page for Fertilizer Recommendation

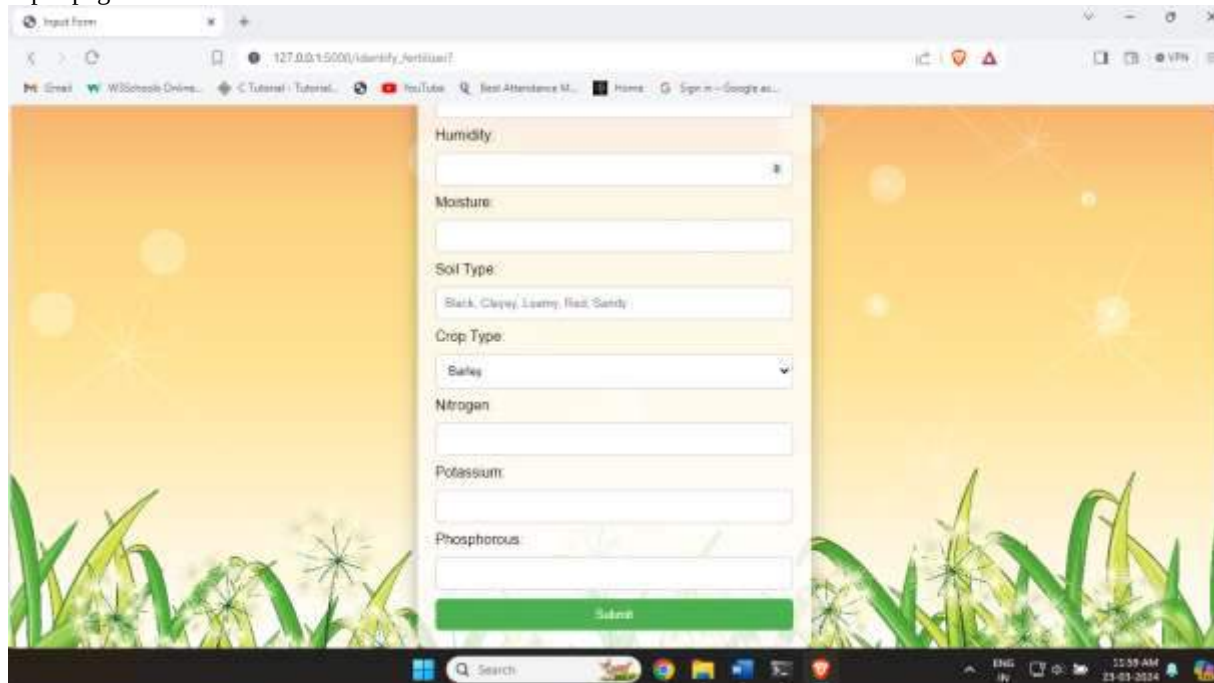


Fig.5: Input page for Fertilizer Recommendation



5. Fertilizer Recommendation



Fig.6: Fertilizer Recommendation

6. Input page for disease identification



Fig.7: Input page for disease identification



7. Disease identification

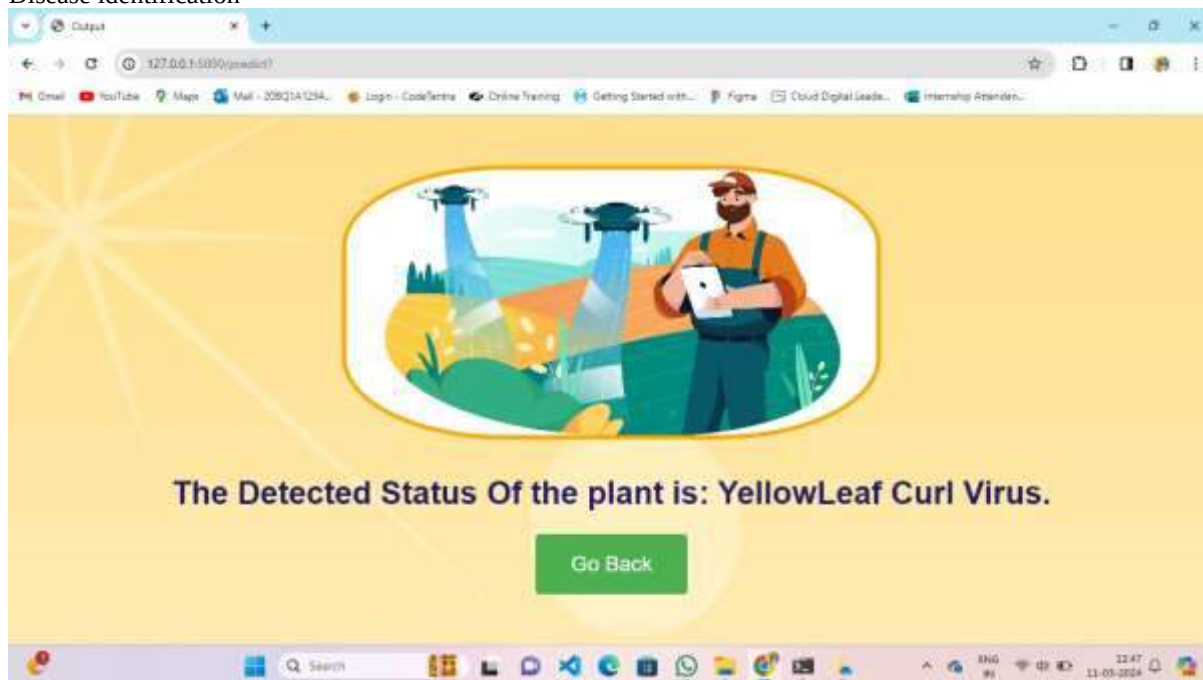


Fig.8: Disease Identification

VI. CONCLUSION

- Through crop recommendation, farmers can make informed decisions about which crops to cultivate based on soil characteristics, maximizing yields and profitability.
- The fertilizer recommendation application further assists farmers by identifying soil deficiencies or excesses and providing tailored recommendations to improve soil health and optimize crop growth.
- Additionally, our plant disease detection application accurately diagnose plant diseases from images of diseased leaves.

VII. FUTURE SCOPE

Expansion of Crop Database:

Continuously update and expand the crop database to include a wider variety of crops, considering regional and seasonal variations.

Mobile Application Development:

Develop a mobile application for greater accessibility, allowing farmers to interact with the system using smartphones.

Feedback Mechanism:

Implement a feedback mechanism to collect user input and experiences for continuous improvement.

IX. REFERENCES

1. S. M. PANDE, P. K. RAMESH, A. ANMOL, B. R. AISHWARYA, K. ROHILLA and K. SHAURYA, "Crop Recommender System Using Machine Learning Approach," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2021, pp. 1066-1071, doi: 10.1109/ICCMC51019.2021.9418351.
2. D. Balakrishnan, A. P. Kumar, K. Sai Kiran Reddy, R. R. Kumar, K. Aadith and S. Madhan, "Agricultural Crop Recommendation System," 2023 3rd International Conference on Intelligent Technologies (CONIT), Hubli, India, 2023, pp. 1-5
3. G. Chauhan and A. Chaudhary, "Crop Recommendation System using Machine Learning Algorithms," 2021 10th International Conference on System Modeling & Advancement in Research Trends (SMART), MORADABAD, India, 2021, pp. 109-112
4. P. Kumar, K. Bhagat, K. Lata and S. Jhingran, "Crop recommendation using machine learning algorithms," 2023 International Conference on Disruptive Technologies (ICDT), Greater Noida, India, 2023, pp. 100-103
5. P. A, S. Chakraborty, A. Kumar and O. R. Pooniwalla, "Intelligent Crop Recommendation System using Machine Learning," 2021 5th International Conference on Computing Methodologies and Communication (ICCMC), Erode, India, 2021, pp. 843-848
6. A. Motwani, P. Patil, V. Nagaria, S. Verma and S. Ghane, "Soil Analysis and Crop Recommendation using Machine Learning," 2022 International Conference for Advancement in Technology (ICONAT), Goa, India, 2022, pp. 1-7
7. Dolli, P. Rawat, M. Bajaj, S. Vats and V. Sharma, "An Analysis of Crop Recommendation Systems Employing Diverse Machine Learning Methodologies," 2023 International Conference on Device Intelligence, Computing and Communication Technologies, (DICCT), Dehradun, India, 2023, pp. 619-624



8. R. K. Ray, S. K. Das and S. Chakravarty, "Smart Crop Recommender System-A Machine Learning Approach," 2022 12th International Conference on Cloud Computing, Data Science & Engineering (Confluence), Noida, India, 2022, pp. 494-499,
9. D. Modi, A. V. Sutagundar, V. Yalavigi and A. Aravatangimath, "Crop Recommendation Using Machine Learning Algorithm," 2021 5th International Conference on Information Systems and Computer Networks (ISCON), Mathura, India, 2021, pp. 1-5
10. S. Bhansali, P. Shah, J. Shah, P. Vyas and P. Thakre, "Healthy Harvest: Crop Prediction And Disease Detection System," 2022 IEEE 7th International conference for Convergence in Technology (I2CT), Mumbai, India, 2022, pp. 1-5, doi: 10.1109/I2CT54291.2022.9825446.
11. P. Kanaga Priya, T. Vaishnavi, T. Pavithra, R. Sivaranjani, A. Reethika and G. Ramesh Kalyan, "Optimized Plant Disease Prediction using CNN and Fertilizer Recommendation Engine," 2023 4th International Conference on Electronics and Sustainable Communication Systems (ICESC), Coimbatore, India, 2023, pp. 1660-1665, doi: 10.1109/ICESC57686.2023.10193314.
12. A. Lakshmanarao, M. R. Babu and T. S. R. Kiran, "Plant Disease Prediction and classification using Deep Learning ConvNets," 2021 International Conference on Artificial Intelligence and Machine Vision (AIMV), Gandhinagar, India, 2021, pp. 1-6, doi: 10.1109/AIMV53313.2021.9670918.
13. A. Nanda, S. Nayak, A. K. Patra, A. Nanda, S. Pani and B. S. Nanda, "Crop Disease Prediction by Using Machine Learning," 2023 International Conference in Advances in Power, Signal, and Information Technology (APSIT), Bhubaneswar, India, 2023, pp. 706-711, doi: 10.1109/APSIT58554.2023.10201690.
14. Soil Test Based Fertilizer Recommendation under Integrated Plant Nutrition System for Vegetable Cowpea [*Vigna unguiculata* (L) Walp] in Ultisols of Kerala, India January 2018International Journal of Current Microbiology and Applied Sciences 7(1):2420-2425 DOI:10.20546/ijcmas.2018.701.291
15. Spatial variation of attainable yield and fertilizer requirements for maize at the regional scale in China March 2017Field Crops Research 203:8-15 DOI:10.1016/j.fcr.2016.11.013



PROSPECTS AND CHALLENGES OF TEACHER EDUCATION ON NEP 2020

Gopal Basak

Student, University of Kalyani, Department of Education, Nadia, West Bengal, 741235

ABSTRACT

A teacher extends a hand; cracks open the mind, and open the heart. Only in teaching do the three "Hs" (Hand, Head, and Heart) hold equal importance. Our nation's destiny and the future of our children are genuinely shaped by the teachers who work with them. All other occupations are taught by the profession of teaching. In India, the teacher was regarded as the most honorable member of society because of their noble profession. Any society's ability to develop rests on its ability to educate its citizens. The components responsible for the teaching and learning process are the teacher's expertise, dedication, quality, professional commitment, and inner drive. The creation of capable instructors is a major difficulty in the modern society. A suitable Teacher education plan needs to be developed as the role of the teacher has become more difficult due to growing knowledge in pedagogical and psychological theories, as well as philosophical and social perspectives. Every country faces a difficulty in providing effective and qualified teachers, which requires progress in teacher education. The Government of India's Ministry of Human Resource Development (MHRD) has released the final report for National Education Policy 2020. (NEP-2020). The Kothari Commission Report (1964–1966), Acharya Rammurti Samiti Report (1990), NCF (2005), National Knowledge Commission Report, NCTE regulations 2009, NCTEF (2010), and other policy documents during the pursuit of this reformation in India resulted in a paradigm shift in the curriculum and rules for teacher education. Nonetheless, there are still certain faults and challenges that require attention. In light of NEP2020, this paper's goal is to seek to highlight some of the policy concerns for teacher education.

KEY WORDS: Education, Teachers Education, NEP 2020.

INTRODUCTION

Education is a dynamic process. The idea behind it varies with time. It is understood in distinct ways from one another in terms of philosophy, sociology, and pragmatics. To ensure that everyone has meaningful access to education, society needs highly motivated, educated, and competent teachers. In order to produce educators who will mould the future generation, teacher education is essential. The process of preparing teachers calls for the development of diverse perspectives and knowledge, the construction of attitudes and values, and the practice of teaching under the guidance of the most qualified mentors. Teachers must be up to date on the most recent developments in education and pedagogy as well as well-versed in Indian values, languages, knowledge, ethos, and traditions, particularly tribal traditions.

On July 28, 2020, the Indian Union Cabinet approved the National Education Policy (NEP). Over the course of more than 4 years of debates and workshops, the Indian government gathered comments from more than 2 lakh rural stakeholders for two national parliamentary level committees after 34 years.

The National Policy on Education (NPE), 1986, is replaced by NEP 2020, the first education policy of the twenty-first century. Access, Equality, Quality, Affordability, and Accountability are the foundational elements of this policy. It is related to the Sustainable Development Goals of the year 2030. By promoting more comprehensive, adaptable, and multidisciplinary education in schools and colleges, it seeks to transform the country into a knowledge society and global superpower. It emphasizes meeting 21st-century needs and seeks to highlight each student's distinctive strengths. NEP 2020 enables universal access to education, which will transform the Indian educational system.

Lessons, assignments, and materials for teaching a specific subject or course are all included in this content's scope. A curriculum's goal is to prepare each student to be an effective social innovator, a responsible citizen, and a confident, successful learner.



REVIEW OF RELATED STUDY

Smitha, S. (2020) studied on “National Education Policy (NEP) 2020 – Opportunities And Challenges in Teacher Education”. The present Paper tries to analyze National Education Policy 2020 with regard to the paradigm shifts in terms of Opportunities and Challenges in Teacher Education Sector.

Jadhav, N. (2022). Studied on “Issues and Challenges of National Education Policy (NEP) 2020 implementation in Teacher Education”. National Education Policy is one of the important educational phenomenon for which India was eagerly waiting. NEP 2020 is the first education policy of the contemporary century which replaces National Policy on Education (NPE), 1986. It brings many fundamental changes in education system and teacher education too. One of the changes is the change in structure of education system the change in teacher education also. The process of convergence will create some issues which should be catered with more academic manners. All these issues are discussed in the paper.

Mahanta, B (2023) Studied on “Recommendations and Challenges of Teacher Education in NEP- 2020”. The present paper focuses on teacher education which is included in part II of advanced education. The present study aims to critically dissect the recommendation and challenges of NEP 2020 regarding teacher education. The study concludes that the New National Education Policy on Teacher Education will enhance the quality of teacher education and present the teacher education system in a world-class environment, with openings, challenges & some formative suggestions by the investigators for enforcing the recommendations of teacher education.

STATEMENT OF THE PROBLEM

After above mentioned reviewed work, the present researcher finds the knowledge gap as well as selected the problem is “Prospects And Challenges Of Teacher Education On Nep 2020”.

OBJECTIVES OF THE STUDY

The objectives of this study are to-

- (A) To introduce major features of NEP 2020.
- (B) To discusses prospects of teacher education on NEP 2020.
- (C) To discusses challenges of teacher education on NEP 2020.

RESEARCH QUESTIONS

1. What are the features of NEP 2020?
2. What are the prospects of teacher education on NEP 2020?
3. What are the challenges of teacher education on NEP 2020?

METHODOLOGY OF THE STUDY

This is descriptive study is based on the analysis of secondary data only. The data for the study has been collected through relevant research journals, thesis, articles, books, magazines and present available literature on websites. Various government reports and NEP 2020 reports have also been considered.

ANALYSIS AND DISCUSSES THE OBJECTIVES

Objective - (A) Major features of NEP 2020

1. Preparation for Schooling and Elementary School Level

- ECCE for all by 2030: National Curriculum Framework for ECCE.
- Achieved 100% gross enrollment ratio in school education by 2030.
- Preparatory class/Balvatika for 5-6 years old children in Anganwadis/Pre-school.
- School preparation module for all class 1 entrants.
- National Foundational Literacy and Numeracy Mission.
- Set up of Bal Bhavans.

2. School Infrastructure and Resources

- Special Education Zones (SEZ)
- Utilize unused capacity of schools as Samajik Chetna Kendraa.
- School complex/clusters for resources sharing



3. Holistic Development of the Student

- No hard separation of curriculum, extra and co-curricular, arts and science, sports and vocational crafts, curriculum to integrate indian culture and ethos.
- Innovative pedagogies to be explored such as experiential teaching/learning methods.
- Book promotion policy and digital libraries.
- Holistic Report Card use for identifying specific aptitude of child.
- Vocational education integrated from primary grades and a ten days(no bag days) internship with local trades /craft person for grades 6-8.
- Lok Vidya - local artists as master instructors in schools

4. Inclusivity

- Gender Inclusion Fund : KGBVs upto class 12.
- Special provisions for gifted children.
- Adult education to focus upon technology based solutions
- NIOS to expand to include vocational courses and courses for grades 3,5 and 8.
- Medium of instructions will be in the mother tongue/local language till grade 5(atleast).

5. Assessments

- National Assessment Center for Performance Assessment, Review and Analysis of Knowledge for Holistic Development- PARAKH.
- Exams in grades 3, 5 and 8 in addition to board exams in grades 10 and 12.
- Board exams modular, low stakes, based on conceptual knowledge and it's application.

6. Curriculum and Pedagogical Framework

- New curriculum and pedagogical framework of 5+3+3+4.
- Reduction in curriculum to core concepts.
- Identification of life skills to be attained in each grade as a part of NCF.
- Alternative model of schools to be encouraged to adopt NCF.
- ICT integration in teaching and learning methodologies.
- Tracking students as well as their learning levels.

7. Role of Government Department/Bodies/Institutions

- State Department to look after policy making Directorate of education to look after operations, SCERT to look after academic and State School Standard Authority to set minimum common standards for online self-disclosure by all public and private schools.
- Random sampling of students for continuous online feedback on self-disclosure by schools.
- Engagement of social workers, alumni, retired teachers and volunteers with schools.
- Strengthening the Central Advisory Board of Education (CABE) for developing, articulating, evaluating and revising the vision if education on a continuous basis in collaboration with MHRD and corresponding apex bodies of states.
- It's desirable that Ministry of Human Resource Development (MHRD) be re-designated as Ministry of Education (MoE) to bring the focus back on education and learning.

Objective - (B) Prospects of teacher education on NEP 2020

1. Pre-service Teacher Education : A National Curriculum Framework for Teacher Education, or NCFTE 2021, will be prepared based on the recommendations of NEP 2020 on teacher education and training to direct all pre-service and in-service teacher education for teachers working in academic, vocational, and special education streams.

- The minimum degree requirement for teachers is the 4-year integrated B.Ed degree by 2030 which is designed as a multidisciplinary and integrated dual-major bachelor's degree in Education and a specialist field. The National Testing Agency will administer appropriate academic and aptitude exams for admission to this degree (NTA).
- The establishment of an education department and the operation of B.Ed. programmes in conjunction with other departments, including those of psychology, philosophy, sociology, neuroscience, languages, arts, music, history, literature, physical education, science, and mathematics, have been mandated for all multidisciplinary universities. In order to improve the quality of their B.Ed. programme, they will also conduct cutting-edge research in a variety of educational areas. A wide variety of knowledge content, pedagogy, and a strong practicum are all taught as part of the B.Ed. degree. Additionally, the curriculum



will cover effective pedagogical methods for teaching basic literacy and numeracy skills, multi-level instruction and assessment, teaching youngsters with disabilities or who have unique interests or talents, utilising educational technology, and learner-centered and collaborative learning.

- For career advancement of teachers who wish to move into more specialised teaching fields, into leadership and management positions in the educational system, or to move from one stage to another between foundational, preparatory, middle, and secondary stages, shorter post-B.Ed. certification courses will also be available.
- All new Ph.D. applicants will be required to take credit-based courses in teaching, education, pedagogy, and writing related to their chosen Ph.D. subject during their doctoral training period, including actual teaching experience gained through teaching assistantships. This requirement has the potential to significantly increase respectability and acceptance of the teaching profession.

2. Teacher Recruitment and Employment : The teacher must pass the TET, demonstrate their teaching abilities in a class, succeed in the interview, and be fluent in the local language in order to be hired in a private or government school (s). The NEP 2020 provides -

- The scope of Teacher Eligibility Tests (TETs) will now be expanded to include teachers in the new stages of schooling (Foundational, Preparatory, Middle, and Secondary). TET and NTA test results in the relevant disciplines will also be taken into consideration when hiring subject teachers.
- In order to address the shortage of teachers in particular for music, dance, art, craft, counsellors, coaches, vocational education trainers, classical language teachers, social workers, technical and maintenance staff, NEP 2020 advocates for hiring teachers to a school complex and sharing them across a group of schools. In order to meet the demand for teachers to teach the recently introduced classical languages and vocational and skill subjects, the NEP 2020 also encourages school complexes to hire local eminent persons or experts as "master instructors" in various subjects, such as in traditional local arts, vocational crafts, entrepreneurship, agriculture, etc

3. Teaching Career and Professionalism : The NEP 2020 calls for the development of performance standards for educators that define their roles at various stages and degrees of expertise as well as the competencies needed at each level.

- By 2022, there will be a set of National Professional Standards for Teachers (NPST) that will govern all facets of managing a teacher's career, such as tenure, ongoing professional development initiatives, pay raises, promotions, and other recognitions.
- Teacher audits or performance reviews will be conducted on a regular basis, according to NEP 2020. These performance evaluation standards will also be developed. Promotions and pay increases will henceforth exclusively be based on such appraisals rather than seniority or duration of service.
- Every year, school teacher are required to complete 50 hours of CPD activities, such as workshops or online teacher development programmes.
- School principals must also complete CPD in leadership, school management, and competency-based learning modules. Moreover, NCERT would research, identify, and suggest international pedagogical techniques for integration into Indian pedagogical practises through CPD.

4. Enculturation of Teacher Empowerment : Teacher empowerment means investing teachers with the right to participate in determining school goals and policies and to exercise professional judgement about what and how to teach. (Bolin, 1989) Teachers require autonomy and control over their own work when participating in the reform process. They become more committed to their students and feel more empowered as a result, which drives them to work harder.

- The NEP 2020 gives teachers autonomy in selecting the best pedagogy and encourages them to also ensure socio-emotional learning of their students, which is a crucial component of holistic development, in recognition of the contribution teachers can make in reforming pedagogy to improve the learning outcomes. Innovative teaching strategies used by educators to enhance student learning outcomes will be acknowledged, documented, and widely disseminated as best practises.
- It is advised that schools within a school complex work closely together since this will lessen the sense of isolation that teachers in smaller schools often feel and foster lively teacher communities that collaborate and share best practises.
- The school managements have been instructed to provide sufficient and safe infrastructure, basic amenities and hygiene, computing devices, internet, libraries, and sports and recreational resources to all teachers and students in order to assist schools and school complexes in evolving into vibrant, caring, and inclusive communities of teachers, students, parents, and principals.

Objective - (C) Challenges of teacher education on NEP 2020

1. Defective Curriculum: The curriculum is still formal and conventional. It is heavily theoretical, and the practical element is not given as much weight. Theory and reality are not very well integrated. It is unrealistic and unconnected to reality and society.

2. Selection problem: There are numerous flaws in the teacher education selection process, and there is no established procedure that must be followed when admitting students for teacher education. No tests of aptitude, attitude, or performance are administered, and



student interviews are not taken into account when determining admittance. Anyone who meets the minimal requirements for eligibility has no trouble enrolling in the course.

3. Lack of control over teacher education institutions: The NCTE, a regulatory body that oversees the operations of teacher education institutions, there is excellent instruction. The educational standards in these schools are established and upheld by it. However, the number of institutions offering teacher education has grown so dramatically over the past few years that it is challenging to keep track of them all. Some of these organisations are sacrificing quality solely for financial gain.

4. Problem of Isolation: This issue can be viewed on three different levels, including (a) the isolation of education colleges from universities, (b) the isolation of colleges from the regular operations of schools, and (c) isolation between various training institutions. The teacher training institutes also stand isolated from the community and real life.

5. Teacher educators are less competent: Teacher educators are less competent. They are not effective enough to help student teachers reach the desired degree of skill. There are lack of expertise in the topic. They are less qualified to handle issues in the classroom and student teachers' behaviour.

6. Insufficient use of science and technology: The development of science and technology has made the world more interdependent and is transforming it into a global community over time. But in order to improve pupil teaching abilities, teacher education programmes have not fully utilised the most recent technologies. In teacher education training institutions, stereotyped and academic approaches still dominate.

7. Use of traditional teaching methods: Future teachers are still frequently taught using traditional teaching methods. Children don't learn about new technologies, and experimentation. There are hardly any modern classroom communication tools in schools. How can we allow student teachers to use innovative teaching techniques if their mentors aren't doing the same.

8. A lack of life skills development: Developing life skills is important for personal development and growth. These abilities empower man to handle life's difficulties. They include social skills such as interpersonal relationships, effective communication, and empathy, as well as mental abilities such as self awareness, problem solving, creative thinking, decision making, and critical thinking. Sympathy and stress management are emotional skills. The main problem is that teacher education is memory-based, meaning that students are not actively involved. As a result, students are not developing the kind of life skills that are crucial for their overall development.

9. Globalization and Value Erosion: The world has become smaller due to globalisation and issues with science and technology. All types of information are quite simple to get. Every nook and cranny of the nation now has access to the internet. Every transaction will be carried out online. Nonetheless, there are certain variations, notably among younger students who are more likely to commit fraud. "Our propensity towards bad is more than our predisposition towards good," is a common saying. In this way, social media, the internet, and other mobile culture elements have contaminated youthful minds. Values began to deteriorate as a result.

10. Social Issues: Our country is currently dealing with a number of social problems. They include the rapid population growth, unemployment, diversity, and racial strife. If teachers are aware student of these challenges, they can protect pupils from these social issues.

11. Quality Concern: A teacher's work quality, which has a big impact on the students they teach, is related to the quality of education. The necessary standards have not been met by teacher education. Teachers lack the critical thinking skills necessary to address problems with organisations, curriculum, and teaching techniques. More theoretical information is emphasised, but teachers are unable to use this knowledge in real-world classroom settings.

12. Lack of Co-Curricular Activities: There are not enough planned Co-Curricular Activities in Teacher Education. Occasionally these activities are neglected as a result of poor time management. But, in today's world of competition, this practise has become a crucial component of academic instruction. The lack of adequate planning and organisation options offered by student teachers causes issues for instructors in their future professional lives.

13. Teaching practise issue: This is one of the major issues with teacher preparation. The way that teaching is done is neither appropriate nor effective. The responsibility of conducting teaching practise is not taken seriously by the student teacher. They act carelessly and irresponsibly. They behave with disregard for the students and the school. They simply view classroom practise as a good time and a form of entertainment. The school and its administration are also an issue since they intervene a lot, do not prepare for teaching practise sessions, and do not give student teachers the required lectures. Schools where teaching is practised are not of a high calibre. Modern technology is not accessible.

14. Lack of Supervision: In order to bring about the desired improvement in skills and behaviour, student teachers need proper supervision at each stage. Students require supervision while they plan and deliver lessons, practise skills, and otherwise gain confidence in dealing with challenging situations in the classroom. Yet, in teacher education institutes, there is a dearth of competent oversight and supervisory staff.

15. Inadequate Evaluation: The evaluation of teacher preparation is flawed. At the conclusion of the session, exams are given. Both internal and external evaluation are subjective. Sometimes, the college of education gave favourable internal evaluations to undeserving candidates in order to obtain good results.



16. Inadequate facilities: A large number of educational institutions are in poor financial standing. Basic amenities such experimental schools, labs, libraries, hostels, and buildings are lacking. Some of them are even running inside of rented structures.

17. Time Frame: For a very long time, the length of a teacher education programme was one year. The teacher education programme, which involves theory, practical applications, and internships in real schools, needs a lot more time to be implemented effectively. Although it couldn't be implemented, the national curriculum framework also suggests a two-year teacher education programme. Thus, the current teacher education programme needs to be extended.

CONCLUSION

The nation and the person both take on new forms as a result of education. There is a well-known proverb that states that teachers construct nations. Indeed, the teacher-education programme in India is given a lot of emphasis. Regrettably, the system still has a number of flaws. According to Benjamin Disraeli, 'The secret of success is to be ready when your opportunity comes!' The time has come for Indian teachers to take the chance and control their own future in light of the National Education Policy, 2020. To attain their dreams, they must work hard and dream big. They also need to share their ideas, learn from experiments and research, and gain understanding from the ideas, convictions, and experiences of other practitioners in order to be conscious, enthusiastic, and empowered practitioners. They must establish lovely bonds with successive generations of students who go through classes and continue to learn throughout their lives. Without a doubt, the new National Education Policy 2020 offers a framework to accomplish these goals and put all these requirements into action, achieving the goals of a lively society and sustainable growth. The new National Education Policy, 2020 will assist the federal and state governments in fixing issues and implementing changes to teacher preparation. After extensive research and discussion, it can be concluded that the federal government and state governments should cooperate to raise standards and improve teacher preparation. Only then will teacher preparation have a brighter future.

SUGGESTIONS

- It is possible to transact curricula using novel and creative methods. The teacher education programme should be changed to better prepare teachers for the various tasks and responsibilities imposed by new technology.
- The socio-economic status of the teachers must be raised so as to attract talented people towards the profession.
- Teachers should receive training in stress management techniques so they can assist students in doing the same and surviving in this age of social isolation, parental pressure, and fierce rivalry. Programs for teacher education should give educators the tools they need to help pupils learn how to solve problems.
- Teachers should have the ability to critically think, make wise decisions, and uphold peaceful relationships with others.
- Teaching methods should encourage self-learning and lessen reliance on instructors. They can think about themselves and try something new as a result.

REFERENCE

1. **Smitha S. (2020).** *National Education Policy (NEP) 2020 – Opportunities And Challenges in Teacher Education.* *International Journal of Management.* Vol-11, Issue-11, P-1881-1886.
2. **Sharma, S & Kumar, T. (2020)** *Problems and Opportunities in Teacher Education in the Context of National Education Policy 2020,* *International Journal for Research Trends and Innovation,* 7(7), Retrieved from <https://ijrti.org/papers/IJRTI2207236.pdf>.
3. **Bhatt, T. (2022).** *New Education Policy 2020 Challenges and Opportunities for Teacher Education,* *Neuro Quantology,* 20(20), 3414-3419 doi:10.14704/nq.2022.20.13. NQ88421.
4. **Jadhav, N. (2022).** *Issues and Challenges of National Education Policy (NEP) 2020 implementation in Teacher Education.* *International Journal of Enhanced Research in Educational Development (IJERED).* Vol-10, Issue-3.
5. **Mahanta, B. (2023).** *Recommendations and Challenges of Teacher Education in NEP- 2020.* *Journal of Emerging Technologies and Innovative Research (JETIR).* Vol-10, Issue-5, P-88-92. doi:10.14704/nq.2022.20.13. NQ88421. <https://www.researchgate.net/publication/362538441>.
6. **Aggarwal, JC (1996),** *Essentials of Educational Technology,* Vikas Publishing House, New Delhi.
7. **Anand C.L. (2000) –** *Teacher Education in emerging India,* NCERT, New Delhi.
8. **Md. Abdul malek and LokanathMishra -** *Quality assurance in teacher education,*
9. *National Policy of Education, 1986.*
10. *National Curriculum Framework, 2005.*
11. *National Education Policy 2020 , New Delhi, MHRD*
12. *Teacher in Emerging Indian Society. (2012). Delhi: PEARSON.*



DIGITAL TRANSFORMATION OF 21st EDUCATION SECTOR IN INDIA

Gopal Basak

Student, Department of Education, University of Kalyani, Nadia, West Bengal, 741235

ABSTRACT

Transformation of digital technology is regarded as 21st century education. There is a significant opportunity for digital transformation in the Indian educational system, particularly in schools, institutions, and colleges. Yet, digitalization and digital approaches are a means of increasing access to education or learning modules by making them available online as well as digitising the content of lectures. Modern students now demand the extensive use of digital resources. Potential students constantly search for advanced learning alternatives outside of the conventional classroom setting. Schools and universities must create new, cutting-edge teaching methods while keeping in mind the circumstances and requirements of today's youth.

Never underestimate the power of technology. With a population of 1.31 billion, the country has seen a significant rise in the usage of technology in recent years. India has a big possibility to develop in this area and to seize the benefits of technology in the field of education because it has approximately 140 million mobile phone users and ranks second in the world for the number of social media users. The Indian educational system is receiving fresh hope thanks to ongoing technological advancements, the rise of social media, the Internet of Things, artificial intelligence (AI), augmented reality, and virtual reality.

KEY WORDS: *e-learning, Digitalization, Modern EDUCATION, Online Learning.*

INTRODUCTION

The educational system in India is as diverse as the huge nation's culture, languages, heritage, etc. There are schools that believe in stressing value education by following the Gurukul system, where kids are taught under the trees while having world-class facilities, and there are schools that have fully digitalized. While some can afford international exchange programmes, some schools place more of an emphasis on books and the physical development of children through internal activities. Meanwhile, there are schools where pupils have trouble getting books. India occupies a significant position in the global education sector. The nation has more than 1.4 million schools with more than 227 million kids enrolled, as well as more than 36,000 higher education institutions, according to the National Sample Survey Office's study. One of the world's most extensive higher education systems is found in India. Equitable Access and Quality are two competing demands on resources that technology is in a position to delicately balance.

Prime Minister Modi has created programmes like Digital India with a great deal of responsibility in digital technologies. India will become a knowledge economy and society as a result of this. The idea behind Digital India is to reform India's educational system. It offers the chance to access educational resources on a worldwide scale. Students today spend a lot of time online and on their smart phones in order to access a wealth of content and advance their knowledge. The only option left for educational institutions, including schools, colleges, and universities, is to adopt these new technology. The most recent technology has given students a unique and new platform.

The use of information and communication technology (ICT) offers a great deal of potential for raising the standard of education provided and expanding access to it across the nation. To achieve this, the National Mission on Education through Information and Communication Technologies (NMEICT) Project, run by the Department of Higher Education within the Ministry of Human Resource Development (MHRD), has launched numerous projects. SWAYAM, SWAYAMPRAKASH, DIKSHA, NDL, NAD, FOSSEE, e-Pathshala, e-PGPathshala, e-ShodhSindhu, e-Yantra, e-Acharya, e-kalpa, Talk to a Teacher etc. And private sector BYJU'S, UNACADEMY, VEDANTU, MERTINATION, TOPPR, DOUBTNUT, K8SCHOOL, CLAS SSAATHI and many others government and private initiatives are helping the students as well as teachers providing them quality educational resources. Additionally, these efforts will result in a vast knowledge base, useful resources, and enablers that will not only provide quality education and accessibility



but also inspire creativity and innovation in the minds of a billion people, especially young students, and thus help them realise their full potential in contributing to the development of the country.

REVIEW OF RELATED STUDY

Agarwal, et. al. (2010). Studied on “Research Commentary: The Digital Transformation of Healthcare: Current Status and the Road Ahead”. In this studies on HIT to provide an overview of the current status of HIT research. Identify three major areas that warrant further research: (1) HIT design, implementation, and meaningful use; (2) measurement and quantification of HIT payoff and impact; and (3) extending the traditional realm of HIT. We discuss specific research questions in each domain and suggest appropriate methods to approach them. We encourage information systems scholars to become active participants in the global discourse on health-care transformation through IT.

Iivari, et. al. (2016). Studied on “The future digital innovators: Empowering the young generation with digital fabrication and making”. This is where this study contributes and it does so by focusing on the perspective of the young generation, in whose hands the future of IS profession, indeed, lies. Digital technology has become intimately intertwined with our everyday life. New stakeholders take part in its development and innovation processes, including children. Calls for offering more in-depth technology knowledge for children have emerged within research on digital fabrication and the maker movement: children need to be educated to design, make, and build new technology. We critically examine existing studies on digital fabrication and making with children, in order to see what the potential of digital fabrication and making for empowering children to become digital innovators of the future is. Implications to IS research, practice, and education are presented.

Balyer, A., & Öz, Ö. (2018). Studied on “Academicians’ views on digital transformation in education. International”. In this study was designed with a phenomenological research design as the qualitative approach in order to determine academics’ views on digital transformation in education in terms program and management processes. In extend of study, academicians give their view point on effective learning can also be achieved through digital tools like Artificial intelligence, learning analytics, online learning, virtual learning as well as its also required to redesign the physical environment & infrastructure equipped with Information and Communication Technology.

R. Raja., & P. C. Nagasubramani., (2018). Studied on “Impact of modern technology in Education”. The purpose of this study is to importance of technology in education system with reference to schools in Chennai and found that with the onset of latest technology like ICT, and other digital tools are very helpful to impart knowledge to our students and process of teaching and learning can be more enjoyable.

Kundu, et. al. (2018). Studied on “A Contemporary Study on the Flourishing Elearning Scenarios in India”. In this article wrote that the Government of India has played a major role in the development of e-learning in India and the Department of Electronics and Information Technology is developing tools and technologies for promotion of e-learning by supporting Research and Development projects at various academic and educational institutes revolving around content development, Research and Development technology initiatives, human resource development projects and faculty training initiatives to improve literacy through distance education in order to improve general literacy and education levels in the country. Rs. 17000 crore has been allocated for this purpose in the Year 2017-18 by the Government for boosting the Skill India Mission. This investment has had a beneficial effect for the domestic and foreign product and services providers in the e-learning market in the country.

Vial, G. (2019). Studied on “Understanding digital transformation: A review and a research agenda”. Purpose of this study digital transformation as a process where *digital technologies* create *disruptions* triggering *strategic responses* from organizations that seek to alter their *value creation paths* while managing the *structural changes* and *organizational barriers* that affect the *positive* and *negative* outcomes of this process. Building on this framework, we elaborate a research agenda that proposes [1] examining the role of dynamic capabilities, and [2] accounting for ethical issues as important avenues for future strategic IS research on digital transformation.

Papagiannidis, et.al. (2020). Studied on “WHO led the digital transformation of your company? A reflection of IT related challenges during the pandemic”. In this paper we reflect on a number of IT related challenges during the COVID19 pandemic, primarily from a CIO and IT professionals perspective. We consider three time periods, namely the period before the pandemic, the response to the pandemic and the period after it. For each period we discuss the key challenges that practitioners faced and outline important areas to consider for the future. Hopefully, the lessons learnt and the experiences gained will positively inform future academic research and practice.



Roy (2020). Studied on “e-learning Scope and Trend in India”. The purpose of this study educational content development for students of different foreign institutions, employee training programme of different corporates, banks and also for some professional institutes.

STATEMENT OF THE PROBLEM

After above mentioned reviewed work, the present researcher finds the knowledge gap as well as selected the problem is “DIGITAL TRANSFORMATION OF 21st EDUCATION SECTOR IN INDIA”.

OBJECTIVES OF THE STUDY

- A. To study the various opportunity government initiative e-learning portal.
- B. To discuss private initiative e-learning opportunity.
- C. To study present status of e-learning in India.

METHODOLOGY OF THE STUDY

This is descriptive study is based on the analysis of secondary data only. The data for the study has been collected through relevant research journals, thesis, articles, books, magazines and present available literature on websites. Various government reports have also been considered.

ANALYSIS AND DISCUSS THE OBJECTIVES

Objective (A) - The Digital Initiative of MHRD 21st Century

The "Bharat Padhe Online" (India Study Online) campaign was started by the Ministry of Human Resource Development (MHRD) to collect suggestions from the public on ways to enhance India's online education system. A week of the campaign was spent in April 2020 and received more than 3,700 suggestions via email and Twitter. The MHRD has launched several e-learning portal as social initiative and the related wellbeing of student.

1. SWAYAM is an indigenous platform for providing best quality education that can be accessed by anyone, anytime, and anywhere using the IT system. It was launched by the Government of India to achieve the three Cardinal principle of education access equity and quality. It is capable of hosting 2000 courses and 80000 hours of learning, covering both school (classes 9 to 12) and higher education (under-graduate, post-graduate, engineering, law, and other professional courses). There are more than 1000 specially chosen faculty members. UGC regulation 2016 credit transfers are possible for SWAYAM courses. Website: <https://swayam.gov.in>

2. SWAYAM PRABHA is a group of 34 DTH channels devoted to telecasting of high-quality educational programmes on 24X7 basis using the GSAT-15 satellite. Every day, there will be new content for at least (4) hours which would be repeated 5 more times in a day, allowing the students to choose the time of their convenience. The channels are uplinked from BISAG-N, Gandhinagar. The contents are provided by NPTEL, IITs, UGC, CEC, IGNOU. The INFLIBNET Centre maintains the web portal. The channels cover both school education (9 to 12 classes) higher education post-graduate and under-graduate levels covering diverse discipline, such as arts, Science, commerce, performance arts, social science and Humanities, engineering, Technology, law, medicine, agriculture, etc. Website: <https://swayamprabha.gov.in>

3. DIKSHA is the 'One nation: One digital platforms' for school education in India. This portal contains E-learning platform an initiative of NCERT under the agencies of MoE GoI. launched in 2017 by honorable vice-president of India- Shri M. Venkaiah Naidu. It is a storehouse of a large number of eBooks and e-Contents created by States/UTs and National level organizations. The e-Textbooks of NCERT/ states and related e-Contents, mapped with QR Codes, are available on DIKSHA, which can be accessed at <https://diksha.gov.in/> DIKSHA is being transformed into a platform for the coherence of access with TV and radio. DIKSHA is designed to inherently support states/UTs and other school boards to exercise autonomy, independence, and choice to craft and run learning programs to suit their needs and achieve their goals. E-Content is available in 36 Indian languages. It has more than 80,000 e-Books for classes 1 to 12 created by CBSE, NCERT in multiple languages. Website: <https://diksha.gov.in>

4. e-Pathshala is a webpage and software was created by the CIET and NCERT. Launched in November 2015, it was jointly started by the Ministry of Human Resource Development, CIET, and NCERT. It provides educational resources for researchers, educators, parents, and students, and may be accessible online and through Google Play, the App Store, and Windows. There are three languages of the text: English, Hindi, and Urdu. A wide range of print and digital educational resources are available on the platform, including NCERT textbooks for classes 1 through 12, audio-visual resources created by NCERT, journals, supplements, teacher training modules, and other items. Website: <https://epathshala.nic.in>

5. e-PG Pathshala a project of the MHRD's National Mission on Education via ICT (NME-ICT), which is being carried out by the UGC, is e-PG Pathshala. Since content and its quality make up the main building blocks of the educational system, subject experts working in Indian universities and other R & D facilities across the nation have created high quality, curriculum-based, interactive e-content in 70 subjects spanning all disciplines of social sciences, arts, fine arts and humanities, natural & mathematical sciences,



linguistics and languages. The lead investigator, paper coordinators, content authors, content reviewers, language editors, and multimedia team were all assigned to each subject. There are 20000 e-Text, 19000 video, 30000 quiz, 723 paper available in this portal. Website: <https://epgp.inflibnet.ac.in>

6. NATIONAL ACADEMIC DEPOSITORY(NAD) it is an initiative of the MHRD to facilitate digital issuance, storage, access and verification of academic awards issued by academic institution. NAD is a 24 × 7 online store house. It is unique innovative and progressive initiative under 'Digital India' theme towards achieving digital enablement of the education record. It aspires to make the vision of Digital Academic Certificate a reality for every Indian. Website: nad.gov.in

7. NATIONAL DIGITAL LIBRARY(NDL) is a virtual library of learning resources that offers a wide range of services for the community of learners and users, including access to textbooks, articles, videos, audio books, lectures, simulations, fiction, and other types of learning media. It is an initiative of the National Mission on Education through Information and Communication Technologies of the Indian Ministry of Education (NMEICT). The goal is to gather metadata from several national and international digital libraries, as well as from other pertinent sources, and to offer a comprehensive text index. There are available 11 language. It is developed, operated and maintained from Indian Institute of Technology Kharagpur. Website: ndl.gov.in

8. e-Shodh Sindhu has created MHRD by combining three consortia initiatives, namely UGC-INFONET, digital library consortium, NLIST, and INDEST-AICTE consortium, to give the research and academic community in the nation access to peer-reviewed journals and a number of bibliography, citation, and factual databases in various disciplines. More than 15000 international electronic journals and e-books are made available to all the higher educational institutions through the e-Shodh sindhu initiative. <https://www.inflibnet.ac.in/ess>

9. e-Yantra MHRD initiative under the NMEICT programme is implemented to incorporate robotics into engineering education with the objective of engineering student. This needs exciting skill of mathematics, computer science and Engineering principle. <http://www.e-yantra.org>

10. e-Acharya also called 'Integrated e-Content portal' of the NMEICT, is the official repository of NMEICT e-content, and all content produce under NMEICT is being put all this repository platform at INFILIBNET centre Gandhinagar. The basic tenets of preservation of digital content and implementing standard metadata scheme are provided. Content are mostly provided by the NCERT. <http://eacharya.inflibnet.ac.in/vidya-mitra/>

11. e-kalpa it is another MHRD/NMEICT initiative. It create digital learning environment for Design in India. It has successfully achieved the digital online content for learning design with e-learning program on design. <http://www.dsource.in/>

12. FREE AND OPEN SOURCE SOFTWARE FOR EDUCATION (FOSSEE) project sanctioned to IIT Bombay has been promoting the use of open source software in educational institution. It does this through instructional material, such as spoken tutorials, documentation, such as textbook companions, awareness programmes, such as conference training workshops and internships. The textbook companion is a collection of code for solved examples of standard textbook. Scilab and python TBCs are also on the cloud. <https://fossee.in>

13. TALK TO A TEACHER developed by IIT Bombay is an initiative of the national Mission on education through ICT. It has been funded by the MHRD to provide free access to a selected few graduate and postgraduate courses, taught at IIT Bombay largely by distinguished faculty members and scholars. It uses A-View collaboration tool developed by Amrita University for providing virtual classroom to the faculty across the country. <http://aview.in>

Objective (B) - The Digital Initiative of Private Sector 21st century

Many private online learning platforms are providing free access to their services in response to high demand, including those like

1. UNACADEMY is an Indian provider of online learning platforms with its corporate headquarters in Bangalore, Karnataka. It offers information on fundamental (K–12) and skill-building courses such as programming, photography, entrepreneurship and in addition to preparing students for a variety of competitive exams such as JEE, NEET, UPSC, GATE, UPSC NDA, Boards, etc. In 2015, Gaurav Munjal, Hemesh Singh, and Roman Saini formed it. Unacademy was valued at \$3.44 billion USD as of May 2022. February 2019 Unacademy plus subscription based concept was introduced. With the Unacademy Plus Membership, students have access to 14 Indian languages, including Hindi, Punjabi, Telugu, Tamil, Malayalam, Marathi, Bengali, Gujarati, and Bhojpuri, as well as live classes. Unacademy introduced Graphy in 2020, a tool that enables designers to establish their online school in less than 60 seconds. Unacademy launched its first offline learning centre in Kota, Rajasthan, in May 2022. Website: unacademy.com

2. BYJU'S is an international educational technology corporation with its headquarters in Bangalore, Karnataka, India. Byju Raveendran and Divya Gokulnath launched it in 2011. Byju's is estimated to be worth US\$22 billion as of March 2022, and the firm states that there are over 115 million enrolled students. An education tutoring software Byju's has a freemium business model, with free access to information only available for 15 days following enrollment. It was introduced in August 2015 and provides educational materials for students in classes 4 to 12. In 2019, an early learning programme for classes 1 to 3 was introduced. Additionally, it prepares students for worldwide exams like the GRE and GMAT as well as Indian exams like the IIT-JEE, NEET, CAT, and IAS. Academic ideas are clarified via 12- to 20-minute digital animation videos, which let students learn at their own pace. According to Byju's, it has a total user



base of 40 million, 3 million paying members annually, and an annual retention rate of over 85%. It app in regional Indian languages in 2019. The establishment of "Byju's Future School," which will be run by WhiteHat Jr. Founder Karan Bajaj, was also announced by the business in April 2021. The Future School uses an interactive learning platform along with coding and other topics like math, science, english, music, and fine arts through storytelling to bridge the gap between passive and active learning. Website: byjus.com

3. VEDANTU is another well-liked website for individualised online education. Indian online tutoring platform Vedantu was established in Bengaluru, India, in 2014. Regular tuition is available for the ICSE and CBSE boards. Also, students have the option of selecting micro-courses with recorded or live delivery. Students take live, one-on-one sessions online from Vedantu, which covers all the important boards (CBSE, ICSE, IGSCSE, IB, and state board). Vedantu is listed as the third-best e-learning site in India for 2023. Live lectures and interesting internet material, Live quizzes, student engagement, and unrestricted study resources (NCERT solutions, popular book solutions, solved questions, etc.) Super Kids of Vedantu (Reading classes, English program, and coding classes). Preschool, grades 1 through 12, and JEE and NEET classes begin. Website: Vedantu.com

4. MERITNATION is another website that provides a top-notch online learning environment. It was started in the year 2009, Founders Pavan Chauhan, Ritesh Hemrajani. The top teachers' interactive classes can be found on this platform for students. Also, users can buy courses with premium plus features. It includes state boards from Karnataka, Maharashtra, Gujarat, Kerala, and Tamil Nadu as well as boards like the CBSE and ICSE. a specific messaging platform for communicating with teachers. scientifically conceived educational materials, tests and intelligent reports. 24-hour feature for resolving doubts (through chat). classes begin for grades 1 through 12. Website: <https://www.meritnation.com>

5. TOPPR it was founded Zishaan Hayath and Hemanth Goteti the online test preparation platform in 2013. Indian students can download a learning app from Toppr. The "Best Tech in Education" awards were given to this platform in 2019. With the aid of top teachers, students can learn online. And through flexible and self-paced learning possibilities, it places a strong emphasis on developing conceptual knowledge. One of the top online learning platforms for JEE aspirants is Toppr. This online learning environment offers video classes, adaptive learning with pacing options, chat help for step-by-step guidance, a live tutoring option available around-the-clock, and a comprehensive syllabus. classes begin from ages 5 to 12. Website: <https://www.toppr.com>

6. DOUBTNUT an educational software was created in India by Tanushree Nagori and Aditya Shankar. In 2016, Doubtut's official website and Android app are both accessible through Google Play. As the name implies, Doubtut essentially serves as a platform for students to get their questions answered. When you have a question, you can either search the Doubtut app or website or upload an image of the issue to obtain the solution. To aid with understanding, the solution is presented as a video. NCERT courses for grades 6 through 12 and IIT-JEE preparation are also available on Doubtut. For youthful JEE hopefuls, Doubtut also offers study materials, crash classes, and a scholarship scheme where the top 1,000 ranked applicants receive cost reductions. Doubtut is free for all users, unlike some of the other education and learning apps on the list. Since there is currently no iOS version, the app is exclusively accessible to Android users. Website: doubtut.com

7. K8 SCHOOL India's first online learning school in India. It provides students with reasonably priced options for online education. And through its connection with Discovery Education, it obtains the best instructional resources available worldwide. Pupils are able to study on flexible times while being safe at home. Through a variety of hands-on activities, they can benefit from an immersive learning experience and deepen their comprehension. This school's learning platform provides access to top-notch online resources. And in India, it is a well-known brand for skill-based online education. Class start nursery to grade 8. In this platform available affordable 100% online educational opportunities, opportunity for personalised learning, online courses taught by qualified instructors, a user-friendly learning platform (LMS), a variety of online resources for learners of various types, Exceptional STEM connections to develop the 4Cs of the 21st century. Website: <https://k8school.com>

8. CLASS SAATHI is yet another well-liked educational tool for both students and educators. The programme can be used for self-study or review, inspiring the direction of educational technology in the future. age group of six to ten. Each grade that a student successfully completes earns them a certificate. Also, the platform adapts examinations for students based on their prior performances (using artificial intelligence). Tailored quizzing, personalised mock tests, AI-powered self-assessment solutions, and constant feedback are all available on this platform. Webapp: <https://class-saathi.web.app>

C. PRESENT STATUS

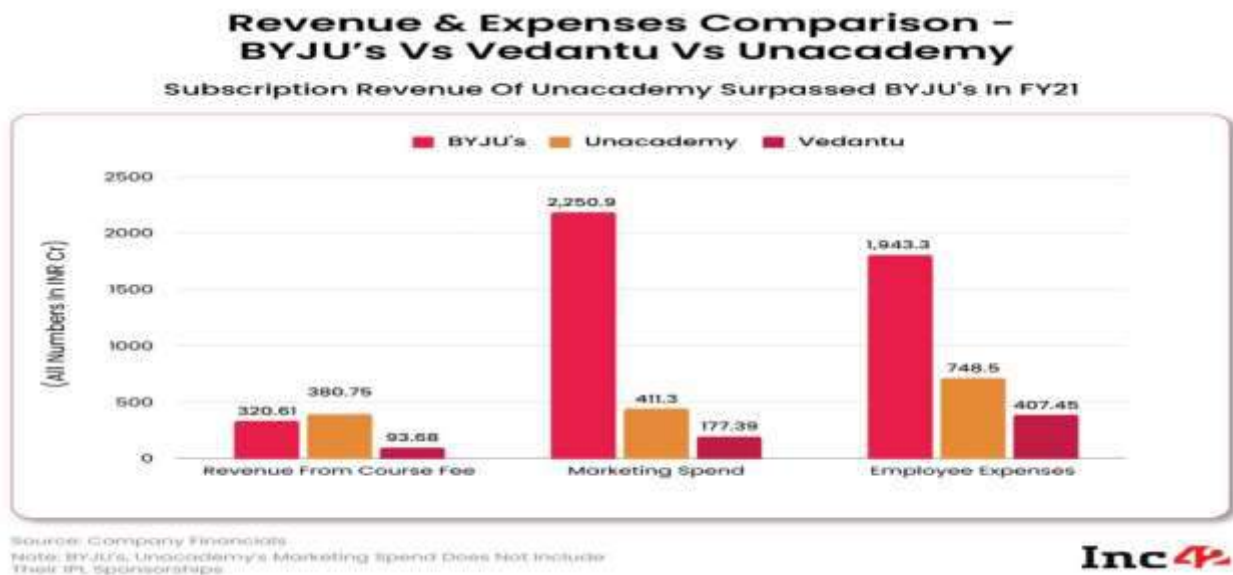
The most fundamental level of online education—schools and colleges—has been impacted by the global epidemic. As education is reaching them rather than the other way around, students who commute a long distance find it to be a more flexible and convenient option. The internet has made a name for itself as an essential resource for self-study. In order to find the most recent information, using search engines like Google, Bing, and Yahoo might be helpful. Students can conduct research on any subject to increase their knowledge and obtain necessary study resources, both of which are important for their academic success. In India, there are more than 370 million internet users, which contributes to the rapid growth of online learning. At this time, the Indian e-learning market is worth more than \$3 billion. With the use of secondary data sources, the author has here depicted the current state of the online educational platform.



Byju's reports to have 150 million users overall, 7 million annual paid subscribers, 71 minutes average time spent by a student daily and used by student across 1701+ cities world wide and Rs. 10,000 crore in gross revenues in FY 22 and its K-12 education business is showing accelerated growth. Between April–July 2022, the company logged a revenue of Rs. 4530 crore. This app valuation 21 billion, number of educators 21k and total employees 4k. Unacademy now has 99 million registered users and 1 million paying subscribers, September 2022. This app valuation 3.4 billion, number of educators 91k and total employees 8k. Vedantu expects to have more than 1 million paying subscribers, around more than 35 million users, 1 billion valuation, numbers of educators more than 500 and total employees more than 5.5k.

BYJU'S, the company with the greatest market capitalization in the edtech industry, had promised to become profitable by FY18 but, other than a meagre profit of over INR 10 Cr in FY19, failed to do so even in future years. It posted a loss of INR 4,600 Cr in FY21. The fact that BYJU's business promotion costs increased by 1.5X from FY20 to INR 2,250.9 Cr in FY21 is telling (the pre-pandemic year). The unicorn spent approximately four times as much on advertising and marketing in FY21 as Unacademy and Vedantu combined. These costs included paying prominent celebrities like Shah Rukh Khan, who serves as the official brand ambassador, becoming the title sponsor of India's men's cricket team, and running advertising and marketing campaigns with numerous A-list celebrities throughout India. Moreover, business promotions accounted for 20% of Unacademy and Vedantu's total expenses while accounting for 32% of BYJU'S total expenses. The financial papers show that Unacademy generated INR 380.75 Cr in course fee income in FY21 while BYJU only made INR 320.61 Cr in subscription revenue. The hardware sales that made up the majority of BYJU's revenue are also included in the company's overall revenue. Because BYJU's is primarily a corporation focused on selling courses rather than devices, tablets, SD cards, and laptops, this has caused concern for some analysts once again. Moreover, BYJU's spent approximately 27% of its expenses on personnel in FY21 compared to Vedantu's 55% and Unacademy's 36% (at INR 748.5 Cr) (at INR 407.45 Cr).

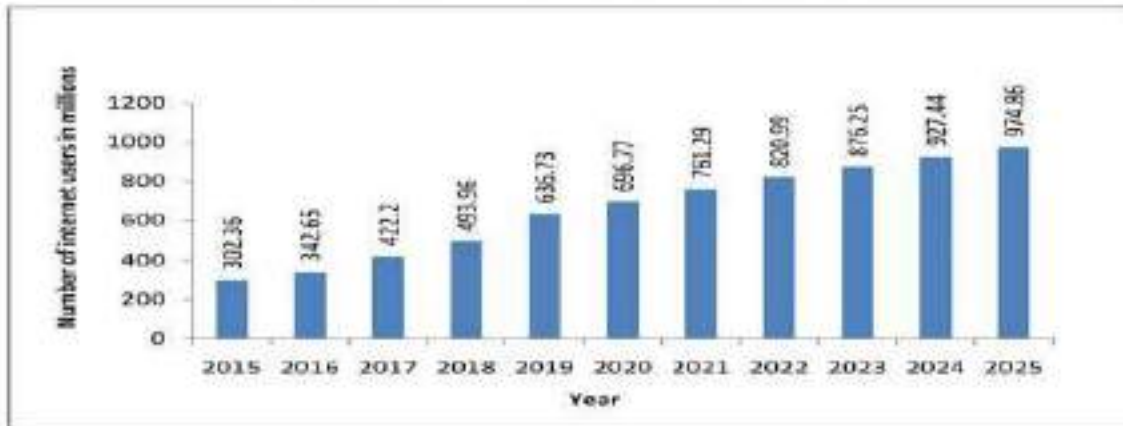
Figure - 1 Rise of Educational App Users



India has the world's largest population of about 500 million in the age bracket of 5-24 years and this provides a great opportunity for the education sector. The education industry in India is estimated to reach US\$ 144 billion by 2020 from US\$ 97.8 billion in 2016. Education sector in India remains to be a strategic priority of the government. Skill India Mission 2015 aims at skilling around 400 million youths in the country by 2022. Internet users are growing continuously at a steady pace every year, the same trend is expected to continue in future years also in India. Number of internet users in India from 2015 to 2020 with a forecast until 2025 (in millions).



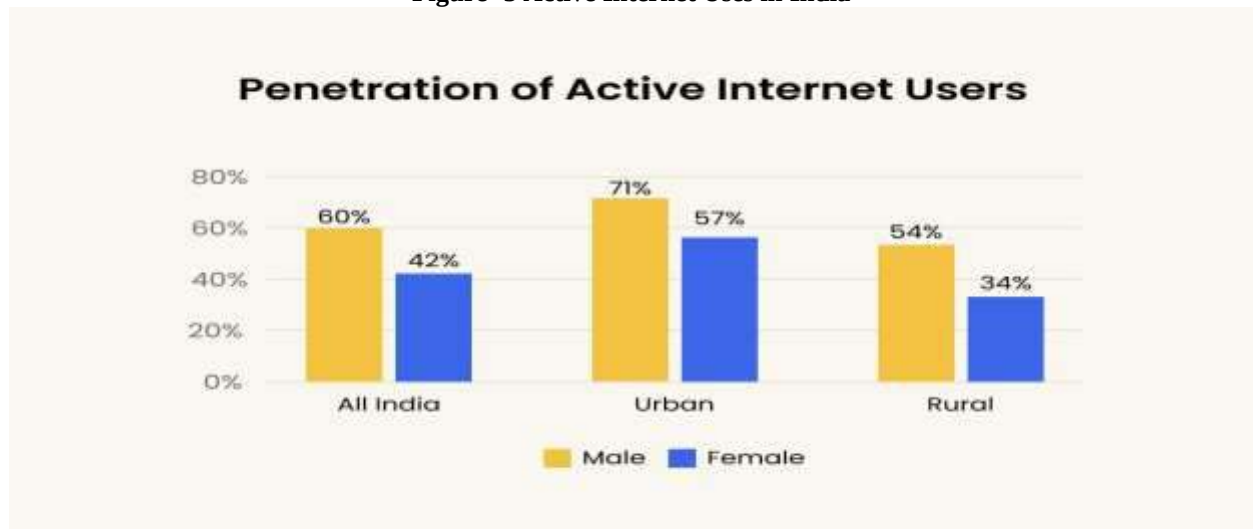
Figure -2 Number of Internet Users in India.(in millions)



Source: <https://www.statista.com/statistics/255146/number-of-internet-users-in-india>

It is clearly shown in the Figure 1 that the internet users have more than doubled in year 2020 as compared with year 2016. The survey report of 2019 by the Internet & Mobile Association of India and Nielsen also added that India is having the second largest internet users after China. Rural India has more internet users than urban area. In 2019, 433 million people aged 12 and above, along with 71 million aged 5–11, accessed the internet. In 2022, 759 million individuals used the internet monthly. By 2025, it's anticipated that this number will increase to 900 million.

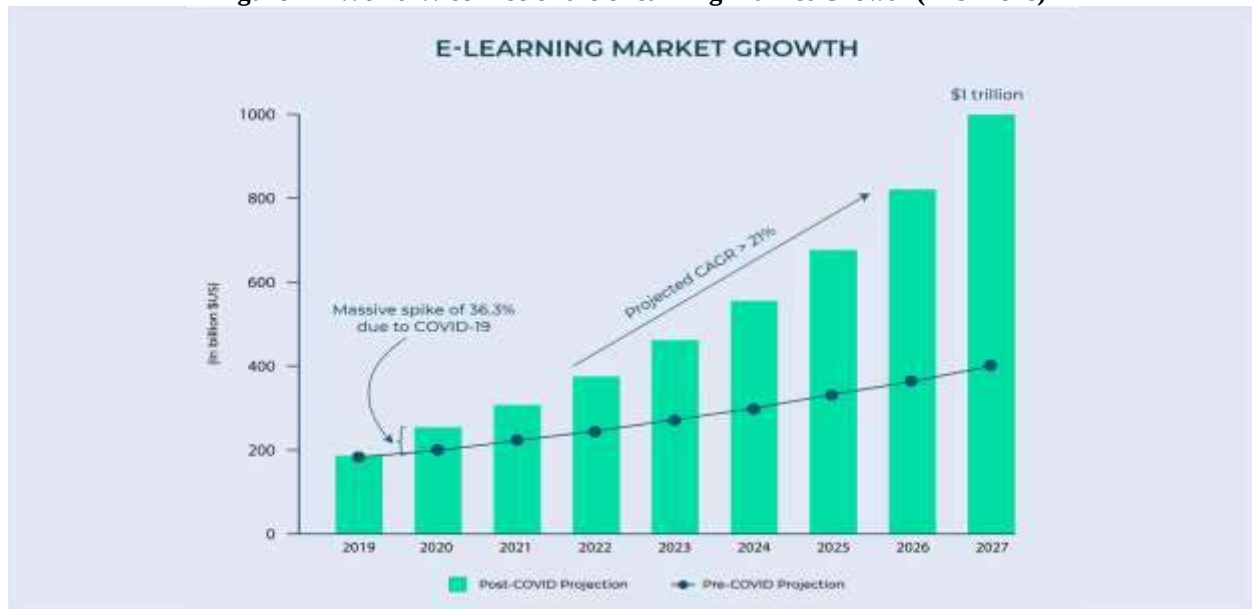
Figure -3 Active Internet Uses in India



<https://www.grabon.in/indulge/tech/internet-users-statistics/>

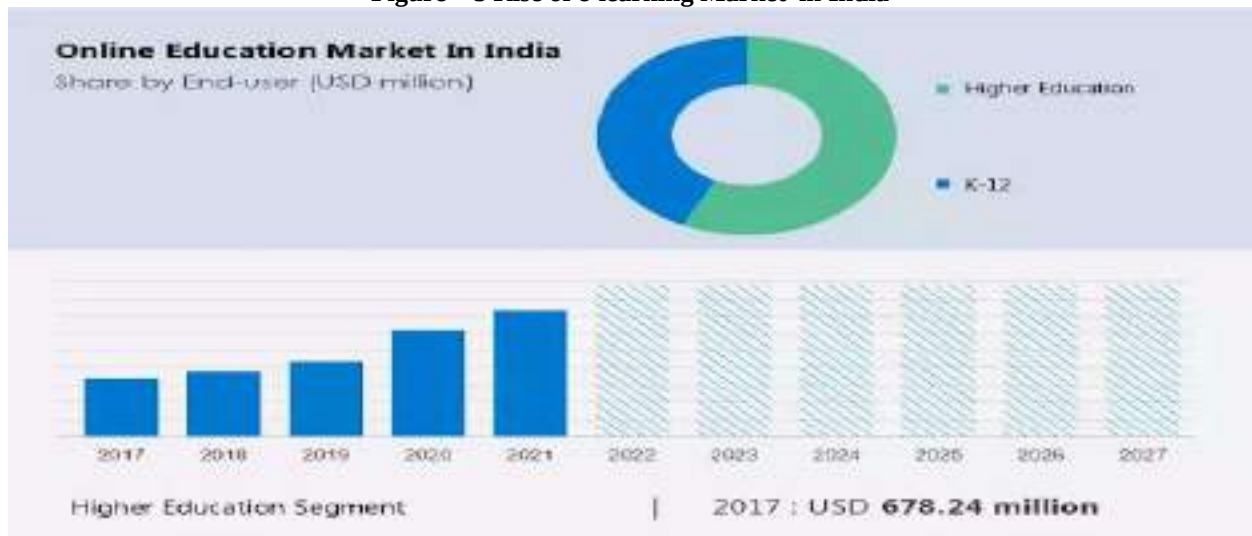


Figure – 4 World Wide Rise of the e-learning Market Growth (in billions)



<https://images.app.goo.gl/jea5TFiP6cEV7Skq9>

Figure – 5 Rise of e-learning Market in India



<https://www.hellobuyer.in/2023/05/online-education-market-in-india-2023.html>

CONCLUSION

Significant digital changes seen as education for the twenty-first century. We were compelled by the pandemic to undergo a remarkable digital transformation in all aspects of our lives and routines, including education. Education quickly changed from being a regular classroom activity to a distant, digitalized one. Suddenly, in order to engage in school, a whole generation had to learn how to use and master digital tools. This necessitated major adaptations from the administration, families, instructors, and children as well as from the broader society. Even if the topic of digitalization in education has been popular for a long time in many While digital tools and disciplines are widely used in educational institutions now, educators—including instructors, students, and administrators—have not received enough training to take on leadership roles and act as change agents in the digital revolution of education. In India, digital learning will play a major role in the future of the subcontinent's educational system. The extent to which smart technologies are transforming the nation's whole educational system is startling. The rural market's adoption of digital education is changing quickly. Direct-to-device technology and reasonably priced high-speed internet are enabling remote learners to advance their education and learn



online. In the near future, the education sector will see an increase in the number of small, medium, and big EdTech start-ups providing academic institutions with a range of cutting-edge digital products. In an effort to develop rules that would stimulate the nation's digital education industry, the government is also making significant initiative. State Education is under the direction of the Centre. To ensure that curricula and instructional strategies are appropriately planned, the Centre has instructed State Education Departments to map the internet access that each of its pupils has access to. Like many other professions, digital education will undergo significant changes in the near future.

REFERENCE

1. Agarwal, R., Gao, G. (Gordon), DesRoches, C., & Jha, A. K. (2010). *Research Commentary: The Digital Transformation of Healthcare: Current Status and the Road Ahead*. *Information Systems Research*, 21(4), 796–809. <http://www.jstor.org/stable/23015646>
2. Iivari, N., Molin-Juustila, T., and Kinnula, M. (2016). *The future digital innovators: Empowering the young generation with digital fabrication and making*. Conference: International Conference on Information Systems (ICIS) At: Dublin, Ireland
3. Balyer, A., & Öz, Ö. (2018). *Academicians' views on digital transformation in education*. *International. Online Journal of Education and Teaching (IOJET)*, 5(4), 809–830. <http://iojet.org/index.php/IOJET/article/view/441/295>
4. R. Raja., & P. C. Nagasubramani., (2018). *Impact of modern technology in Education*, *Journal of Applied and Advanced research*, *Journal of Applied and Advanced Research*, Issue:3, Pp.33–39.
5. Kundu, A., & Dey, N, K. (2018). *A Contemporary Study on the Flourishing Elearning Scenarios in India*, *IJCRT | Volume 6, Issue 2 April 2018 | ISSN: 2320-2882 . DOI:10.13140/RG.2.2.14695.98725*
6. Vial, G. (2019). *Understanding digital transformation: A review and a research agenda*. Volume 28, Issue 2, June 2019, Pages 118–144. <https://doi.org/10.1016/j.jsis.2019.01.003>
6. Papagiannidis, S., Harris, J., and Morton, D. (2020). *WHO led the digital transformation of your company? A reflection of IT related challenges during the pandemic*. *International Journal of Information Management Article 102166*. doi: 10.1016/j.ijinfomgt.2020.102166
7. Roy, S (2020). *e-learning Scope and Trend in India*. DOI:10.13140/RG.2.2.23177.19042 https://www.researchgate.net/publication/338913710_elearning_Scope_and_Trend_in_India
8. <https://en.unesco.org/covid19/educationresponse>
9. <https://www.indiatodayin.cdn.ampproject.org/v/s/www.indiatoday.in/amp/educationtoday/featurephilia/story/covid-19-impact-digital-education-conventional-education>.
10. Wikipedia. *Covid-19 Pandemic in India*. Retrieved on https://en.wikipedia.org/wiki/Education_in_India
11. Wikipedia, *Education in India* Retrieved on August 24, 2020 from <https://en.unesco.org/covid19/Educationresponse>
12. MHRD notice (20 March, 2020). *COVID-19 Stay Safe: Digital Initiatives*. Retrieved on May 25, 2020 from <https://www.mohfw.gov.in/pdf/Covid19.pdf>



ZAHID KAWTHARI'S WORK "MUQADDIMAT" AND ITS UNIQUENESS

Khabibidinov Baburshah Abduvali ugli

Doctoral Student, International Islamic University of Uzbekistan

ABSTRACT

This article talks about the life and work of Zahid Kawthari, who lived in the last century, and his work "Muqaddimat". The main part of Alloma Zahid Kawthari's work consisted of writing refutational works against the sectarian ideas that were gradually spreading in some regions at that time. In the work "Muqaddimat" various fields of Islamic studies are widely covered.

KEYWORDS: *Zahid Kawthari, Cairo, Islam, Al-Muallami, Caucasus, Fiqh, Sunnah.*

More than a year ago, Islam lost an imam from among the Muslim imams who raised themselves above the absurdity of this life, and turned to knowledge as a believer does to worship his Lord. This is because he knew that knowledge is an act of worship through which the scholar seeks the satisfaction of God and not the satisfaction of anyone else, and does not seek to raise himself in it. The earth, no corruption, and no prolongation due to his position, and he does not want it as a symptom of this world, but rather he seeks it to support the truth in order to please the truth, glory be to Him. That is Imam Al-Kawthari, may God have mercy on him

He was pleased with him and pleased with him.

I do not know that a scholar died and his place was lost in these years as the place of Imam Al-Kawthari was lost. Because he is the remnant of the righteous predecessors who were not made a mercenary or a Muslim

Rather, it was the ultimate goal for them and the loftiest place for their sights. Behind the knowledge of religion there is no goal that a believer can seek, nor is there any elevation that a scholar can reach.

He - may God be pleased with him - was a scholar who fulfilled the old saying (scholars are the heirs of the prophets), and he did not see that inheritance as an honor only to be proud of it and dwell on it.

People saw this inheritance as a jihad in declaring Islam, clarifying its truths, and removing the illusions that affect its essence, so that he would reveal it to the people as pure, bright, and luminous.

So people live by His light and are guided by His guidance, and that inheritance requires the scholar to strive as the prophets struggled and to be patient in adversity and adversity as they were patient, and to encounter hardship from those who call them to the truth and guidance as they did. This inheritance is not an honor except for the one who takes into account its causes. He fulfilled his rights and knew his duty

In it, and so was Imam Al-Kawthari - may God be pleased with him.

That venerable Imam was not one of those who imitated a new doctrine, nor was he one of those who preached something that had never been done before. He was not one of those whom people today call "renovation." Rather, he was alienated from them, for he was a follower and not an innovator. But I say nonetheless. He was one of the innovators in the true sense of the word renewal, because renewal is not what people know today, which is the removal of the shackles and the restoration of the era of the first prophethood. Rather, renewal is that the religion should be restored to its splendor, removing any illusions attached to it, and making it clear to people as pure as its essence, as pure as its origin. It is a matter of renewal that the Sunnah lives, the heresy dies, and a pillar rises among the people Debt.

That is renewal in truth and sincerity, and Imam Al-Kawthari revived the Sunnah of the Prophet, revealing what was hidden between the folds of history, including its books, and the methods of its narrators, and he announced to the people in letters written down and in books he composed, the Sunnah of the Prophet, may God bless him and grant him peace, from his sayings, deeds, and reports.



Then he devoted himself to the efforts of the previous scholars who upheld the Sunnah and cared for it properly, so he published their books in which their deeds were recorded to revive the Sunnah and the religion.

With corruption, the scholars were not distracted by this world from the afterlife, and they were not among the ranks of kings.

Imam Al-Kawthari was a true scholar. His knowledge was known to scholars, and few of them understood his jihad. I knew him for years before I met him. I knew him in his writings in which the light of truth shines, and I knew him in his comments on the manuscripts that he published, and what he was and was. I admire the manuscript as much as I admire the comment from He commented on it. The manuscript was sometimes a small treatise, but the Imam's comments on it make it a readable book. Comprehension, erudition, and breadth of horizons are clearly visible in the commentary, all with the elegance of expression, the kindness of gesture, the strength of criticism, the hitting of the target, and the mastery of it. On thinking and expression, and it cannot occur to the reader that he is a non-Arab writer and not a clear Arab, and due to his extreme humility he did not write along with the title of the book his official work that he carried out during the rule of the Othman family, because he did not see - may God be pleased with him - that The honor of a scholar is obtained from his official work, but rather from his scientific work. Some readers - due to the integrity of the structure, the accuracy of the meaning, the brilliance of the preamble, and the magnificence of the style - did not think that the writer was Turkish, but rather believed that he was an Arab who was born an Arab and lived as an Arab, and he was not shaded. Except an Arab environment. But there is no wonder, for he was Turkish in his lineage, in his upbringing, and in his human life during the period that he lived in Constantinople. As for his scientific life, it was purely Arabic. He was only an Arab who read, and nothing filled his bright head except the Arab Muhammadan light. Therefore, he was He wrote only pure writing, devoid of all the extraneous styles in the Arabic curriculum. Rather, he used eloquent usage that had not been disputed about his eloquence, which indicates his great knowledge of language books in terms of language, grammar, and rhetoric. Then, on top of that, he read Arabic poetry, and it was beautiful.

He was distinguished - may God be pleased with him - with merits that elevated him and made him a role model for the Muslim world. He has elevated knowledge above the commercial market, and has informed the hypocrites that the Muslim scholar is his homeland, the land of Islam, and that he does not accept worldliness in his religion, and does not accept anyone who humiliates Islam relentlessly, and does not allow anyone other than God and the truth to be his will, and that it is not right for him to live in A land in which he cannot speak the truth and where he does not exalt the word of Islam, even if it is his country in which he grew up and grew up in its songs. The world lives by spirit, not by matter, and by eternal truths, not by fleeting symptoms. It is sufficient for him to be prominent before God and in the Hereafter, as for the status of this world and its people

A fleeting shadow and a barrier.

A fleeting glance at the life of that great scholar shows us that he was a sincere scholar, a fighter who was patient in times of adversity and adversity. He traveled throughout the Islamic countries through tribulations and tribulations, and he spread light and knowledge wherever he settled and resided. He traveled throughout the Islamic regions and in every country he had students who drank from his source.

He is sweet and his sincere and faithful spirit shines on their souls. He presents knowledge in a pure manner, not tamed by dissent or distortion. He goes forward in telling the truth, not caring about whether or not people please him.

They were dissatisfied as long as what was between them and God was eternal.

It appears that this was in his blood that ran through his veins, as he has been striving for the truth since he grew up, and that in his family there is piety, mental strength, patience and endurance.

For jihad, he is from a family that was in the Caucasus; Where strength, strength, beauty of body and soul, and soundness and depth of thought.

His father moved to Istanbul, where he was born upon guidance and truth. He studied religious sciences until he achieved the highest level at the age of twenty-eight, then he rose up the teaching ladder until he reached his highest level at a young age, until he was afflicted by those who wanted to separate him from the world. He abandoned religion in order to rule the world by other than what God revealed. He stood watching for them, while the wood was green, the hopes were blooming, and the aspirations of the youth were motivated. But he preferred his religion over their world and preferred to defend the Islamic remnants rather than have a comfortable life. Rather, he preferred to be in a state of affairs. He will always be pleased with God, provided that he lives a comfortable life and is pleasing to the people And the satisfaction of those in whose hands are the affairs of this world, because pleasing God is the goal of faith.



He struggled against the federalists who had control over the state when they wanted to narrow the scope of religious studies and shorten their time. He - may God be pleased with him - saw in that shortcoming a deficiency in its parties, so he worked the trick, plotted and destined until he eliminated their desire and prolonged the period that they wished to shorten so that students could Sciences Islam is about assimilating and digesting sciences, especially for a non-Arab who learns in clear Arabic.

In all his circumstances, he was knowledgeable and upright, who did not depend on someone in high status and did not flatter someone in status to achieve a goal or reach a goal, no matter how honorable it was. He - may God be pleased with him - believed that the excellence of matters could only be reached by a sound path and method. He is upright, and it is not possible for a generous person to reach a noble goal except through a path in which he protects himself from humiliation, for no one can achieve a noble person except an honorable person like him, and there is no honor in relying on those who have status in this world.

He who relies on them is not worthy of God.

He - may God be pleased with him - worked diligently and worked in the path of His Excellency until he became the representative of the sheikhdom of Islam in Turkey, and he is one of those who know the position has its right, so he did not neglect the interest of pleasing the one who is in power, no matter how strong and controlling he may be, and before he was removed from his position in order to maintain the interest. . And retirement for the sake of Truth is better than compliance with falsehood.

The sheikh was removed from the agency of the Islamic sheikhdom, but he remained in its council of representatives, of which he was its president, and he did not see any harm in his position for him to be demoted from leadership to membership as long as the reason for the descent was high. Psychological superiority does not prevent a worker from working as a president or a subordinate, for pride is derived. Of the truth in itself and blesses it The truth is great.

But the proud, chaste, and pious scholar is put to the severest test. When he sees his dear country, which is the great abode of Islam, the center of its glory, and the center of the Muslims' hopes, it is dominated by atheism, then it is controlled by those who do not hope for this religion to be dignified, then the one holding onto his religion becomes like one clutching to hot coals, then he finds himself intended for harm and

If he did not survive, he would be thrown into prison and prevented from learning and teaching.

Then the Imam sees himself between three things: Either he remains a captive and shackled, his knowledge extinguished in his absences in prisons, and that is dear to a scholar who is accustomed to studying, guiding, and bringing forth the treasures of the religion so that people can teach them with evidence, or he flatters, flatters, and flatters, and other than that. Cutting the throats, or even slitting their necks, or emigrating

And the land of God is vast, and remember the Almighty's saying: [Was not the land of God wide so that you emigrated therein] (An-Nisa: 93).

He immigrated to Egypt, then moved to the Levant, then returned to Cairo, then returned to Damascus a second time, then he dropped the walking stick for good in Cairo. During his travels to the Levant, his residence in Cairo was light, and the dwelling in which he lived was either small or spacious, a school for housing. To it is the true seeker of knowledge, the seeker of knowledge In school, these students will be guided to the sources of knowledge from the books that have been written, while the market for Islamic sciences is popular and the souls of scholars are full of Islam. So he responded.

The minds of those searching for it and directing them towards it, and He explains what is closed to them and overflows with the abundance of His knowledge and the fruits of His thought.

The writer of these lines did not meet the Sheikh until about two years before his death, and the spiritual meeting took place years before that when I was reading his writings and reading his comments on what came out of his manuscript, and reading the books he wrote, and I did not think that I would have anything to do with him. The same sublime world as it has in me, even I read his book (Good Litigation in the Biography of Imam Abu Yusuf al-Qadi) and found that he - may God be pleased with him - singled me out with a good word when speaking about the tricks attributed to Abu Yusuf. I bear witness that I heard praise from great men and scholars, and I was not as proud of the praise as I was of the praise of that venerable sheikh, because he was a scholarly badge from one who possesses Giving the scientific medal.

I sought to meet him, but I was ignorant of his position. As I was walking in the square of the Green Threshold, I found a distinguished and dignified old man. Gray hair emanated from him like the light of truth. He was wearing the garb of Turkish scholars. Students from Syria had gathered around him, and it occurred to me that he was the old man I was seeking. He followed his students until I inquired from one of them: Who is the sheikh? He said that he was Sheikh Al-Kawthari, so I hurried to meet him to find out his position, so I introduced myself to him, and found that he had a desire to meet.



Like what I have, then I visited him and learned that he is above his books and his research, and that he is a treasure in Egypt.

Here I want to show a page from the history of that Sheikh Imam that only a few people know:

I wanted its benefit to spread and for students of knowledge to be able to return its sweet flower and benefit from its abundant source. The Sharia Department proposed to the Council of the Faculty of Law at Cairo University that the venerable Sheikh be assigned to teach in the Sharia Diploma in the graduate studies departments of the college, and the Council approved the proposal. After the distinguished members learned the Sheikh's place in the sciences of Islam and his great scientific works, I went to the Sheikh with the professor, head of the Sharia Department, during that time, but we were surprised by the Sheikh's apology for accepting his illness, his wife's illness, and his poor eyesight. Then he insisted on apologizing, and the more we insisted on we hoped to apologise, even if we did not find any benefit. We begged him to reconsider this scientific assistance that we were waiting for and hoping for. Then I returned to him alone again, repeating the hope and insisting on it, but this time he was frank with me. The noble Sheikh said... This is a place of true learning, and I do not want to study there unless I am strong and teach my lessons in the way I like, and my old age, weak health, and the health of my wife, who is the only one in this life, all of this prevents me from doing so.

Performing duty in a manner that pleases him.

This volume has collected fifty-seven introductions (13) which we have classified into five main sciences:

First: On the Sciences of Doctrine, Theology, Sects, and Philosophy.

Second: In the Noble Hadith and its Sciences.

Third: In general jurisprudence, rulings and principles.

Fourth: In history, biographies.

Fifth: On Sufism, Ethics, and Sermons.

We have arranged the introductions to each science according to the date of writing by its author, Imam al-Kawthari, as much as possible.

The honorable reader will see that his first introduction is the introduction to (Criticism of Al-Mughni), and its date is in the year 1727. Although the Sheikh was not able to write it down - it is only testimonies - you will find in it rare sayings and valuable benefits. The last thing he wrote of his introductions to books was the introduction to the book (The Ember of the Quoted) dated 41 Shaban 1731.

The Sheikh, may God Almighty have mercy on him, was - and still is - a teacher of knowledge and literature, investigation and jihad, patience and steadfastness in the bitter banners of truth, a stranger in the country.

To whom he immigrated, a stranger in his knowledge and investigation, a stranger in his uprightness and his exaltation over the bad people of affairs and their owners, and his distance from the doors of the rulers and their ways.

God Almighty created him for knowledge, boldness in the truth, and pride in religion.!

There is a word in my heart that is disputing me, so I must write it.

I sought knowledge in an Arab country, and I was alarmed by the winks directed at the imam whose introductions I have the honor to correct, and whose authors rely on a book printed in two volumes in response to one of the books of Imam al-Kawthari. I looked at this response quickly, then carefully, and I found the gap between the two men. Vast and

The shrine is far away.!

I found myself between a scholar who delineates what is in the books of jarh and ta'deel, no more than their letters, and between a scholar who has the knowledge of jarh and ta'deel, and the king of jurisprudence! It seems to you that at the top of a lofty mountain that cannot be reached, a science has the reins to sift out all falsehood and extraneous things, so you see the scientist working hard to refine the issue for a long time, and it is at its peak.

Al-Kawthari is on the tip of the tongue or the pen, scattering it as prose.!!

Then I saw that the writer of that response had pity for himself and had mercy on him, and referred - in secret - to the status of Imam Al-Kawthari in his eyes, as if he wanted to wash himself.

A porter was carried on him, and he praised Al-Kawthari with a praise befitting two contemporaries who had been raised among them as had been raised by the teachers of the purity of brotherhood among scholars. He said in:



Shame that response

His last introduction to (Taqdimah al-Jarh wa al-Ta'deel) by Ibn Abi Hatim, page (Co:) (And the eminence of the great scholar, Professor Muhammad Zahid al-Kawthari, may God bless him, had great merit in his days by alerting him to the existence of a copy of (Taqdimah) in the library of Murad Mal, and for his guidance. To copy many books, in addition to his care for publications

The department thanked God for his efforts, and gave everyone success to continue serving science and disseminating it.) This praise was issued by him a long time after he wrote the response, and the date of this writing was Shawwal 47, 1731 AH, that is: twenty-six years before the death of Imam Al-Kawthari, after he wrote his book (Tanqeel) and after he printed his introduction from it, which he called (The Vanguard of Takil). Al-Kawthari stopped at it and responded to it with his book (Al-Tirhab). By criticizing reprimand.)

I ask every reader of this response and this praise: Does he imagine that their author is the same?! The response did not remain between him and the declaration of the revolutionary's disbelief except as stated by the eye and

Her eyebrow - or her eyelid - and this calls for long life and survival, and gratitude for the praiseworthy endeavour, and does not give it to enthusiastic benefactors! To print it as they become available.!

If Al-Muallami believed that what Al-Kawthari wrote was true and truthful, would it be permissible for him, according to Islamic law, to pray this supplication for him?! And he describes him with these descriptions! Al-Mu'alami - may God Almighty have mercy on him - here is one of two men: either he sinned by praying that God would prolong Al-Kawthari's life in misguidance and misguidance, or he was blamed for what

He wrote about "torture" and regretted what he had done, and wanted to wash away what he had done to him.

This second possibility is the reality for many things, including: There is no scientific connection or correspondence between Al-Kawthari and Al-Muallami that would lead him to the manuscript of a book to be completed. Rather, the strong connection and scientific correspondence was between Al-Kawthari and the Ottoman Encyclopedia in Hyderabad, Deccan, which printed (Al-Jarh). And modification) and Others, Al-Kawthari showed those in charge of it the manuscript of the book, and they sought to obtain it, and they informed Al-Muallami of that - while he was in Mecca - and he explained that, and

He wrote a word of thanks to Al-Kawthari, and took it as an opportunity to apologize to him from a distance. Perhaps he would reach Al-Kawthari and read it before he died, but that was unlikely.

Al-Muallami also praised Imam Al-Kawthari in another place in his books. In the book (Al-Anwar Al-Kashifah), p. 131, he described him as (the scholar).

He read the books of the Hanafi school and others. He wrote this book in the year 1733 AH, that is, seven years after the death of Al-Kawthari.

This praise from Al-Muallami came from him, and it was quoted from Al-Kawthari from his book (The Welcome), which Al-Kawthari responded to Al-Muallimi, and this is fair to him.

On this occasion: I draw attention and say: Whatever hidden matter may be hidden, the future of time between Al-Kawthari and Al-Muallami will reveal it. In conclusion, I say: The scientific method that Al-Kawthari, the Imam, designed for himself - after taking its nectar from the rational and transmission sciences - is a method whose depth is unknown and

Only one who seeks knowledge and is given talents like what he was given can achieve it! How can this happen except with the help of God the Most Gracious, the Bestower?

Our last supplication is: Praise be to God, Lord of the Worlds.

REFERENCES

1. Mehmet Emin Ozafshar. "Muhammad Zahid al-Kawseri: His Life"
2. Abdullah al-Suduni. "Taju al-tarajim fi tabaqati al-hanafiya"
3. Muhammad al-Shahrastani. "Book about religions and sects"
4. Ahmad Hayri. "al-Imam al-Kawseri"
5. Zahid Kawthari. "Muqaddimat"



6. Arslonov Z. Z. THE PLACE OF ALIKHANTORA SOGUNIY IN THE HISTORY OF EAST TURKESTAN //Colloquium-journal. – Голопристанський міськрайонний центр зайнятості= Голопристанский районный центр занятости, 2020. – №. 24-2. – С. 9-11.
7. Islomov Z. Source studies analysis of “muqaddimatu-ladab” in foreign archival funds //The Light of Islam. – 2019. – T. 2019. – №. 4. – С. 41.
8. Makhsudov D. A GENIUS OF THE WORLD //Theoretical & Applied Science. – 2019. – №. 5. – С. 544-548.
9. Ugli A. Z. Z. THE PLACE OF ALIKHANTORA SOGUNIY IN THE HISTORY OF EAST TURKESTAN //Colloquium-journal. – Голопристанський міськрайонний центр зайнятості, 2020. – №. 24 (76). – С. 32-33.
10. Arslonov Z., Ergashev H. ALIKHANTORA SOGUNIY'S VIEWS ON POLITICAL GOVERNANCE IN EAST TURKESTAN //Студенческий вестник. – 2020. – №. 32-2. – С. 84-85.
11. Mahsudov D. IX-XV асрларда Мовароуннахрда ёзилган тафсирларнинг хусусиятлари //Молодой ученый. – 2020. – №. 14. – С. 311-314.
12. Makhsudov D. R. Mufassirs of Mawarannahr //ISJ Theoretical & Applied Science, 12 (80). – 2019. – С. 539-543.
13. Zokirjonugli Z. A. Approaches to studying the scientific heritage of Alikhantora Soguni //Asian Journal of Multidimensional Research. – 2022. – T. 1
14. Zokirjonugli Z. A. APPROACHES TO STUDYING THE SCIENTIFIC HERITAGE OF ALIKHANTORA SOGUNI.
15. Makhsudov D. R. МУФАССИРЫ МАВЕРАННАХРА В СРЕДНИХ ВЕКАХ //Theoretical & Applied Science. – 2019. – №. 12. – С. 539-543.
16. Makhsudov D. A GENIUS OF THE WORLD //Theoretical & Applied Science. – 2019. – №. 5. – С. 544-548.
17. Ugli A. Z. Z., Farhodjonova N. Alikhantura Soguniy Role in State Administration in East Turkestan //Journal of Modern Islamic Studies and Civilization. – 2024. – T. 2. – №. 02. – С. 128-132.
18. Islamov Z. Codicological Analysis of Manuscripts of “Mukaddamatu-l-Adab” of Mahmud Zamakhshari in the Funds of the World //The Light of Islam. – 2020. – T. 2020. – №. 2. – С. 30-36.
19. Islomov Z. International Islamic Academy of Uzbekistan—a result of the reforms worth to the centuries //The Light of Islam. – 2018. – T. 1. – №. 1.
20. Islomov Z. The role of the international Islamic academy of Uzbekistan in the development of Islamic studies //The Light of Islam. – 2019. – T. 2019. – №. 1. – С. 1.



LIFE AND ACTIVITY OF IBN JARIR TABARI

Mavlanov Nurali Rayimovich

*Doctoral Student of Department of "Islamic Studies and Islamic Civilization ICESCO",
Specialization of Qur'anic Studies, Hadith Studies, International Islamic Academy of Uzbekistan,*

ABSTRACT

This scientific article is about the life and work of the great scholar Ibn Jarir Tabari, who, with his unique and invaluable knowledge and scientific works and exemplary qualities, became a worthy example not only for the future generation, but also for the people of his time. It contains interesting information about the life and work of the scientist.

KEYWORDS: *Ibn Jarir Tabari's works, a great scholar, commentator, editor, jurist with exemplary qualities, piety, chastity, modesty.*

The full name of the great scholar Ibn Jarir Tabari, who became a worthy example not only for the future generation, but also for the people of his time, with his unique and invaluable knowledge and scientific works and exemplary qualities, is Abu Ja'far Muhammad ibn Jarir ibn Yazid ibn Kasir ibn Ghalib Abu Ja'far at-Tabari is al-Omuli.

Ibn Jarir Tabari was a commentator, historian, jurist. He gained fame with the name of the Imam of the commentators.

He was born at the end of 224 AH (or beginning of 225 AD, 838 AD) in Amul (أمل), the largest capital city of Tabaristan (طَبَرِسْتَان) province in present-day Iran.

Ibn Jarir Tabari grew up with good upbringing and high spiritual care from childhood.

When it was discussed in his presence, he himself said about it:

"I was seven years old when I completely memorized the Qur'an. I was leading people when I was eight years old. I started writing hadiths when I was nine years old. One day my father had a dream about me. Then I said to Rasulullah a.s. I was standing in their presence. I have a bag full of stones. I am Rasulullah a.s. I was walking around them and passing the stones in that bag in all directions. When my father narrated this dream to one of the mature scholars of his time, he interpreted that dream as "Your son will be a great preacher of religion when he grows up. He is a worthy defender of Islamic law and protects it from the attacks of impure enemies! As soon as my father heard the interpretation of his dreams, he was deeply moved and encouraged me to study science. As a result, he became devoted to my pursuit of knowledge. I was a very young baby then. My father used to tell me about the dreams he had and retell them over and over again."¹

Ibn Jarir Tabari memorized the entire Qur'an at the age of seven, led the people at the age of eight, and began writing hadiths at the age of nine.

The first place where he began to study the science of the Qur'an and hadith was his birthplace - the city of Amul. Then there was the city of Ray (ری), which is considered an ancient city of Tehran, the capital and largest city of Iran. During his stay in this city, Ibn Jarir Tabari had the opportunity to spell more than one hundred thousand hadiths from the scholars of the city of Ray and its neighboring regions.

After that, with the permission of his father, Ibn Jarir Tabari again traveled to Baghdad, Iraq, at the age of twelve, in 236 AH. The main reason he went to Baghdad was to learn from Abu Abdullah Ahmad ibn Hanbal (780-855 AD, 164-241 Hijri), the fourth of the four jurisprudential scholars, that is, the owner of the Hanbali school, a famous muhaddith and jurist. However, by the time he

¹ Dictionary of Writers, Guiding the Stranger to Knowing the Writer, Yaqut al-Hamawi al-Rumi, edited by Dr. Ihsan Abbas, Dar al-Arab al-Islami, Beirut-Lebanon, first edition, 1993, Part Six, p. 2446,



reached Baghdad, Ahmad ibn Hanbal had died. That's why he can't meet someone. After that, his next intensive journeys on the way to learning will begin.

This time, Ibn Jarir Tabari traveled to the cities of Basra and Kufa in Iraq and studied science in these places for several years.

After that, in 253 A.H. (between 867-868 AD), he traveled through the lands of Syria (now Syria, Lebanon, Palestine, Jordan) to the city of Fustot (فُسْطَاط), the first capital of Egypt in the history of Islam. The purpose of every day and night of his travels is to study knowledge. During his trip to the city of Fustot, he learned the knowledge left by the second of the four jurists of that place, that is, the owner of the Maliki school, the famous muhaddith and jurist, Malik ibn Anas, the third of the four jurists, the owner of the Maliki Shafi'i school, the famous muhaddith and jurist, Muhammad ibn Idris, and Abdullah ibn Wahb, who devoted his whole life to the cause of knowledge, was with Malik ibn Anas as a student for more than twenty years, and studied the knowledge left by the great scholars of the Maliki madhhab, Abdullah ibn Wahb. After that, he returned from the city of Fustot and lived in Baghdad, the capital of Iraq, until the end of his life, sharing his knowledge with people.

Arab historian Abu Bakr Ahmad ibn Ali ibn Thabit Khatib al-Baghdadi Ibn Jarir Tabari says in his book "Tarihu Baghdad wa Zuyuluhi": "He was able to understand the meanings of the Qur'an very well, he was able to understand the jurisprudential rulings derived from it at an excellent level, he thoroughly studied the hadiths, the relevant knowledge, the words of the Companions and the followers and the subjects of the Shariah rulings, as well as the issues related to halal and haram things, and the people of the past. He was a person who studied the days and messages well".

Ibn Jarir Tabari had a unique and unusual mind, insight, intelligence and understanding from his childhood. He was a unique person of his time not only in these aspects, but also in terms of applying the learned knowledge to life, living with it, kindness and justice. The father, who saw these aspects in his child, attracted him to scholars and mahads. He earned what he earned with this intention and spent it mainly in this way. As a result, Ibn Jarir Tabari interpreted his father's dream in practice. The speed of this process can be understood from his words: "I was seven years old when I completely memorized the Qur'an. I was leading people when I was eight years old. I started writing hadiths when I was nine years old.

The books that have reached us and the priceless records in them are proof of how much and how thorough the knowledge and information he gathered are.

Because of these characteristics, Ibn Jarir Tabari, who devoted himself to knowledge since his childhood, became a worthy and exemplary owner of knowledge and behavior during his continuous pursuit of knowledge.

Ibn Jarir Tabari had a high level in piety. In this regard, if a group of dieting people is an ocean, it is a separate ocean. He was wary of the unclean. He kept himself away from doubts. He protected himself from returned words, actions and things, and was very afraid of being affected by them.

Ibn Kasir says about his piety and dieting: "He was firm and steady about him. He could not be blamed by any critic in this regard. He was one of the greatest of the righteous."

Ibn Jarir Tabari was one of the most pious scholars of his time. When he was offered the position of a judge, he rejected the offer. He considered the way of science and education above all.

Ibn Jarir Tabari was a man of chastity and life. He restrained his language from immoral words that are inappropriate for people of knowledge and hurtful words that hurt others. He lived like this until the end of his life.

Moreover, he was an ascetic in worldly goods, and he was not affected by its intrigues and fabrics.

When he was demanding knowledge, he was satisfied with a little, that is, very little.

No matter how much he suffered, no matter how difficult he was, he did not ask people for any worldly goods. He was patient and looked for a solution other than the request. He was chaste from people's wealth. He would not take financial burdens for fear of being charmed by the world and eventually falling into ruin. He did not even accept gifts from kings, governors and emirs during his lifetime because of this danger.

Ibn Jarir Tabari was very humble in front of his friends, pilgrims who came to see him and his students. He did not even look at pride from his place in science. With his knowledge, he did not consider himself superior to others.



If he was invited to a party, he would answer the invitation and definitely go. He would answer the scientific questions asked to him with kindness. He was not jealous, enmity, or held a grudge against anyone. He saw every second of his life as an opportunity for good deeds. His soul was always satisfied with God's destiny he could forgive those who did wrong without knowing about his rights, and he could also forgive those who did evil on purpose.

Abu Bakr Muhammad ibn Dawud al-Zahiri Hanbali and his followers were able to put up with a great deal of patience against the various inappropriate claims, slanders, painful discrimination and discrimination that were said about him by Hanbali and his companions due to the misunderstanding caused by the misunderstandings that arose after the certain attitudes he expressed about Ahmad ibn Hanbal in the last moments of his life. , even if he easily forgave them.

The person in front of him was able to recognize his qualities even if he appeared as his rival. But when he saw falsehood and injustice, he could not remain silent. The doctor, for example, took measures to eliminate them with wisdom and knowledge. He knew the truth as the truth, and his heart was brave and courageous in this regard. He could not be blamed by any critic in this regard. No matter how much pain and suffering he suffered from ignorant and ignorant people, he was able to patiently tell them the right path and the truth.

Ibn Jarir Tabari was always busy. Someone had not found that person in a completely idle, empty state. In addition to classifying books, he also taught science to his apprentices and wrote down various necessary information. Moreover, before going to sleep every night, he would go to bed only after reading a quarter of the Qur'an, maybe more. As a result of his diligence, there was no one in his time who recited the Qur'an with a beautiful voice and followed the rules of tajweed better than him.

Ibn Jarir Tabari wrote a book by himself before the Asr prayer, and wrote it down to his students from the Asr prayer to the evening prayer. He taught from the evening prayer to the evening prayer. He went home after performing the evening prayer.

That person divided his unique and valuable time in this way in order to acquire knowledge and education and strictly followed those rules.

Ibn Jarir Tabari had intended to write a commentary on the Qur'an since childhood. He succeeded in his intention. He had the opportunity to publish a large volume of tafsir books. It was published in fifteen volumes in some editions, and in thirty volumes in some publishers. Its latest new edition was published in 26 volumes in 1434 AH, 2012 AD under the supervision of Abdullah bin Abdulmuhsin al-Turki. It is his commentary on the Qur'an that introduced Ibn Jarir Tabari to the world.

A mature student of Imam Muslim ibn Hajjaj, teacher of Abu Bakr al-Qaffal al-Shashi, author of the work "Sahihu Ibn Khuzayma", famous muhaddith and jurist - Abu Bakr Muhammad ibn Ishaq ibn Khuzayma ibn Mughaira ibn Salih ibn Bakr an-Nisaburi al-Shafi'i (223-311 Hijri) says: "I read Ibn Jarir's commentary from beginning to end. I found out that there is no one more knowledgeable than him on Earth."

Ibn Jarir Tabari wrote his tafsir, which he had dreamed of since his childhood and which caused such high recognitions, for seven years while narrating it to his students.

Ibn Jarir Tabari experienced many hardships and hardships while traveling in search of knowledge. Even when the money sent by his father was delayed, he cut the length of the shirt he was wearing when he was forced by hunger and poverty, so he bought bread and ate with the money.

Due to the fact that he persevered with the hardships he experienced and was extremely pious and humble, he became a scientist with a sharp mind, a deep mind, and a high potential. He had deep knowledge not only in tafsir, hadith, history, but also in Arabic grammar, logic, algebra, and medicine.

Abu Bakr Ahmad ibn Ali ibn Thabit Khatib al-Baghdadi says about Ibn Jarir Tabari in his book "Tarihu Baghdad wa Zuyuluhi": "I heard from Ali ibn Ubaidullah al-Simsimi that Ibn Jarir Tabari wrote a book of forty pages every day for forty years".

Ibn Jarir Tabari studied under so many famous sheikhs that it is very difficult to give an exact number of them.

Al-Zahabi enumerates a number of respected sheikhs of Ibn Jarir Tabari, and at the end of his words, he says, "وَلَقِيَ أَمَّا سِوَاهُمْ", "besides the listed sheikhs, he also met several other groups of scholars", and notes that he was educated in the presence of so many scholars that it is difficult to count. Ibn Jarir Tabari's shaykh in the city of Rai was Abu Abdullah Muhammad ibn Humayd al-Razi



al-Tamimi (died 248 AH), from whom Ahmad ibn Hanbal also narrated a hadith. Ibn Jarir Tabari studied tafsir and hadith from this shaykh. He learned one hundred thousand hadith from him.

Ibn Jarir Tabari was the most distinguished and prominent scholar of his time, and many students studied under him. The most famous of them is Sheikh Abdullah ibn Ahmad al-Farghani.

Authored works

Ibn Jarir Tabari wrote more than twenty works, of which two are the most famous. One is the interpretation of the Qur'an, and the other belongs to the field of history.

Ibn Jarir Tabari died on Sunday evening, on February 16, 923 AD, on the 26th day of Shawwal, 310 AH.

He lived his whole life in the mihrab of knowledge and its practice.

Ibn Kathir says about his death: "Ibn Jarir Tabari died at the age of 85." Even at that age, his hair and beard were very dark. He was buried in his yard for obvious reasons. The reason for this is that in his book "Ikhtilaf al-Ulama" Abu Hanifa, Shafi'i, Maliki and Awza'i, while talking about a number of jurists and their scientific debates, did not mention Ahmad ibn Hanbal among them. When asked about the reason for this, he replied that "Ahmad ibn Hanbal was more reliable not in the matter of authenticity, but more in the matter of muhaddis." He did not belittle Ahmad ibn Hanbal with these words. Even during his life, he expressed only and only high and excellent evaluations about the scientific status and degrees of the person. However, without considering the meaning of that answer, Abu Bakr Muhammad ibn Dawood al-Zahiri Hanbali and his followers slandered Ibn Jarir Tabari, and they did not even allow him to leave his yard. Some ignorant and ignorant people even dared to accuse him of unbelief. Even now, he was actually free of these proportions, and he was recognized as the most reliable and honorable person in the world of Islam and the knowledge of the Qur'an and the Sunnah, and the observance of both of them. Because of this, some ignorant people prevented Ibn Jarir Tabari from burying him, so he was buried in his yard.

Arab historian Abu Bakr Ahmad ibn Ali ibn Thabit Khatib al-Baghdadi Ibn Jarir says this in his book "Tarihu Baghdad wa Zuyuluhi" about the funeral of Tabari, and the great allama Abul Qasim Ali ibn Husayn ibn Hibatullah ibn Asakir al-Dimashqi, who is considered the muhaddi of the Levant of Syria, also echoed his words in his "Tarikh al-madinati Dimashq" states in the book: "Uncountable number of people were present at his funeral. There were so many of them that none but Allah knows their number. That's why funerals were held on his grave day and night for several months. He was buried in his backyard in Baghdad on Monday morning, the day after his death. Because of this separation, many people of knowledge shed tears and said good words and confessions about Ibn Jarir Tabari.

REFERENCES

1. *The Beginning and the End, Ibn Kathir al-Dimashqi, Part Eleven, Chapter: Then I entered the year three hundred and ten, translated by Abu Jaafar al-Tabari, Yaqt al-Hamawi: Dictionary of Writers (Guiding the Unbelievable to Knowing the Writer), Part 6,*
2. *The History of Baghdad and its Aftermaths, by Al-Khatib Al-Baghdadi, Scientific Library Edition, Part 2,*
3. *Tadhkirat al-Hafiz, Shams al-Din al-Dhahabi, tenth class, translated by Muhammad bin Jarir al-Tabari,*
4. *Biographies of Noble Figures, Shams al-Din al-Dhahabi, the seventeenth class, Muhammad bin Jarir, vol. 14,*
5. *Classes of hadith narrators in Khorasan in the fifth century AH, numbering (555) narrators, doctoral thesis: Mansour Ghulam Abd al-Sattar al-Nahlawi, University of Damascus,*
6. *The Book of Al-Tabari: Biography and History, Dr. Abdul Rahman Al-Azza'wi, House of Cultural Affairs,*
7. *Dr. Muhammad Al-Zuhayli: Imam Al-Tabari,*
8. *Taj al-Din al-Subki: The Great Shafi'i Classes, vol. 3, 9.*
9. Ugli A. Z. Z. THE PLACE OF ALIKHANTORA SOGUNYI IN THE HISTORY OF EAST TURKESTAN //Colloquium-journal. – Голопристанський міськрайонний центр зайнятості, 2020. – №. 24 (76). – С. 32-33.
10. Arslonov Z., Ergashev H. ALIKHANTORA SOGUNYI'S VIEWS ON POLITICAL GOVERNANCE IN EAST TURKESTAN //Студенческий вестник. – 2020. – №. 32-2. – С. 84-85.
11. Makhudov D. IX-XV asrlarda Movarounnaxrda e'zilgan tafsiqlarining xususiyatlari //Молодой ученый. – 2020. – №. 14. – С. 311-314.
12. Makhudov D. R. Mufasssirs of Mawarannahr //ISJ Theoretical & Applied Science, 12 (80). – 2019. – С. 539-543.
13. Zokirjonugli Z. A. Approaches to studying the scientific heritage of Alikhantora Soguni //Asian Journal of Multidimensional Research. – 2022. – T. 1
14. Zokirjonugli Z. A. APPROACHES TO STUDYING THE SCIENTIFIC HERITAGE OF ALIKHANTORA SOGUNI.
15. Makhudov D. R. МУФАССИРЫ МАВЕРАННАХРА В СРЕДНИХ ВЕКАХ //Theoretical & Applied Science. – 2019. – №. 12. – С. 539-543.
16. Makhudov D. A GENIUS OF THE WORLD //Theoretical & Applied Science. – 2019. – №. 5. – С. 544-548.
17. Ugli A. Z. Z., Farxodjonova N. Alikhantura Soguniy Role in State Administration in East Turkestan //Journal of Modern Islamic Studies and Civilization. – 2024. – T. 2. – №. 02. – С. 128-132.



18. Islamov Z. Codicological Analysis of Manuscripts of "Mukaddamatu-l-Adab" of Mahmud Zamakhshari in the Funds of the World //The Light of Islam. – 2020. – T. 2020. – №. 2. – С. 30-36.
19. Islomov Z. International Islamic Academy of Uzbekistan—a result of the reforms worth to the centuries //The Light of Islam. – 2018. – T. 1. – №. 1.
20. Islomov Z. The role of the international Islamic academy of Uzbekistan in the development of Islamic studies //The Light of Islam. – 2019. – T. 2019. – №. 1. – С. 1.
21. Arslonov Z. Z. THE PLACE OF ALIKHANTORA SOGUNIY IN THE HISTORY OF EAST TURKESTAN //Colloquium-journal. – Голопристанський міськрайонний центр зайнятості= Голопристанский районный центр занятости, 2020. – №. 24-2. – С. 9-11.
22. Islomov Z. Source studies analysis of manuscripts of "muqaddimatu-ladab" in foreign archival funds //The Light of Islam. – 2019. – T. 2019. – №. 4. – С. 41.



IDENTIFICATION OF SIGNATURE COUNTERFEITS

**Shaik Karishma¹, Siddu Devi Naga Susmitha², Nanditha Katari³,
G. Sirisha⁴**

*^{1,2,3}B. Tech Students, Department of Information Technology, Vasireddy Venkatadri Institute of Technology,
Pedakakani Mandal, Nambur, Guntur-522508 Andhra Pradesh, India.*

Article DOI: <https://doi.org/10.36713/epra16255>

DOI No: 10.36713/epra16255

ABSTRACT

The goal of the "Identification of Signature Counterfeits" project is to address the urgent problem of fraudulent signature replication in response to the current state of the digital world and the demands for secure authentication techniques. Robust verification procedures are needed since handwritten signatures are crucial in a variety of applications. It is crucial to confirm that a signature comes from the person who intended it to. Because of all the variations, there is very little chance that two signatures are exactly the same, even if they are created by the same person. The fluctuation of several signature traits makes the process of detecting forgeries more difficult. As such, identifying forged signatures is a significant difficulty for authentication procedures.

INDEX TERMS—Signature, Counterfeits, Siamese, fraud, genuine.

I. INTRODUCTION

The overarching aim of this project is to devise a robust methodology for effectively distinguishing between genuine and counterfeit signatures. The initial stage entails training the system using a comprehensive database comprising a diverse range of signatures. Throughout this training phase, the system meticulously scrutinizes each signature, extracting vital parameters to construct a reference signature, which serves as a cornerstone for subsequent verification tasks.

Following the training phase, the system utilizes this reference signature as a benchmark for authenticating other signatures. It achieves this by meticulously analyzing the disparities between the parameters of the original signature and those of the verification signature. Through this comparative analysis, the system discerns variations between the signatures and evaluates whether they exceed a predetermined threshold. If the observed differences surpass this threshold, the signature under scrutiny is flagged as potentially fraudulent.

This methodology ensures a meticulous and rigorous approach to signature verification, leveraging advanced computational techniques to detect even subtle differences between genuine and counterfeit signatures. By establishing a robust framework grounded in comprehensive training and meticulous parameter analysis, the system offers a reliable means of identifying potentially fraudulent signatures, thereby bolstering security and trust in document authentication processes.

II. LITERATURE SURVEY

All over the world we have been assisting to a significant increase of the telecommunication systems usage. Every day, people are inundated with persuasive marketing campaigns aimed at drawing their attention to novel telecommunication offerings. Telecommunications firms face challenges in a fiercely competitive business environment. The fact that customers are quickly embracing the new trends and routinely using—and abusing—communication services in their daily lives suggests that their efforts were successful. Even while fraud cases are uncommon, they are becoming more frequent and account for a sizable portion of the money that telecom companies lose annually. In this study, we looked at the issue of detecting fraud in telecommunications systems, particularly in instances of fraud that is superimposed, and we offered an anomaly detection method that is backed by a signature schema[1].

The advent of electronic transactions has revolutionized the retail landscape, democratizing access to small and local businesses previously constrained by global crises. As e-commerce burgeons, so too does the prevalence of business transactions accepting credit cards, whether through Card Present (CP) or Card Not Present (CNP) modalities. This symbiotic relationship between e-commerce growth and transactional diversity yields manifold benefits, streamlining transactions and broadening market horizons. However, it also begets a pressing concern: the proliferation of fraudulent payment scenarios. In



this study, we leverage a signature-based approach to discern potential fraud instances and delineate the behavioural attributes indicative of fraudulent activities. By scrutinizing user behaviour features, we aim to fortify fraud detection mechanisms and enhance transactional security in the burgeoning e-commerce sphere. This multifaceted approach not only bolsters fraud prevention but also fosters consumer trust, underpinning the sustainable growth and resilience of the digital marketplace amidst evolving threats. [2].

In today's technologically-driven landscape, the imperative of fraud detection has surged to the forefront, given the potential for staggering financial losses and the escalating threat of identity theft. As consumers increasingly entrust their personal information to online platforms and conduct transactions via digital channels, the need for robust fraud prevention measures has become paramount. This essay delves into AT&T's pioneering efforts in combating fraud, illustrating its early recognition of the need for systematic approaches to safeguard revenue streams. By examining common fraud schemes and the methodologies deployed to thwart them, the essay sheds light on the evolution of fraud detection strategies. Emphasizing the pivotal role of effective data management, the narrative underscores the value of employing transparent and interpretable models, leveraging comprehensive visualization techniques, and fostering a flexible operational environment. These insights serve to underscore the importance of a multifaceted approach to fraud detection, tailored to address the complexities of modern-day fraud schemes and bolster organizational resilience against emerging threats[3].

III. MATERIALS

A. Libraries and Frameworks

OpenCV: For image loading and preprocessing.

NumPy: For numerical operations and array manipulations.

TensorFlow and Keras: For building and training deep learning models.

B. Dataset

The dataset comprises genuine and fraudulent signature images stored in separate folders. Genuine and fraudulent pairs are created for model training and evaluation.

C. Network Architecture in Siamese

Convolutional layers are the first layers in the Siamese network design, followed by dense layers. It seeks to acquire discriminative characteristics for identifying real signatures from fakes.

D. Layer for Calculating Custom Distance

The Euclidean distance between feature vectors derived from authentic and fraudulent signatures is calculated via a custom layer.

E. Training Models

Pairs of real and fake signatures are used to train the Siamese model. Minimizing the binary cross-entropy loss is the goal of training.

F. Functionality for Classification

A function for categorizing signature pairs according to their expected distance is offered. The basis for classifications is a predetermined threshold.

IV. METHODS

A. Data Loading and Preprocessing

The code loads signature images from a specified directory, resizes them to a predefined size, and normalizes pixel values. Genuine and fraudulent pairs are created for training and testing purposes.

B. Siamese Network Architecture

The Siamese network architecture consists of two identical convolutional neural networks (CNNs) sharing weights. Each CNN extracts features from input images. The output of each CNN is then passed through a dense layer to get a feature vector.

C. Custom Layer for Distance Calculation

Euclidean distance between feature vectors obtained from genuine and fraudulent signature images is calculated using a custom layer. The distance computation helps in differentiating between genuine and forged signatures.



D. Model Compilation and Training

The Siamese model is compiled with binary cross-entropy loss and Adam optimizer. Training is performed using pairs of genuine and fraudulent signatures.

E. Classification Function

In the classification process, each pair of signatures undergoes preprocessing before being fed into the trained Siamese model. This model computes the distance between the signatures, representing their similarity. If this distance falls below the predefined threshold, the signatures are labeled as genuine. Conversely, if the distance exceeds the threshold, the signatures are deemed forged. This approach leverages the Siamese model's ability to learn intricate patterns in the signatures' features, enabling accurate discrimination between genuine and forged instances based on their inherent similarities or differences.

V. RESULT AND DISCUSSIONS

The utilization of the Siamese network, a sophisticated neural network architecture, represents a significant breakthrough in the realm of fraud detection and document authentication. This groundbreaking approach involves training the network to discern subtle nuances between genuine and forged signature pairs, a task critical for safeguarding against fraudulent activities in various industries.

Throughout the rigorous training process, the Siamese network undergoes iterative learning, fine-tuning its parameters to minimize the distance between genuine signatures while simultaneously maximizing the distance between fraudulent ones. This meticulous optimization enables the network to develop a keen understanding of the distinctive features inherent in authentic signatures, empowering it to accurately differentiate between genuine and forged documents.

Upon completion of training, the Siamese network demonstrates remarkable proficiency in classifying unseen signature pairs based on their similarity. Leveraging the learned representations of genuine and forged signatures, the network exhibits the ability to make rapid and precise predictions when presented with new pairs, thereby enhancing the efficiency and reliability of fraud detection systems.

To illustrate the effectiveness of the trained model, practical examples are provided, showcasing its ability to classify signature pairs into genuine or forged categories with a high degree of accuracy. By computing the Euclidean distance between signature pairs and comparing it against a predefined threshold, the model reliably identifies potential instances of fraud, thereby enabling prompt intervention and mitigation.

Furthermore, the transparent presentation of classification results facilitates easy interpretation, empowering users to comprehend the model's decision-making process and instilling confidence in its efficacy. Additionally, the visual display of signature images alongside their respective classifications offers valuable insights into the model's performance, aiding in the refinement of fraud detection mechanisms.

In summary, the Siamese network's capacity to effectively classify signature pairs based on their similarity represents a significant advancement in fraud detection technology. Its ability to discern between genuine and forged documents with precision holds immense promise for enhancing security measures across various sectors, thereby safeguarding against financial losses and preserving trust in digital transactions.

A. Input

Path of the Signature images which has to be compared are given as inputs.

B. Output

1) When a Genuine image and a Fraudulent image are provides as input.

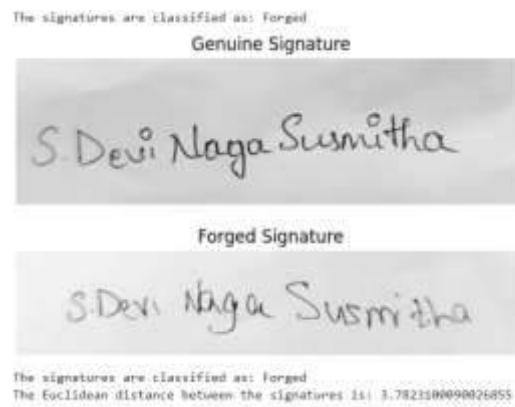


Fig-1. Forged Signature

2) When two Genuine Signature images made by the same person are given as inputs.

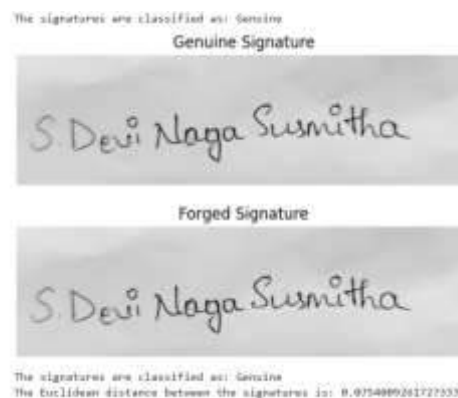


Fig-2. Genuine Signature

3) When two Genuine Signature images made by different persons are given as input.

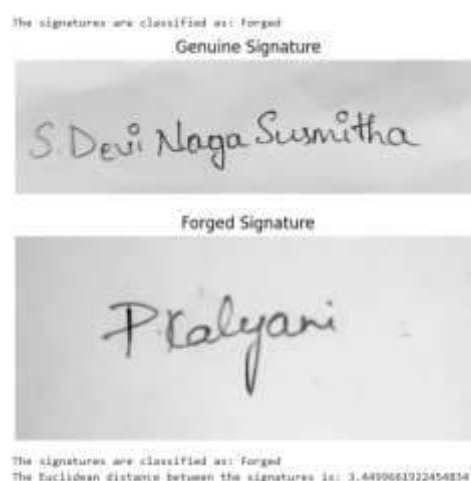


Fig-3. Forged Signature



VI. ADVANTAGES OF USING SIAMESE NETWORK

A. *Learning from Limited Data*

Siamese networks are very good at learning from sparsely labelled input. Siamese networks may efficiently use tiny datasets for learning meaningful representations, since the complexities of getting labelled data frequently result in a restricted number of samples in signature forgery datasets.

B. *Robustness to Variations*

Even in authentic samples, signatures might differ significantly because of things like writing pressure, angle, and speed. Siamese networks are resistant to such fluctuations because they are trained to concentrate on the similarities and differences rather than the absolute features of signatures.

C. *Pairwise Comparison*

By comparing pairs of signatures directly, Siamese networks naturally capture the notion of similarity between signatures. This pairwise comparison allows the model to distinguish between genuine and forged signatures based on their intrinsic characteristics, rather than relying solely on explicit features.

D. *Embedding Space*

Siamese networks learn to embed signatures into a feature space where genuine signatures are close to each other and forged signatures are farther away. This embedding space facilitates intuitive interpretation and decision-making, as signatures with similar features are clustered together.

E. *Adaptability to Various Data*

Siamese networks can be trained on different types of signatures and handwriting styles without significant modifications. This adaptability makes them suitable for a wide range of signature forgery detection tasks, including different languages, writing styles, and document types.

F. *End-to-End Learning*

Siamese networks enable end-to-end learning, where the entire model, including feature extraction and comparison, is trained jointly. This approach avoids manual feature engineering and allows the model to automatically learn relevant features for distinguishing between genuine and forged signatures.

VII. REAL WORLD APPLICATIONS

A. *Banking and Financial Institutions*

By using this technology, banks can lower the risk of fraudulent transactions by authenticating signatures on contracts, checks, and financial documents.

B. *Legal and Forensic Analysis*

During an investigation, law enforcement authorities and forensic specialists can use signature verification systems to confirm signatures on identification cards, legal documents, and other important documentation.

C. *Document Authentication Services*

Businesses that provide document authentication services can incorporate signature verification systems into their offerings to give their clients safe and dependable verification options that guarantee the authenticity of crucial documents.

D. *Government and Administrative Agencies*

By using this technology to validate signatures on applications, licenses, permits, and other official documents, government departments and administrative bodies can improve security and stop identity fraud.

E. *Retail and E-commerce*

To provide an extra degree of security to transactions and agreements, retailers and e-commerce platforms can use signature verification systems to authenticate signatures on delivery receipts, contracts, and electronic documents.

F. *Art Authentication*

Art galleries and museums leverage signature verification methods to authenticate signatures on priceless artworks, ensuring their origin and validity. This enhances trust and confidence among collectors, patrons, and the public.



G. Access Control and Biometrics

To improve overall security measures, signature verification can be incorporated into access control systems to offer secure authentication for entrance into buildings, restricted regions, or digital systems.

These applications demonstrate the versatility and importance of signature forgery detection systems across various industries and sectors, where maintaining the integrity and authenticity of signatures is paramount.

VIII. CONCLUSION

At the heart of our project lies the paramount objective of thwarting signature forgeries through the implementation of a state-of-the-art system leveraging intricate methodologies and computer algorithms. Our cutting-edge technology stands as a formidable bulwark, furnishing indispensable aid in fortifying pivotal sectors such as government documentation, banking, and legal proceedings. By adeptly discerning authentic signatures from spurious ones, our system engenders a robust shield against the insidious threat of fraudulence.

The ramifications of our endeavour extend far beyond mere technical innovation; they embody a resolute commitment to upholding the sanctity of crucial documents and transactions. Through meticulous scrutiny and analysis, we furnish an invaluable layer of security, thereby insulating individuals and organizations from the pernicious consequences of fraudulent activities. In our forthcoming presentation, we shall delve into the intricacies of our system, elucidating its inner workings with clarity and precision. By elucidating the significance of bolstering integrity and trust in vital industries, we endeavour to underscore the imperative nature of our mission. Ultimately, our aim is to fortify the very fabric of our societal framework, bolstering its resilience against the perils posed by the malevolent spectre of signature forgery.

IX. CONFLICTS OF INTEREST

At several phases of creating and implementing a signature forgery detection model, conflicts of interest may appear. First of all, biases may unintentionally creep into the model during data collection if the dataset is obtained from a party with a stake in the results, such as a business looking to disparage rivals. Furthermore, biased classifications may result from the learning process being skewed if the people classifying the data have personal prejudices or affiliations. To address this, careful examination of data sources and labelling procedures is needed to guarantee objectivity and equity in the training of models.

Second, if the goals of the training procedure are not in line with the unbiased and precise detection of signature forgeries, conflicts of interest may develop during the model's training. A model's ability to learn and generalize may be impacted by the financial, professional, or personal interests of those working on its development. Therefore, it's imperative to set precise rules and moral principles for model building, including methodological openness and team member disclosure of any potential conflicts of interest.

Finally, if stakeholders stand to gain from particular categorization outputs, conflicts of interest may surface throughout the implementation and assessment of the signature forgery detection methodology. Biased interpretations of model projections can have far-reaching effects in a variety of contexts, including judicial proceedings, financial transactions, and authentication systems. Therefore, to reduce conflicts of interest and maintain the integrity and justice of the model's implementation in real-world circumstances, there is a need for impartial oversight, stringent evaluation processes, and systems for accountability. We can guarantee that signature forgery detection fulfils its original purpose without being hampered by competing interests by encouraging transparency, moral behaviour, and alignment with society values.

X. ACKNOWLEDGEMENT

We would like to express our profound gratitude to the creators of the several open-source frameworks and libraries that we have utilized in this research, including scikit-learn, TensorFlow, and OpenCV. We were able to create the signature forgery detection system since these tools provide crucial functionality for data manipulation, deep learning model creation, and picture processing.

Additionally, we thank the academic community for its contributions, as their studies and insights served as the basis for the approaches used in this project. Our solution's design and implementation have been greatly impacted by the combined knowledge and developments in the domains of computer vision, machine learning, and neural networks.

Finally, we would like to express our gratitude for the encouragement and input we got from mentors and peers during the development process. Their advice and helpful critiques were really helpful in helping us improve our strategy and the system's overall quality. Their advice enabled us to overcome obstacles and make wise choices, which ultimately led to the accomplishment of this project.



REFERENCES

1. Ferreira, P., Alves, R., Belo, O., & Cortesão, L. (2006). Establishing fraud detection patterns based on signatures. In *Advances in Data Mining. Applications in Medicine, Web Mining, Marketing, Image and Signal Mining: 6th Industrial Conference on Data Mining, ICDM 2006, Leipzig, Germany, July 14-15, 2006. Proceedings 6* (pp. 526-538). Springer Berlin Heidelberg.
2. Belo, O., Mota, G., & Fernandes, J. (2016). A signature based method for fraud detection on e-commerce scenarios. In *Analysis of Large and Complex Data* (pp. 531-543). Springer International Publishing.
3. Becker, R. A., Volinsky, C., & Wilks, A. R. (2010). Fraud detection in telecommunications: History and lessons learned. *Technometrics*, 52(1), 20-33.
4. Edge, M. E., & Sampaio, P. R. F. (2009). A survey of signature based methods for financial fraud detection. *computers & security*, 28(6), 381-394.
5. Laughman, C., Lee, K., Cox, R., Shaw, S., Leeb, S., Norford, L., & Armstrong, P. (2003). Power signature analysis. *IEEE power and energy magazine*, 1(2), 56-63.
6. Zhu, G., Zheng, Y., Doermann, D., & Jaeger, S. (2008). Signature detection and matching for document image retrieval. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 31(11), 2015-2031.
7. Oladele, T. O., Adewole, K. S., Oyelami, A. O., & Abiodun, T. N. (2014). Forged Signature Detection Using Artificial Neural Network.
8. Kuriakose, Y. V., Agarwal, V., Dixit, R., & Dixit, A. (2022). A Novel Technique for Fake Signature Detection Using Two-Tiered Transfer Learning. In *Proceedings of International Conference on Computational Intelligence: ICCI 2020* (pp. 45-58). Springer Singapore.
9. Akusok, A., Espinosa Leal, L., Björk, K. M., Lendasse, A., & Hu, R. (2021, June). Handwriting features based detection of fake signatures. In *Proceedings of the 14th Pervasive Technologies Related to Assistive Environments Conference* (pp. 86-89).
10. Brault, J. J., & Plamondon, R. (1993). A complexity measure of handwritten curves: Modeling of dynamic signature forgery. *IEEE Transactions on Systems, Man, and Cybernetics*, 23(2), 400-413.



UDC 631.4

CHEMICAL AND SALINY PROPERTIES OF SOILS OF THE DRIED BOTTOM OF THE ARAL SEA

Oteuliyev Jaksilik Begdullayevich¹, Dozhanov Kilishbay Jienbayevich²,
Alpisbaeva Akmaral Jubatkhanovna³

¹*Doctor of Philosophy in Agricultural Sciences {PhD}, Associate Professor*

²*Trainee Teacher*

³*Assistant*

*Karakalpak State University named after. Berdaha
The Republic of Uzbekistan*

ANNOTATION

The article examines the chemical composition and salinity properties of soils at the bottom of the Aral Sea, which have dried out due to drying up of water. Because of this, the vegetative development of plant seeds and seeds planted here is somewhat difficult.

KEY WORDS: soil profile, salinity, soil nutrients, dry matter, salts, chlorosulfate.

Currently, the drying up of the Aral Sea is leading to serious climate changes, increased aridity and desertification, and a deterioration of all living conditions in the region. To reduce the negative consequences of this problem, you can mitigate the acute situation by analyzing soil and climatic conditions and selecting plant species adapted to these soils.

For this purpose, research work was carried out in field and laboratory conditions to determine the chemical properties and soil salinity indicators of the dried bottom of the Aral Sea in the Moinak region of the Republic of Karakalpakstan ((0-point) 43°52'20.4"N 59°01'13, 3"E-circuit).

In subsequent years, millions of plants and thousands of tons of seeds of halophytic plants are planted annually on the dried bottom of the Aral Sea. Not all sown seeds of halophytic plants are able to germinate. Before planting all plant seeds, it is advisable to take into account the soil and climatic conditions of these lands. Therefore, before planting, soil samples were taken in laboratory conditions and the chemical composition of the soils of the dried bottom of the Aral Sea was determined.

Due to the drying of the Aral Sea, various amounts of salt deposits were formed, and in order to study the effect of these salts and other harmful chemical elements on soil and plant fertility indicators, soil samples were taken from the research site in the prescribed manner and analyzed in laboratory conditions and the following results were obtained (table 1)

Table 1.

**Chemical composition of soils
(Drained bottom of the Aral Sea, Muynak district, 0-point)**

Elements	According to the genetic description of soil layers						
	0-10	10-20	20-34	34-52	52-66	66-79	79-100
Al	2,16	3,84	3,48	6,36	2,86	3,96	4,83
Si	19,7	17,4	29,5	23,9	20,9	21,3	19,9
P	0,427	0,214	0,365	0,447	0,259	0,520	0,334
S	3,85	4,28	0,486	0,437	1,15	0,591	0,371
Cl	2,07	1,40	0,771	1,09	0,589	0,793	1,03
K	1,30	1,20	1,52	1,84	1,01	1,18	1,31
Ca	8,24	12,2	7,86	9,51	10,0	14,0	15,1
Ti	0,213	0,210	0,543	0,317	0,178	0,214	0,212
Cr				0,0124			
Mn	0,0126	0,0261	0,0243	0,0649	0,0182	0,0261	0,0425
Fe	0,586	1,30	0,875	3,66	0,655	1,59	2,17
Ni		0,0015	0,0013	0,0043		0,0015	0,0027
Cu	0,0015	0,0022	0,0019	0,0042	0,0015	0,0025	0,0027
Zn	0,0008	0,0022	0,0013	0,0069	0,0009	0,0022	0,0038



As	0,0006	0,0007	0,0007	0,0004		0,0015	0,0006
Br	0,0002	0,0003		0,0002			0,0002
Rb	0,0052	0,0056	0,0063	0,0092	0,0039	0,0050	0,0062
Sr	0,0648	0,0731	0,0397	0,0810	0,0818	0,0882	0,146
Y	0,0008	0,0012	0,0014	0,0018	0,0007	0,0011	0,0017
Zr	0,0185	0,0187	0,0263	0,0210	0,0153	0,0187	0,0237
Ag		0,0004		0,0004	0,0003	0,0248	
Ba	0,0258	0,0289	0,0286	0,0212	0,0203		0,0209
Pb	0,0006	0,0008	0,0009	0,0016	0,0005	0,0007	0,0010
O	61,4	57,9	54,5	52,2	62,2	55,7	54,5

The table shows that in the analyzed soils there are no elements that are a source of nutrients for plants, and those that are present are in very small quantities.

Soil salinization can occur under the influence of natural and anthropogenic factors. Due to the fact that the dried bottom of the Aral Sea is part of a desert region on a dry sea bottom, the process of salinization of desert soils in connection with the rise of underground groundwater is still being studied, several studies have been carried out on the natural salinity level in the desert region.

In salinization processes, salts accumulate in the following cycles: continental cycles, littoral cycles and the third - delta cycle and the third cycle includes river deltas used for irrigation. There are also artesian cycles and anthropogenic cycles. The current process of soil salinization in the study area belongs to the last three cycles.

In recent years, the drying up of the sea in the Aral Sea region, the deterioration of the natural components of the region, and the increase in the level of salinity of soil covers can be characterized as affecting not only the agrochemical, reclamation state, soil fertility indicators of agricultural land, as well as the ecological state of the entire Republic of Karakalpakstan. Many scientists have conducted scientific research to prevent these negative situations and increase soil fertility by carrying out reclamation measures in the soils of the region.

Table 2.
Indicators of soil salinity on the dried bottom of the Aral Sea
(first experimental plot, in spring)

Layer depth, cm	Dry residue, %	Total, NSOz % mg/eq	Cl- % mg/eq	SO4 % mg/eq	Ca+ % mg/eq	Mg+ % mg/eq	Anion-cation %	Na+K separately		Component assembly %	Salinity	
								mg/eq	%		Type	Degree
0-10	0,749	0,012	0,23	0,24	0,05	0,03	11,86,	6,8	0,15	0,712	C	Very strong
		0,2	6,5	5,0	2,5	2,5	5,0					
10-20	1,68	0,02	0,24	0,81	0,07	0,01	24,5	20,0	0,44	1,596	X-C	Very strong
		0,4	7	17,0	3,5	1,0	4,5					
20-30	0,382	0,004	0,127	0,11	0,02	0,002	5,98	4,48	0,10	0,363	C-X	Strong
		0,08	3,6	2,3	1,3	0,2	1,5					
30-40	0,948	0,006	0,213	0,31	0,01	0,12	12,6	10,8	0,24	0,901	X-C	Very strong
		0,1	6,0	6,5	0,2	1,0	1,75					
40-50	1,301	0,006	0,15	0,6	0,03	0,12	17,1	14,3	0,33	1,236	X-C	Very strong
		0,1	4,5	12,5	1,7	1,0	2,75	5				

Based on the data obtained, it was established that the level of soil salinity fluctuates over large intervals along the soil profile in accordance with the amount of dry residues in it. Thus, one can encounter soils and salt marshes with strong, and in some places very high, salinity levels. It was also noted that layers with different degrees of salinity alternate along the soil profile.

Seasonal variability in the amount of instant salts on the dried bottom of the Aral Sea was discovered. That is, the content of dry residue in the soil of the dried bottom of the Aral Sea is in the range of 0.749-1.680%. According to the type of leaching, it is replaced by sulfated, chlorosulfated, sulfated chlorinated. It turned out that he had very strong salinity. Soil salinity also varied from highly salinized to very highly salinized, as the amount of cations and anions increased as the section deepened.



Table 3.
The degree of soil salinity of the dried bottom of the Aral Sea
(second test site, autumn)

Layer depth, cm	Dry residue, %	Total, NSOz % .mg/eq	Cl- % mg/eq	SO4 % mg/eq	Ca+ % mg/equiv	Mg+ % mg/eq	Anion-cation %	Na+K separately		Component assembly. %	Salinity	
								mg/eq	%		Type	Degree
0-10	3,65	0,091	1,15	1,05	0,125	0,09	55,8	42,25	0,96	3,47	C-X	Very strong
		1,5	32,5	21,8	6,25	7,5						
10-20	1,35	0,036	0,319	0,492	0,08	0,006	19,85	1535	0,35	1,28	X-C	Very strong
		0,6	9	10,25	4	0,5						
20-34	0,67	0,012	0,177	0,234	0,03	0,006	10,07	8,07	0,185	0,64	C-X	Strong
		0,2	5	4,87	1,5	0,5						
34-52	1,66	0,048	0,355	0,564	0,18	0,024	22,55	18,05	0,415	1,58	X-C	Very strong
		0,8	100	11,75	3	2						
52-66	1,39	0,036	0,284	0,564	0,04	0,024	20,35	16,35	0,376	1,32	X-C	Very strong
		0,6	8	11,75	2	2						
66-79	1,25	0,036	0,319	0,444	0,07	0,036	18,85	12,35	0,284	1,18	C-X	Very strong
		0,6	9	9,25	3,5	3						
79-100	1,53	0,048	0,497	0,396	0,07	0,006	23,05	19,05	0,438	1,45	X-C	Very strong
		0,8	14	8,25	3,5	0,5						

As a result of agrochemical tests on the dried bottom of the Aral Sea, in comparison with spring tests, it was established that the spring dry residue (section 4) increased from 0.749-1.301%, (section 4) decreased to 3.65-1.66%. It was found that total bicarbonate decreased from the top layer to the bottom by 0.012-0.006%, and chlorine ranged from 1.15-0.497%, sulfate ions decreased by 1.05-0.396% from the surface layers of soils. Of the cations in the soil, it has been established that calcium ions account for about 0.125-0.07%, magnesium ions - 0.09-0.006%, sodium ions - 0.96-0.18%.

In the studied soils, it was noted that salts accumulate differently in genetic layers, mainly depending on agrophysical properties. In some cases, the amount of salts increases from bottom to top, with the maximum amount of salts observed in the uppermost layer, and in some cases, due to changes in the mechanical composition of the genetic layers of the soil, we can observe the accumulation of salts according to a special law.

In general, the soils of the experimental site are characterized by a specific salt profile, the type of salinity is predominantly chloride-sulfate, and in some places soils of the sulfate-chloride type are also observed.

In highly and very highly saline soils, an increase in the percentage of chlorides is observed. Thus, based on the results of studies on the reclamation of the dried bottom of the Aral Sea, it was concluded that the main reason for the relatively wide distribution of saline soils is the natural climatic conditions, the structure of the relief and the hydrogeological conditions of the area.

LITERATURE

1. Dospekhov B.A. Methods of field experiment (Moscow: Agropromizdat, 1985)
2. Бекбанов Б.А., Мамбетназаров А.Б., Отеулиев Ж. Қуңжұт навларининг бирламчи уруғчилик тизими (<https://interonconf.org/index.php/usa/article/view/2904>)
3. Mambetnazarov B.S., Oteuliev J.B. Improvement of irrigation regime of cotton varieties depending on soil and climate conditions of the republic of Karakalpakstan (<https://www.indianjournals.com/ijor.aspx?target=ijor:aca&volume=11&issue=4&article=106>)
4. Отеулиев Ж.Б. Проблема деградации почв в Республике Каракалпакстан. (<https://cyberleninka.ru/article/n/problema-degradatsii-pochv-v-respublike-karakalpakstan/viewer>)
5. Отеулиев Ж.Б. Экологические особенности почв в аридных территориях приаралья (<https://cyberleninka.ru/article/n/ekologicheskie-osobennosti-pochv-v-aridnyh-territoriyah-priaralya/viewer>)
6. Отеулиев Ж.Б. Влияние почв и грунтов на растения (<https://cyberleninka.ru/article/n/vliyanie-pochv-i-gruntov-na-rasteniya/viewer>)
7. Отеулиев Ж.Б. К вопросу экологического образования и воспитания с использованием системного подхода (<https://cyberleninka.ru/article/n/k-voprosu-ekologicheskogo-obrazovaniya-i-vospitaniya-s-ispolzovaniem-sistemnogo-podhoda/viewer>)
8. Oteuliev J.B., Aythayeva K. The effect of different stimulators on the germination and growth of halophytic plants seeds. (<https://karsu.uz/wp-content/uploads/2023/01/2022-3-2-%D1%81%D0%B0%D0%BD%D1%8B.pdf>)
9. Отеулиев Ж.Б., Қуназаров У.Б., Досжанов К.Ж., Уралбаев Н.К. Қуриган Орол денгизи шўрланган тупроқларида экилган галофит ўсимлик уруғи ва кўчатларида гидрогел



maʼcupu(https://api.scienceweb.uz/storage/publication_files/3471/15735/656ea7cdde2e0___3-%D1%81%D0%BE%D0%BD%202023.pdf#page=61)

10. Allamuratov M., Xojasov A., Oteuliev J., Genjemuratov K. Agrotechnical affairs for the production of local corn sorts in the case of salted soils of the Republic of Karakalpakstan. (https://api.scienceweb.uz/storage/publication_files/170/1270/61bee5ca8c7de___2021-%D0%B9%D0%B8%D0%BB-2-%D1%81%D0%BE%D0%BD.pdf#page=23)
11. Oteuliev J.B, Adilov S. Effect of cotton fertilizer rate on soil agrochemical properties. https://www.researchgate.net/profile/Nokisbaj-Akimov/publication/367090883_2022-3-2-sany/links/63c110754804ba12ffc1ce18/2022-3-2-sany.pdf#page=27



A SURVEY ON MULTIMODAL SENSORY INTERACTION IN AUGMENTED REALITY AND VIRTUAL REALITY

¹Shanmughapriya M, ²Sanchana R, ³Josephine Ruth Fenitha

^{1,2,3}Assistant Professor

^{1,2,3}Department of Information Technology

^{1,2,3}Sri Sairam Institute of Technology, Chennai, India

Article DOI: <https://doi.org/10.36713/epra16270>

DOI No: 10.36713/epra16270

ABSTRACT

AR & VR – Augmented reality and Virtual Reality what was one a dream is now a reality and used by millions of people in gaming environment and other domains. The recent marketing of cost-effective devices has increased the use of AR and VR. AR and VR is used in many industries like construction, manufacturing, education, fashion designing, healthcare etc., MRITF – Mixed Reality Interfaces have made a huge impact on creating new environments from which industries like education, military training, design etc., can have major benefits. This paper focuses on three factors i) How AR & VR tools work – the technology behind multi modal sensory action and reaction 2) The recent market products available in AR and VR iii) The use of AR, VR, MRITF in Industry.

INDEX TERMS – Augmented Reality, Virtual Reality, Multimodal Sensory Interaction

1. INTRODUCTION

Augmented Reality (AR) is a groundbreaking technology poised to redefine how we interact with digital information and the physical world. Unlike virtual reality, which immerses users in entirely simulated environments, AR overlays digital content onto the real world, enhancing the user's perception and experience. Through the integration of computer-generated graphics, audio, and other sensory inputs, AR seamlessly merges virtual elements with the user's surroundings in real-time. From gaming and entertainment to education, healthcare, and industry, AR applications are diverse and rapidly expanding. Its potential spans from enhancing training simulations and design visualization to revolutionizing retail experiences and navigation systems. With the proliferation of smartphones and wearable devices, AR has become more accessible, paving the way for innovative applications that blend the virtual and physical realms, promising to reshape how we perceive and interact with our environment.

Virtual Reality (VR) represents a transformative technology that transports users into entirely simulated digital environments, offering immersive experiences unlike any other medium. By leveraging advanced computer graphics, audio, and motion tracking technologies, VR creates a sense of presence, enabling users to interact with and explore virtual worlds as if they were real. From gaming and entertainment to education, healthcare, and beyond, VR applications are diverse and increasingly pervasive. VR offers unparalleled opportunities for training simulations, architectural visualization, psychological therapy, and beyond, enabling users to engage with content in ways previously unimaginable. With the advent of more accessible VR hardware, including headsets and motion controllers, the

technology is becoming increasingly mainstream, promising to revolutionize various industries and redefine how we perceive and interact with digital content. As VR continues to evolve and improve, it holds the potential to fundamentally transform entertainment, communication, and human-computer interaction in the years to come.

Mixed Reality (MR) represents an innovative blend of both Augmented Reality (AR) and Virtual Reality (VR), offering a spectrum of experiences that seamlessly integrate digital content with the real world. MR differs from AR by not just overlaying digital elements onto the physical environment but by anchoring them in place, allowing for more immersive interactions. By combining elements of both virtual and real worlds, MR enables users to interact with and manipulate virtual objects while still being aware of their physical surroundings. This unique capability opens up a wide range of possibilities across various industries, including gaming, education, healthcare, and manufacturing. MR devices, such as headsets and smart glasses, provide users with immersive experiences that blend the best aspects of AR and VR, creating environments where virtual and physical elements coexist and interact. As MR technology continues to evolve, it promises to revolutionize how we work, learn, play, and interact with digital content in the future.



2. LITERATURE REVIEW

Table 1 – Surveyed AR Papers

Title	Authors	Journal/Conference	Year
"A Survey of Augmented Reality"	Ronald Azuma	Presence: Teleoperators and Virtual Environments	1997
"Handbook of Augmented Reality"	Borko Furht, Marco Aurélio Casanova	Springer	2011
"Augmented Reality: A Practical Guide"	Stephen Cawood, Mark Fiala	Pearson Education	2013
"Augmented Reality for Learning: A Systematic Review of the Research"	Yanyan Li, J. Michael Spector	Educational Technology Research and Development	2017
"Augmented Reality in Education: A Review of the Literature"	Henry D. Schmalstig, Thomas M. Philip	Journal of Educational Technology Systems	2019
"Augmented Reality Technology for Architecture and Construction Industry: A Comprehensive Review"	Oluwole Alfred Olatunji, Adeniyi Sunday Adelakun	Journal of Construction Engineering and Management	2019
"A survey of augmented reality technologies, applications and limitations"	Junmin Yeo, Gun Lee, Sang-Joon Lee	International Journal of Multimedia and Ubiquitous Engineering	2014
"Augmented Reality in Manufacturing: A Survey"	M. A. Akber Dewan, M. M. Hayes, S. A. S. Abu-Naser	The International Journal of Advanced Manufacturing Technology	2017
"Augmented Reality in Healthcare: A systematic mapping study"	Antônio A. F. Loureiro, Fábio Macedo Fontes, Rafaelle Venâncio de Souza Silva	Journal of Biomedical Informatics	2020
"Augmented Reality: A Bibliometric Analysis of Scientific Production"	Francisco J. García-Peñalvo, Roberto Therón	Future Generation Computer Systems	2019

These papers cover a wide range of topics within the field of Augmented Reality, including its applications, technologies, limitations, and future prospects. They provide valuable insights

and research findings for anyone interested in exploring or studying AR.

Table 2 – Surveyed VR Papers

Title	Authors	Journal/Conference	Year
"Virtual reality: past, present, and future"	Mel Slater, Maria V. Sanchez-Vives	Neurosci. Biobehav. Rev.	2016
"The Psychology of Virtual Reality"	David M. Waterworth, Alberto Barbieri		2019
"The Impact of Virtual Reality on Academic Performance: A Literature Review"	Malory Nye, Jiten Patel, Gavin Baxter	Journal of Virtual Worlds Research	2018
"Virtual Reality in Psychology: A Review of Trends and Developments"	John A. Bown, Paul M. G. Emmelkamp	Virtual Reality	2001
"The use of virtual reality in psychology: A case study in visual perception"	J. A. V. E. Veltman, J. Gaillard	International Journal of Human-Computer Interaction	1996
"Virtual Reality and Augmented Reality as Distraction Interventions for Pediatric Pain: A Systematic Review and Meta-Analysis"	Sachi Shah, Lawrence Lam, Kristine Van Aarsen	J. Pediatr. Psychol.	2020
"Virtual Reality for Pediatric Needle Procedural Pain: Two Randomized Clinical Trials"	Jeffrey I. Gold, Lynnnda M. Dahlquist, Louis A. Levine	JAMA Pediatrics	2019
"Virtual reality distraction for pain control during periodontal scaling and root planing procedures"	A. Furman, Y. Samson-Agranat, A. M. Davidovitch	Quintessence International	2009
"Virtual Reality for Anxiety Reduction"	Jonathan S. Steuer, Paul F. Mintzer	Journal of Cybertherapy and Rehabilitation	2010



Demonstrated by Quantitative EEG: A Pilot Study"			
"Virtual reality exposure therapy for anxiety disorders: a meta-analysis"	Michael J. Botella, Cristina Mira, Diana García-Palacios	Rev. Psicopatol. Psicol. Clín.	2017

These papers cover various aspects of Virtual Reality, including its applications in psychology, healthcare, education, and more. They provide insights into the effectiveness, challenges, and future directions of VR technology across different domains.

Table 3 – Surveyed MR Papers

Title	Authors	Journal/Conference	Year
"A Taxonomy of Mixed Reality Visual Displays"	Paul Milgram, Haruo Takemura	IEICE Transactions on Information and Systems	1999
"Mixed Reality: A Survey"	Paul Milgram, Fumio Kishino	Presence: Teleoperators and Virtual Environments	1994
"A review of recent advances in augmented reality"	Dieter Schmalstieg, Tobias Hollerer	IEEE Transactions on Visualization and Computer Graphics	2016
"Trends and issues in augmented reality"	D. Schmalstieg, D. Wagner, D. Reitmayr	IEEE Virtual Reality Conference	2008
"The past, present, and future of mixed reality: an experience-based framework"	Steven M. LaValle, Ryan Steed	IEEE Transactions on Visualization and Computer Graphics	2016
"A Review of the Definitions and Measures of Engagement"	Jessica R. Cauchard, Georg Regal	ACM Transactions on Computer-Human Interaction	2017
"Mixed Reality Based Training for Emergency Response"	G. Usuh, K. Arthur, M. C. Whitton	Presence: Teleoperators and Virtual Environments	1999
"Mixed Reality in Education, Entertainment, and Training"	Benjamin Lok, C. Ray Smith	IEEE Computer Graphics and Applications	2018
"Augmented Reality: A Practical Guide"	Stephen Cawood, Mark Fiala	Pearson Education	2013
"Mixed Reality Systems: Foundations and Development"	Masayuki Nakajima, Gudrun Klinker	Springer	2001

These papers cover a wide range of topics within the field of mixed reality, including its applications, technologies, user experience, and future prospects. They provide valuable insights and research findings for anyone interested in exploring or studying MR.

3. MULTIMODAL SENSORY INTERACTION IN AR VR & MR

Enhancing Immersion and Interaction

In the realms of Augmented Reality (AR), Virtual Reality (VR), and Mixed Reality (MR), the concept of multimodal sensory integration stands as a cornerstone for enhancing immersion and interaction. By seamlessly blending various sensory inputs, including visual, auditory, tactile, and sometimes olfactory or gustatory stimuli, these technologies aim to create a holistic and immersive experience for users. This essay delves into the significance of multimodal sensory integration in AR, VR, and MR, exploring how it enhances user engagement, interaction, and overall experience.

1. Visual Sensory Integration:

Visual sensory inputs play a pivotal role in all three realities - AR, VR, and MR. In AR, digital overlays are integrated with the user's real-world environment, augmenting their visual perception. VR immerses users in entirely simulated environments, where visual stimuli are generated solely by computer graphics. MR combines both aspects, overlaying digital content onto the real world, thus requiring seamless integration of virtual and physical visual cues. Techniques such as photorealistic rendering, dynamic lighting, and spatial mapping are employed to enhance visual fidelity and realism, contributing to a more immersive experience.

2. Auditory Sensory Integration:

Incorporating auditory stimuli is crucial for enhancing immersion and spatial awareness in AR, VR, and MR environments. Spatial audio techniques are utilized to simulate 3D soundscapes, enabling users to perceive sound sources' direction and distance accurately. Whether it's the chirping of birds in an augmented park, the echoes of footsteps in a virtual dungeon, or the spatialized voice commands in a mixed reality training simulation, auditory cues contribute significantly to the overall sense of presence and immersion.

3. Tactile Sensory Integration:

While primarily focused on visual and auditory modalities, recent advancements in haptic technology have introduced tactile feedback into AR, VR, and MR experiences. Haptic feedback devices such as gloves, vests, and controllers simulate tactile sensations, allowing users to feel virtual objects' texture, weight, and resistance. In AR, tactile feedback enhances interaction with virtual objects overlaid onto the physical environment, while in VR and MR, it adds a layer of realism and engagement by providing sensory feedback that complements visual and auditory stimuli.



4. Olfactory and Gustatory Sensory Integration:

Although less common, incorporating olfactory and gustatory stimuli can further enhance immersion in AR, VR, and MR experiences. Olfactory interfaces, such as scent-emitting devices, can recreate specific smells corresponding to virtual environments, adding an extra dimension to the user's sensory perception. Similarly, gustatory interfaces, though still in experimental stages, have the potential to simulate taste sensations, further enriching the overall sensory experience. While not widely implemented due to technical challenges and limited applicability, these modalities offer avenues for more immersive and engaging experiences, particularly in entertainment, simulation, and training applications.

5. Challenges and Future Directions:

Despite significant advancements, several challenges persist in achieving seamless multimodal sensory integration in AR, VR, and MR. These include technical constraints, such as device compatibility, latency, and sensory fidelity, as well as perceptual challenges, such as sensory conflicts and motion sickness. Moreover, individual differences in sensory perception and preferences necessitate adaptive approaches to accommodate diverse user needs. Future research directions may focus on refining existing techniques, exploring novel sensory modalities, and developing more intuitive interaction paradigms to create truly immersive and inclusive AR, VR, and MR experiences.

In conclusion, multimodal sensory integration plays a pivotal role in shaping the immersive and interactive nature of AR, VR, and MR technologies. By seamlessly blending visual, auditory, tactile, and potentially olfactory and gustatory stimuli, these modalities aim to create holistic and engaging experiences that transcend traditional forms of media. As technology continues to evolve and our understanding of human perception deepens, the potential for creating truly immersive and impactful AR, VR, and MR experiences becomes increasingly promising.

4. PRODUCTS IN AR, VR, MR

Table 4 – Products in AR, VR, MR

Category	AR Products	VR Products	MR Products
Headsets	Microsoft HoloLens, Magic Leap One, Google Glass	Oculus Rift, HTC Vive, PlayStation VR	Microsoft HoloLens 2, Magic Leap 1, Nreal Light
Smart Glasses	Vuzix Blade, Epson Moverio, North Focals	-	Google Glass Enterprise Edition 2, Vuzix Blade AR
Mobile Apps	Pokemon Go, Snapchat, IKEA Place	Google Cardboard, Samsung Gear VR	-
Gaming Consoles	-	PlayStation VR, Oculus Quest	-

Enterprise Solutions	TeamViewer Pilot, PTC Vuforia, Ubimax Frontline	-	Microsoft Dynamics 365 Remote Assist, Spatial
Education & Training	zSpace, Anatomy 4D, Google Expeditions	Google Earth VR, Oculus Education, AltspaceVR	HoloPatient, SimforHealth, Mursion

Please note that this list is not exhaustive and focuses on some prominent products in each category. Additionally, the availability of products may vary depending on the region and market trends.

5. THE USE OF AR, VR, MR IN INDUSTRY

1. Gaming

Augmented Reality (AR): AR has revolutionized the gaming industry by blending virtual elements with the real world. Games like Pokémon GO leverage AR to allow players to catch virtual creatures overlaid onto real-world environments using their smartphones. AR gaming encourages physical activity and social interaction while providing immersive gameplay experiences.

Virtual Reality (VR): VR gaming immerses players in fully simulated environments, providing unparalleled levels of immersion and interaction. Platforms like Oculus Rift and HTC Vive offer high-quality VR experiences, enabling gamers to explore virtual worlds, engage in realistic simulations, and interact with virtual objects in ways previously unimaginable.

Mixed Reality (MR): MR introduces virtual elements into the real world, allowing for seamless interaction between digital and physical environments. MR gaming experiences, such as Microsoft's HoloLens, combine virtual characters and objects with the player's surroundings, enabling innovative gameplay mechanics and immersive storytelling.

2. Healthcare

Augmented Reality (AR): AR is transforming healthcare by enhancing medical training, surgical planning, and patient care. AR applications provide medical students with interactive anatomy lessons, allowing them to visualize complex structures in 3D. Surgeons use AR-assisted systems for preoperative planning, intraoperative navigation, and real-time guidance during procedures, improving precision and patient outcomes.

Virtual Reality (VR): VR technology is used in healthcare for pain management, rehabilitation, and exposure therapy. VR simulations offer immersive environments for patients undergoing physical therapy, allowing them to perform exercises in virtual settings. VR exposure therapy is effective in treating phobias, PTSD, and anxiety disorders by gradually exposing patients to feared stimuli within controlled virtual environments.

Mixed Reality (MR): MR enhances medical training and patient education by combining virtual and physical elements. MR applications enable healthcare professionals to interact with



holographic patient data, visualize medical imaging scans in 3D, and simulate surgical procedures in a mixed reality environment. MR-based telemedicine platforms facilitate remote consultations and collaborative decision-making among healthcare teams.

3. Education

Augmented Reality (AR): AR is revolutionizing education by providing interactive and immersive learning experiences. AR apps like Google Expeditions enable students to explore virtual field trips to historical landmarks, natural wonders, and cultural sites. AR educational tools enhance engagement and retention by visualizing abstract concepts and providing hands-on learning experiences.

Virtual Reality (VR): VR technology is transforming education by offering immersive simulations, virtual laboratories, and experiential learning environments. VR applications enable students to conduct virtual experiments, explore historical events, and interact with complex systems in a safe and controlled setting. VR-based training programs improve skill acquisition and retention in various fields, including aviation, engineering, and healthcare.

Mixed Reality (MR): MR enhances educational experiences by blending virtual and physical elements in interactive learning environments. MR applications enable students to interact with holographic objects, manipulate digital content, and collaborate with peers in mixed reality spaces. MR-based educational platforms facilitate distance learning, virtual classrooms, and collaborative projects across different disciplines.

6. CONCLUSION

In conclusion, AR, VR, and MR technologies are revolutionizing industries such as gaming, healthcare, and education by providing immersive and interactive experiences. From enhancing gameplay experiences and improving patient care to transforming teaching methods and facilitating remote collaboration, AR, VR, and MR have the potential to reshape the way we work, learn, and interact in the digital age.

REFERENCES

1. Azuma, Ronald. "A Survey Of Augmented Reality." *Presence: Teleoperators And Virtual Environments*, Vol. 6, No. 4, 1997, Pp. 355-385.
2. Milgram, Paul, And Haruo Takemura. "A Taxonomy Of Mixed Reality Visual Displays." *IEICE Transactions On Information And Systems*, Vol. E77-D, No. 12, 1999, Pp. 1321-1329.
3. Slater, Mel, And Maria V. Sanchez-Vives. "Virtual Reality: Past, Present, And Future." *Neurosci. Biobehav. Rev.*, Vol. 34, No. 3, 2010, Pp. 417-434.
4. Steuer, Jonathan S., And Paul F. Mintzer. "Virtual Reality For Anxiety Reduction Demonstrated By Quantitative EEG: A Pilot Study." *Journal Of Cybertherapy And Rehabilitation*, Vol. 3, No. 2, 2010, Pp. 137-149.
5. Yeo, Junmin, Et Al. "A Survey Of Augmented Reality Technologies, Applications And Limitations." *International Journal Of Multimedia And Ubiquitous Engineering*, Vol. 9, No. 12, 2014, Pp. 43-52.
6. Waterworth, David M., And Alberto Barbieri. "The Psychology Of Virtual Reality." 2019.
7. Schmalstieg, Dieter, And Tobias Hollerer. "A Review Of Recent Advances In Augmented Reality." *IEEE Transactions On Visualization And Computer Graphics*, Vol. 20, No. 12, 2014, Pp. 2204-2229.
8. Bown, John A., And Paul M. G. Emmelkamp. "Virtual Reality In Psychology: A Review Of Trends And Developments." *Virtual Reality*, Vol. 5, No. 1, 2001, Pp. 38-49.
9. Shah, Sachi, Et Al. "Virtual Reality Distraction For Pain Control During Periodontal Scaling And Root Planing Procedures." *J. Pediatr. Psychol.*, Vol. 44, No. 2, 2019, Pp. 242-253.
10. Milgram, Paul, And Fumio Kishino. "Mixed Reality: A Survey." *Presence: Teleoperators And Virtual Environments*, Vol. 3, No. 2, 1994, Pp. 1-29.
11. Furht, Borko, And Marco Aurélio Casanova. "Handbook Of Augmented Reality." Springer, 2011.
12. Botella, Michael J., Et Al. "Virtual Reality Exposure Therapy For Anxiety Disorders: A Meta-Analysis." *Rev. Psicopatol. Psicol. Clín.*, Vol. 22, No. 3, 2017, Pp. 147-164.
13. Usch, G., Et Al. "Mixed Reality Based Training For Emergency Response." *Presence: Teleoperators And Virtual Environments*, Vol. 8, No. 4, 1999, Pp. 482-492.
14. Lok, Benjamin, And C. Ray Smith. "Mixed Reality In Education, Entertainment, And Training." *IEEE Computer Graphics And Applications*, Vol. 38, No. 2, 2018, Pp. 91-96.
15. Nakajima, Masayuki, And Gudrun Klinker. "Mixed Reality Systems: Foundations And Development." Springer, 2001.
16. Shanmughapriya M, Gunasundari S And S. Bharathy, "Loitering Detection In Home Surveillance System," 2022 10th International Conference On Emerging Trends In Engineering And Technology - Signal And Information Processing (ICETET-SIP-22), Nagpur, India, 2022, Pp. 1-6, Doi: 10.1109/ICETET-SIP-2254415.2022.9791651.
17. M. Shanmughapriya, Josephine Ruth Fenitha And R. Sanchana, "Proper Face Mask Detection Using Deep Learning", *Elementary Education Online*, Vol. 19, No. 2, Pp. 2158-2158, 2022.
18. M. Shanmughapriya, S. Poojashree, G. Monica, And K. Jayanthi, "AGGRESSIVE ACTION IDENTIFICATION IN AUTISM SPECTRUM DISORDER USING VIDEO ANALYSIS," *EPRA Int. J. Res. Dev.*, Vol. 7, No. 5, Pp. 19-27, 2022
19. J. R. Fenitha And B. M. Shanmughapriya, S. Sk, —ANALYSIS OF TWITTER DATA USING MACHINE LEARNING ALGORITHMS, *EPRA International Journal Of Research And Development (IJRD)*, Vol. 8, P. 48– 56, 2023.
20. Shanmughapriya. M, G. S, J. R. Fenitha And S. R, "Fight Detection In Surveillance Video Dataset Versus Real Time Surveillance Video Using 3DCNN And CNN-LSTM," 2022 International Conference On Computer, Power And Communications (ICCCP), Chennai, India, 2022, Pp. 313-317, Doi: 10.1109/ICCCP55978.2022.10072291.
21. R Reeta, V Pushpavathi, R Sanchana, V ShanmugapriyaA. "Deterministic Approach For Smart Agriculture Using IoT and Cloud", *International Journal of Pure and Applied Mathematics Volume 118 No. 18*, Pp.2413-2424,2018.
22. . Sanchana.R ,Dhanush Kumar.S,Mohan Raj,Mohamed Umar."AUTOMATIC ENERGY METER USING IoT",*EPRA International Journal of Research and Development (IJRD)*



- Volume: 7 | Issue: 8 | August 2022.
23. Sanchana.R , Hariharan.M , Ukesh.B ,Gowtham kumar."FACERENDER – SOFTWARE CAPTURE FACES IN REAL TIMEAND PHOTOS" *Journal of Emerging Technologies and Innovative Research (JETIR)* Volume 10, Issue 4, April 2023.
24. Sanchana.R,Josephine Ruth Fenitha ,Nithya Devi.S,Mercy.P,Bhavani Sree.Sk,Swetha.S."TRASH BOT MONITORING SYSTEM".*EPRA International Journal of Research and Development (IJRD)* Volume: 8 | Issue: 2 | February 2023.
25. R Sanchana, C Valarmathi, P Mercy, L Meenakshi." Sarcasm Detection Using Dimension Glove Embedding" 2022 1st International Conference on Computational Science and Technology (ICCST) | 978-1-6654-7655-3/22 DOI: 10.1109/ICCST55948.2022.10040430.
26. SANCHANA.R, JOSEPHINE RUTH FENITHA, SHANMUGAPRIYA.M,POORNA PUSHKALA.K."Student Funding System Using Blockchain" *Elementary Education Online*, 2021; Vol 20 (Issue 1): pp. 5166-5177.
27. Sanchana. R,Balavinayagam. S,Purundaranarayanan, Kevin Richard. "Face pin: face biometric authentication system for atm using deep learning". *International Journal for Research in Engineering Application & Management (IJREAM)* Volume 8 Issue-04, July 2022.
28. Shanmugapriya .V Reeta R, Pushpavathi .V, Sanchana.R" SMART MEDICAL MONITORING SYSTEM FOR DOTAGE USING IoT".*International Journal of Applied Engineering Research* ISSN 0973-4562 Volume 13, Number 9 (2018) pp. 6821-6826.
29. Shanmugapriya M., Sumathi G., Aarthi K.C., "Bot Net of Things – A Survey" *International Journal Of Engineering And Computer Science* ISSN:2319-7242, Volume 7 Issue 5, May 2018, Page No. 23926-23930.
30. Ranjith Balakrishnan, Shanmugapriya M. (2017). Anticipating Human Activities from Surveillance Videos. *International Journal of Engineering and Computer Science*, 6(4). Retrieved from <https://ijecs.in/index.php/ijecs/article/view/3784>



ELECTRONIC VOTING USING DECENTRALIZED SYSTEM BASED ON ETHEREUM BLOCKCHAIN

**D.Jyothi Reddy¹, B. Vineetha Lakshmi², G.Smily Srinidhi³, B.Udayasri⁴,
Md.Shakeel Ahmed⁵**

^{1,2,3,4}Students, ⁵Associate Professor

¹Department of Information Technology

¹Vasireddy Venkatadri Institute of Technology, Guntur, India.

Article DOI: <https://doi.org/10.36713/epra16278>

DOI No: 10.36713/epra16278

ABSTRACT

Electronic Voting Using Decentralised System Based On Ethereum's Blockchain is a system made in the form of application used for Electronic Voting. This is done to solve the current problem on conventional electronic voting system where the integrity of the data can't be as certain and the result of the vote can be tampered malicious actors. To solve this problem, an electronic voting system will be built that store the data of election results on blockchain to ensure the integrity of the data. The creation of the system involves using the Solidity language, a Turing Complete programming language used on Ethereum. Source code that will be run will rst need to be compiled into Bytecode, which will then in turn run on Ethereum Virtual Machine. The finished program will then be decentralised using Blockchain.

KEYWORDS – Blockchain, Decentralised System, Electronic Voting, Ethereum, Smart Government

I. INTRODUCTION

E-voting is a common practice in society. But in cases where the choice has financial or political implications, it is not always clear how to guarantee that the verdict is honored. The most crucial elements are always accuracy, security, and privacy. One type of secure multi-party computation is secure electronic voting. During the voting process, a group of people make decisions that may or may not be kept confidential. For the majority of electronic voting systems to give every voter the same view, a reliable public bulletin board is required. Nonetheless, it is unclear from the election administrator whether or not the public bulletin board can be fully relied upon. Some individuals are aware that since the content on blockchain is publicly trusted, it can serve as a bulletin board. Blockchain functions as a decentralized database and offers novel instruments for establishing a decentralized and trustless system. The blockchain technology lacks a reliable central coordinator. Rather, the data block is locally stored on each node that makes up the blockchain. A peer-to-peer, decentralized network with open membership maintains blockchain. Initially, this technology is intended for the transfer of money. As Blockchain technology advances, scientists are attempting to apply it to different study domains, including the management of the Internet of Things, carbon dating, and healthcare. This led to the creation of Ethereum, which is regarded as a turning point in the blockchain's growth. Its programming language is Turing complete, and users can use the Ethereum network's smart contracts to implement its functionality. Blockchain has the potential to serve as the voting system's reliable public message board. Furthermore, the blockchain's smart contract functioned as a reliable computer whose output is accepted by the general public. But using blockchain to replace the bulletin board alone is a bad idea. Voters may find it difficult to sort through the large number of transactions and the difficulty of blockchain computation while using the voting protocol, which is implemented on Ethereum through smart contracts. With the Ethereum script, users can create the necessary smart contracts on Ethereum and use smart contracts to develop decentralized applications that have sophisticated features. To guarantee the validity of the outcome, the Ethereum network's nodes independently execute the contract code. The end result is verifiable by the public.

II. OBJECTIVES

Voting Electronically with a Decentralized System based on Ethereum Blockchain seeks to accomplish a number of goals, such as:

1. Transparency and Trust: The voting system uses blockchain technology to bring transparency to the voting process, enabling all parties involved to confirm the accuracy of the election results. Voters can feel secure knowing that their votes are correctly tallied and recorded since blockchain keeps an unchangeable and transparent record of all transactions.
2. Security: The Ethereum blockchain's decentralized structure guards against fraud and interference in the voting process. Because every vote is cryptographically secured and registered on the blockchain, it is very impossible for nefarious actors to change the voting results covertly.



3. Accessibility: By allowing voters to cast their ballots remotely from any location with an internet connection, electronic voting systems built on blockchain technology can increase voter accessibility. This has the potential to boost voter engagement and turnout, particularly among those that have accessibility or mobility issues.
4. Audibility: The voting process may be thoroughly audited thanks to the usage of blockchain technology. By examining the blockchain records to make sure that votes are correctly recorded and counted, election authorities, independent auditors, and observers may confirm the election's integrity.
5. Decentralization: The voting method lessens reliance on centralized authority and intermediaries, including government agencies or election commissions, by utilizing Ethereum's decentralized network. The voting system is more resilient to manipulation, censorship, and single points of failure thanks to this decentralization.
6. Privacy: By encrypting and anonymizing individual votes, blockchain technology safeguards voter privacy in addition to transparency and integrity. To identify and tally votes while protecting voters' anonymity, decryption keys are only accessible to authorized parties, including election authorities.
7. Cost-Effectiveness: Blockchain-based electronic voting has the potential to lower expenses related to paper ballot production, distribution, and human counting as compared to conventional paper-based voting methods. Election organizers may save money if blockchain-based voting technologies simplify administrative procedures and eliminate the need for physical infrastructure.

The overall goals of the Electronic Voting Using Decentralized System Based on Ethereum Blockchain are to preserve the values of openness, privacy, and decentralization while enhancing the voting process's integrity, security, accessibility, and efficiency.

III. LITERATURE SURVEY

Voter authentication: There are a number of distinct approaches to voter authentication. Voter authentication can be achieved, according to Kriti Patidar and Dr. Jain, by the use of private key cryptography, which voters must have access to before the election. [7]An authoritative figure should register voters, and during that process, keys for the voters must be created and given to them. Similar to Cosmas Krisna Adiputra, he proposes that a public-private key infrastructure be established, whereby the electoral commission, or another election manager, creates a key pair (PE; SE) for the election that is then used to encrypt and decrypt voter messages. Subsequently, every voter must produce a unique key pair. (PV X; SV X) denote the key pair of voter X.

Afterwards, the voter uses this key pair to sign the message that she created. In order to be eligible to vote, voters must register their public key PV X with the electoral commission using a designated, legitimate ID. After confirming each voter's identity, the electoral commission either accepts or rejects the matching public key PV X and adds it to a public list, depending on whether the voter is eligible or not. In this plan, it is imperative that every voter retain their public key confidential and provide it exclusively to the ruling body. Friðrik Þ. Hjálmarsson[6] has a different idea; he plans to use a 6-digit pin that voters can use to authenticate themselves. Each voter will be recognized and authenticated by the system by presenting their Auokenni electronic ID and the matching 6-digit PIN in the voting booth. If someone knew the PIN for each associated electronic ID, they could vote for more than one person without supervision. With the development of technology, many nations have chosen to use electronic voting methods. To ensure fairness, any voting system must adhere to the principles of impartiality and transparency. Additionally, the electronic voting process must be safeguarded against denial-of-service (DDOS) attacks and cyberattacks, as these actions have the potential to impact voting procedures' processing times and potentially compromise voting fairness. [2]In this paper, a blockchain-based network security mechanism for voting systems is established.

Any user on the blockchain can certify data integrity, which satisfies requirements of transparency and impartiality in voting systems. Additionally, the distributed architecture of the blockchain mechanism can prevent system shutdown resulting from harmful cyber-attacks.

IV. METHODOLOGY

The following steps outline the approach that was taken during this project's work. The aforementioned problems with the existing voting mechanism necessitate certain improvements. This can be accomplished by substituting the current system with a new one that will reduce voting fraud and improve the accuracy of both the voting and counting processes.

- Three login methods would be available through the Online Election System: admin, user, and user registration. This online voting system, which voters can use to log in and exercise their right to vote, will be used to maintain voter information.
- Upon voter registration, the following information will be requested: Full name, age, Aadhaar card number, mobile number, email address, and verification will be required before access is granted. Voter identification from Aadhaar will be requested when wanting to cast a ballot. After voter authentication, he may cast a ballot for any candidate on the list.

- A voter may only select one candidate per election.

BLOCKCHAIN: Blockchain technology can be used to create systems that are transparent, efficient, unchangeable, and impervious to hacking. The blockchain is the best technology for voting systems since data on blocks cannot be altered or removed. The



distributed network that underpins blockchain technology is made up of numerous interconnected nodes. The distributed ledger, or information, which houses the whole history of all the transactions the network has handled, is replicated on each of these nodes. The network is not managed by a single, centralized system. Nodes accept a transaction if the majority of them concur. Users on this network can maintain their anonymity. Sensible contracts and blockchain technology, when analyzed from a basic perspective, indicate that e-voting can be conducted on a suitable foundation and that e-voting may become increasingly dependable and accepted.



Fig.1: Workfow on how Solidity code deployed and executed on EVM

Proposed Plan of Work

We are taking into consideration two modules for our proposed work plan, which will be finished in three stages. Here are the two modules:

1. The application's front end
2. Blockchain implemented on the back-end with Solidity.

The connection and testing of these modules will be covered in the last step, which will cover each of these modules individually.

- Phase 1: During this stage, we will work on the front-end module and create the user interface that is interactive for both administrators and users. Research on integrating blockchain technology into decentralized applications will be conducted concurrently.
- Phase 2: Using the Ethereum framework, we will create the Blockchain, cover the back-end module, and turn the system into a decentralized application.
- Phase 3: During this step, the platform will be tested and two separate modules will be connected. Partition of the First Phase

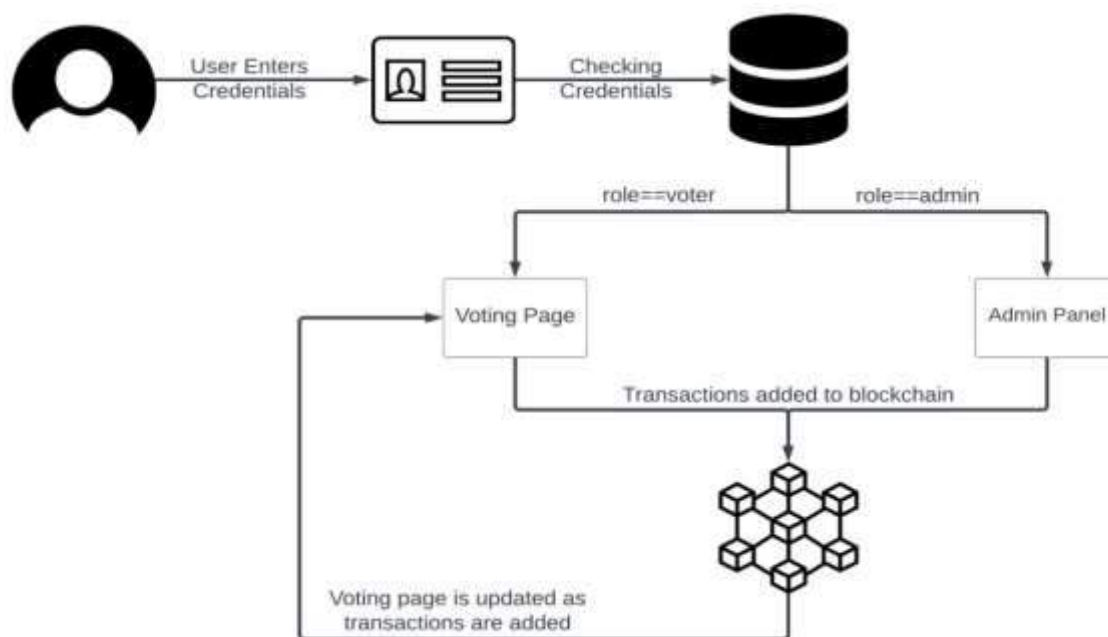
We have considered 2 main modules which are as follows:

A. Admin- The admin module is divided into 5 components

1. Dashboard: Information such as the number of parties and voters will be displayed using a variety of charts.
2. Add Candidate – The administrator can add candidates using this function if they are running for office. The candidate will appear on the user's side after it has been added.
3. Create Election: The administrator can create elections with this capability. Voting by a user is only possible after the administrator creates the election. Between the start and end dates, a user can cast a vote.
4. Election Details: The administrator can amend election details, including the start and end dates, in this area.
5. Candidate Details: All of the candidates that the administrator has added will be seen in this section. If an incorrect entry is made, the administrator can change the candidate's details.

B. User- The user module is divided into 3 components Dashboard-

1. Information about parties and their candidates can be seen on the user dashboard. All of the candidate's information is visible to the user.
2. Voter Registration: The user must first register in this section before he can cast a ballot.
3. Voting Area: Only the person who has registered will be sent to this page, where he can cast his ballot.

**Fig.2: System Architecture**

User enters the credentials (voter id & password) and they are matched with the database. If the match is found user is either redirected to admin page or voter page as per their role corresponding to the credentials in the database. Once the admin is logged in he/she can start the voting process by adding candidates and defining dates. Voter can vote once the voting process has been started. Once the voter has voted the transaction is recorded to the blockchain and the voting page is updated with real-time votes

Advantages of Proposed System:

- Decentralization ensures that no party controls the voting process.
- Transparency throughout the voting process.
- It is tamper proof.
- Voters can vote from any part of the world.
- This method of voting is cost effective.
- The results are provided in real time.

V. RESULTS

Our output screens are as follows:

1. Connecting to Server

```
C:\Users\Udayasri Bodapati\OneDrive\Desktop\BLOCK CHAIN VOTING SYSTEM>truffle migrate
This version of μWS is not compatible with your Node.js build:

Error: Cannot find module '...\binaries\μws_win32_x64_120.node'
Require stack:
- C:\Users\Udayasri Bodapati\AppData\Roaming\npm\node_modules\truffle\node_modules\ganache\node_modules\@trufflesuite\μws-js-unofficial\src\μws.js
- C:\Users\Udayasri Bodapati\AppData\Roaming\npm\node_modules\truffle\node_modules\ganache\dist\node\core.js
- C:\Users\Udayasri Bodapati\AppData\Roaming\npm\node_modules\truffle\build\migrate.bundled.js
- C:\Users\Udayasri Bodapati\AppData\Roaming\npm\node_modules\truffle\node_modules\original-require\index.js
- C:\Users\Udayasri Bodapati\AppData\Roaming\npm\node_modules\truffle\build\cli.bundled.js
Falling back to a NodeJS implementation; performance may be degraded.

Compiling your contracts...
=====
> Compiling .\contracts\Election.sol
> Compiling .\contracts\Migrations.sol
> Artifacts written to C:\Users\Udayasri Bodapati\OneDrive\Desktop\BLOCK CHAIN VOTING SYSTEM\build\contracts
> Compiled successfully using:
   - solc: 0.5.16+commit.9c3226ce.Enscrepten.clang

Starting migrations...
=====
> Network name:    'development'
> Network id:     5777
> Block gas limit: 6721975 (0x6691b7)
```

Fig.3: Connecting to Server



2. Connecting to Server

```
2_deploy.js
=====

Replacing 'Election'

> transaction hash: 0x0f390bec8db6b7664a837afb93e2ce8b5af5cf2778e3efc45723f966f7314e3
> Blocks: 0
> contract address: 0x9b3C305108c63F437b5d0fBEa85ecb83D28eEefe
> block number: 3
> block timestamp: 1711523213
> account: 0xA0710ced75d8AC4c948389B09316d0F9e7ec0952
> balance: 99.997249922192417373
> gas used: 642952 (0x9cf88)
> gas price: 3.175945351 gwei
> value sent: 0 ETH
> total cost: 0.002041980415316152 ETH

> Saving migration to chain.
> Saving artifacts
=====
> Total cost: 0.002041980415316152 ETH

Summary
=====
> Total deployments: 2
> Final cost: 0.002600458540316152 ETH
```

Fig.4: Connecting to Server

3. Voter Sign up page

Sign Up

Please fill in this form to create an account.

Name 

Error Name

Email 

Error Email

Password 

Error Password

Repeat Password 

Repeat Password

D.O.B: 

dd-mm-yyyy

Fig.5: Voter Sign up page



4. Voter Log in page

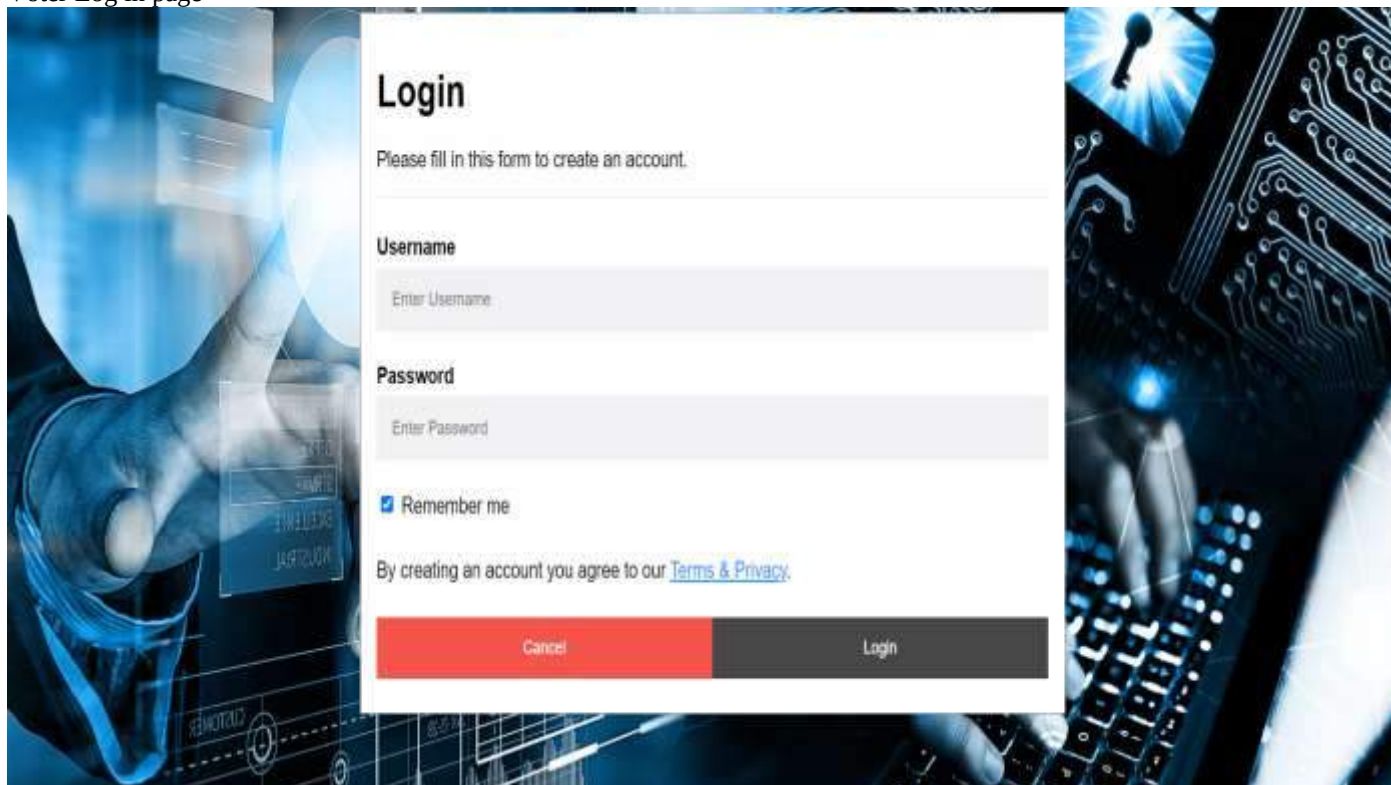


Fig.6: Voter Log in page

5. Voters Casting Vote

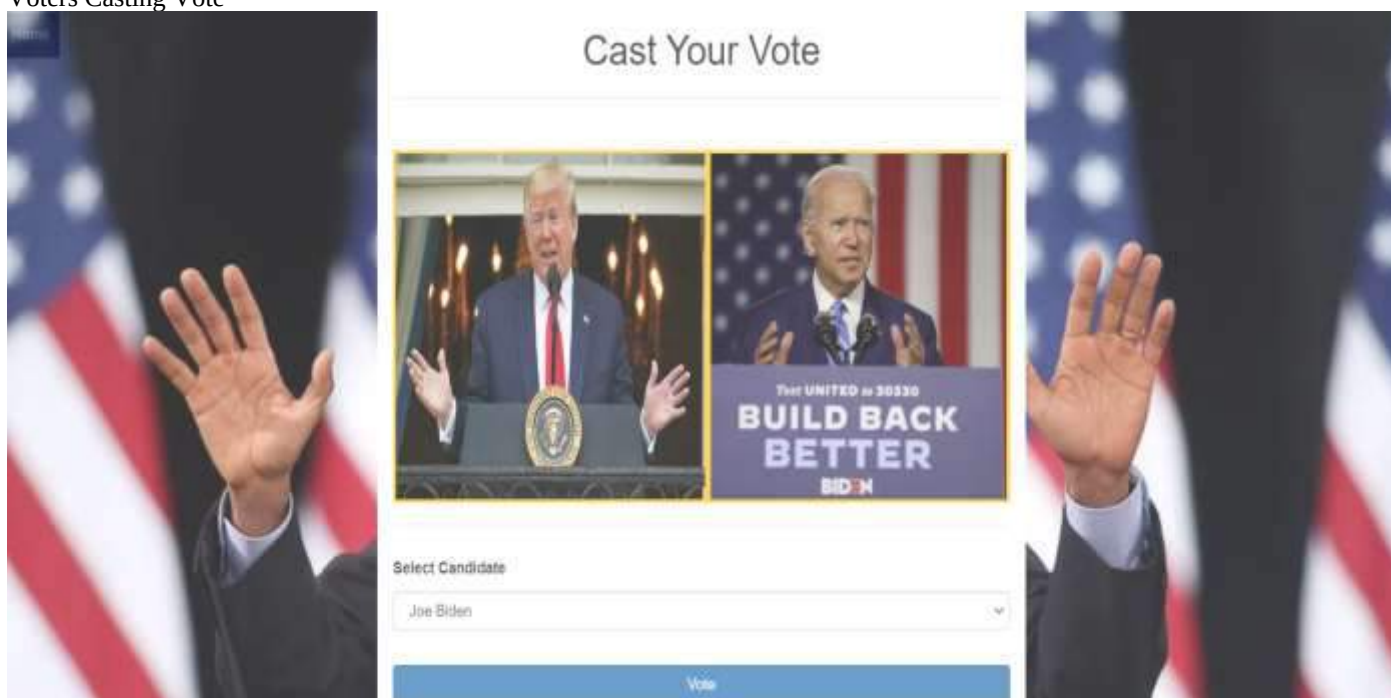


Fig.7: Voters Casting Vote



6. Admin Login page

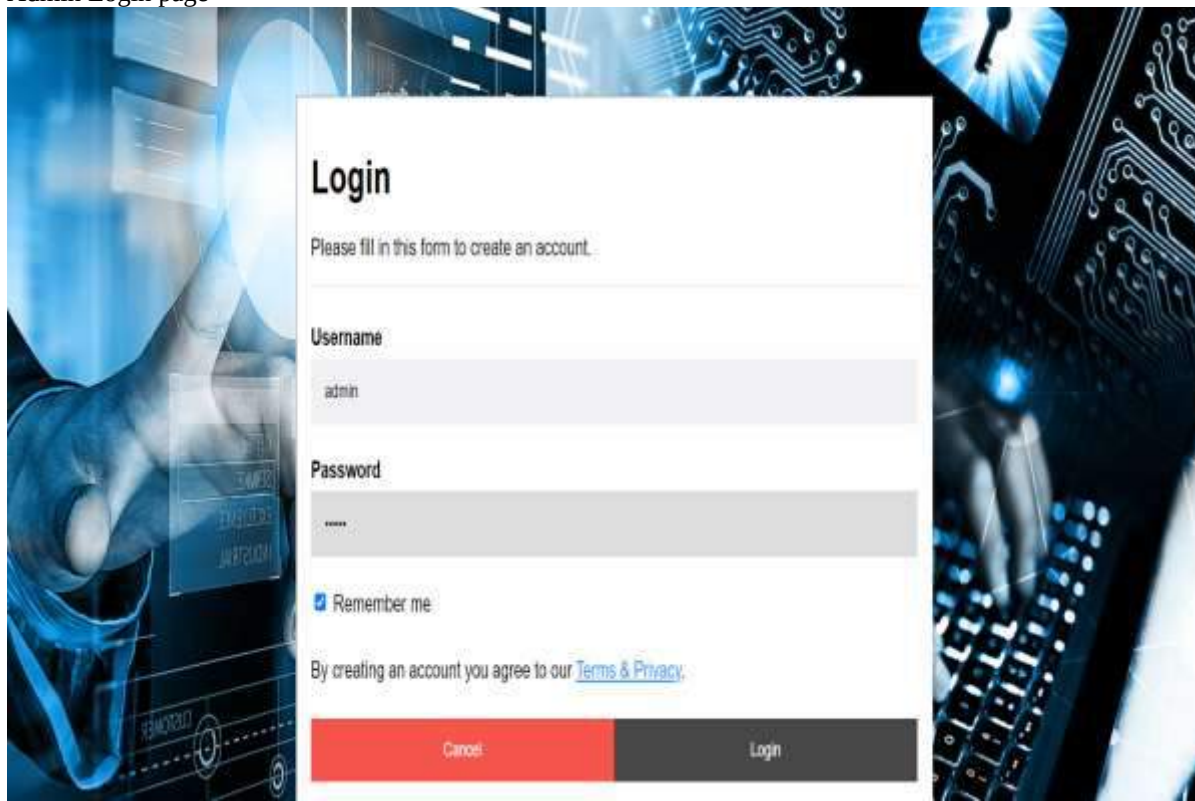


Fig.8: Admin Login Page

7. Admin Checking Results



Fig.9: Admin Checking Results

VI. CONCLUSION

Decentralized Voting with Ethereum Blockchain offers a robust and transparent solution for secure elections. By leveraging blockchain technology, it ensures the integrity of votes and provides a tamper-proof platform. With continued enhancements, including improved user experience, scalability, and integration with other cutting-edge technologies, it has the potential to revolutionize the democratic process and empower citizens to participate in a trusted and efficient voting system. It represents a significant step towards building a more democratic and accountable society.



VII. FUTURE SCOPE

In future iterations, the decentralized voting system can be enhanced by implementing additional features such as real-time vote counting, secure voter identification mechanisms, advanced data analytics for voter insights, and integration with emerging technologies like artificial intelligence and biometrics. These enhancements will further enhance the efficiency, security, and accessibility of the voting process, making it more inclusive and trustworthy.

IX. REFERENCES

1. F. P. Hjálmarsson, G. K. Hreiðarsson, M. Hamdaqa and G. Hjálmtýsson, "Blockchain-Based E-Voting System," 2018 IEEE 11th International Conference on Cloud Computing (CLOUD), San Francisco, CA, 2018, pp. 983-986, doi: 10.1109/CLOUD.2018.00151.
2. C. K. Adiputra, R. Hjort and H. Sato, "A Proposal of Blockchain-Based Electronic Voting System," 2018 Second World Conference on Smart Trends in Systems, Security and Sustainability (WorldS4), London, 2018, pp. 22-27, doi: 10.1109/WorldS4.2018.8611593.
3. K. Garg, P. Saraswat, S. Bisht, S. K. Aggarwal, S. K. Kothuri and S. Gupta, "A Comparative Analysis on E-Voting System Using Blockchain," 2019 4th International Conference on Internet of Things: Smart Innovation and Usages (IoT-SIU), Ghaziabad, India, 2019, pp. 1-4, doi: 10.1109/IoTSIU.2019.8777471.
4. Xiao S., Wang X.A., Wang W., Wang H. (2020) Survey on Blockchain-Based Electronic Voting. In: Barolli L., Nishino H., Miwa H. (eds) *Advances in Intelligent Networking and Collaborative Systems. INCoS 2019. Advances in Intelligent Systems and Computing*, vol 1035. Springer, Cham. https://doi.org/10.1007/978-3-030-29035-1_54
5. Li, Y., Susilo, W., Yang, G., Yu, Y., Liu, D., Du, X., & Guizani, M. (2020). A Blockchain-based Self-tallying Voting Protocol in Decentralized IoT. *IEEE Transactions on Dependable and Secure Computing*, 1-1. doi:10.1109/tasc.2020.2979856
6. K. Patidar and S. Jain, "Decentralized E-Voting Portal Using Blockchain," 2019 10th International Conference on Computing, Communication and Networking Technologies (ICCCNT), Kanpur, India, 2019, pp. 1-4, doi: 10.1109/ICCCNT45670.2019.8944820.
7. Y. Zhang, Y. Li, L. Fang, P. Chen and X. Dong, "Privacy-protected Electronic Voting System Based on Blockchain and Trusted Execution Environment," 2019 IEEE 5th International Conference on Computer and Communications (ICCC), Chengdu, China, 2019, pp. 1252-1257, doi: 10.1109/ICCC47050.2019.9064387.
8. T. M. Roopak and R. Sumathi, "Electronic Voting based on Virtual ID of Aadhar using Blockchain Technology," 2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA), Bangalore, India, 2020, pp. 71-75, doi: 10.1109/ICIMIA48430.2020.9074942.
9. F.S. Hardwick, A. Gioulis, R.N. Akram, K. Markantonakis, E-Voting with Blockchain: An E-Voting Protocol with Decentralisation and Voter Privacy, <https://arxiv.org/abs/1805.10258>, 3 July 2018.
10. H.V. Patil, K.G. Rathi, M.V. Tribhuvan, A Study on Decentralized E-Voting System Using Blockchain Technology, *International Research Journal of Engineering and Technology*, Fast Track Publication, p48 - p53, Chennai, IRJ Publications, 2018



SMART WAY SENTIMENT ANALYSIS IN SOCIAL MEDIA

Jeba Stanley.J¹, Maruthapandi.M², Karthickraja.P³, Sivaprakash.S⁴, Herosingh.C⁵

¹Assistant Professor, Department Of Computer Science And Engineering

^{2,3,4,5}UG Students Department of Computer Science and Engineering

N.S.N College of Engineering and Technology, Karur, Tamil Nadu, India.

ABSTRACT

Social media provides a low-tech means of communication for people to express their thoughts, feelings, and attraction. The paper's goal is to extract different sentimental behaviors that will be utilized to help decide on a course of action and classify people's feelings and affections as neutral, contradictory, or clear. Noise removal was used to pre-process the data in order to eliminate noise. The research project used a variety of methodologies. The popular classification techniques were used to extract the sentiment once the noise was removed. The data was classified using multi-layer perceptions (MLP) and convolutional neural networks (CNN). These two classification results were compared against other techniques such as support vector machines (SVM), random forests, decision trees, Naïve Bayes, etc. using the sentiment classification from Twitter data and the consumer affairs website. In the proposed work, convolutional neural networks and multi-layer perceptions exceed other machine learning classifiers.

INTRODUCTION

Together with spoken language, non-verbal indicators used in interpersonal communication to convey emotions and provide feedback include hand gestures, facial expressions, and voice tones. However, the latest developments in HCI—from the traditional mouse and keyboard to automated speech recognition software and customized interfaces for individuals with disabilities—do not fully capitalize on these important communicative skills, which frequently leads to a less than natural interaction. If computers could recognize these emotional inputs, they could give specific and appropriate help to users in ways that are more in tune with the user's needs and preferences. Over the past two decades, machine learning has become one of the mainstays of information technology and, with that, a rather central, albeit usually hidden, part of our lives. With ever-increasing amounts of data becoming available, there is good reason to believe that smart data analysis will become even more pervasive as a necessary ingredient for technological progress. Learning, like intelligence, is a multifaceted process that is difficult to define precisely. Terms like "to gain knowledge, understanding of, or skill in, by study, instruction, or experience" and "modification of a behavioural tendency by experience" are included in dictionary definitions. Psychologists and zoologists research how humans and animals learn. We concentrate on machine learning in this book. There are numerous similarities between machine learning and animals. Undoubtedly, a great deal of machine learning methodology comes from psychologists trying to use computational models to refine their theories of animal and human learning. Furthermore, it appears possible that some aspects of biological learning may be clarified by the ideas and methods machine learning researchers are investigating.

EXISTING SYSTEM

The majority of existing systems only employ one of the following—voice or face—to determine a person's emotional state. These algorithms typically don't account for the fact that people can still somewhat fake their facial expressions and neglect other body language clues that could indicate their emotional state. The fact that those devices can only identify fundamental emotions like joy, sorrow, etc. is another drawback. They only consider one of the aforementioned stimuli. They use raw image processing to understand the expressions of the person on his face, not his emotional state. As such, there are many limitations to this approach. As I already said, it's rather easy to fake or cheat with such an approach. Another disadvantage is that such devices are rather inflexible because they are designed based on pre-existing fundamentals. It doesn't take into consideration a person's cultural aspects that might change the way he behaves, and as a result, it is impractical to sample on a scale. In the existing system, support vector machine kernel identification with complete facial emotion recognition is done. This research work analyzes the performance of four different SVM kernels (Radial Basis Function, Linear Function, Quadratic Function, and Polynomial Function) for face emotion recognition. A database of 714 face emotion images was created by capturing twice the seven facial expressions of 51 people with a digital camera.

**Disadvantages**

- Facial emotions are defined as a positive or negative experience linked to a specific pattern of physiological activity.
- They are characterized by a coordinated set of responses that may involve verbal, physiological, behavioral, or mechanisms.
- Typically, emotions are expressed through the face, speech, or body language.

PROPOSED SYSTEM

Preprocessing of the input photos, feature extraction, training, classification, and database comprise the stages of the architecture that is suggested in this work. Preprocessing of the input photos involves cropping and face detection. Finding distinctive characteristics in the data is a process known as feature extraction, which can be carried out using certain methods such as principal component analysis, feature averaging, etc. The collected features will be fed into the neural network together with predetermined network parameters to train the network. The neural network will classify data per the network's defined targets. Face photos are extracted from a collection of expressions on the face. In the original photograph, there is also a camera model and time. The face is identified, cropped, and saved as a distinct image for improved performance. Next, features are extracted from the clipped image. The neural network will be trained to acquire knowledge using these features as input. In addition, the testing image will undergo preprocessing, from which features will be retrieved and fed into the neural network. The neural network's classifier will categorize the input test image's expression.

MODELLING AND ANALYSIS

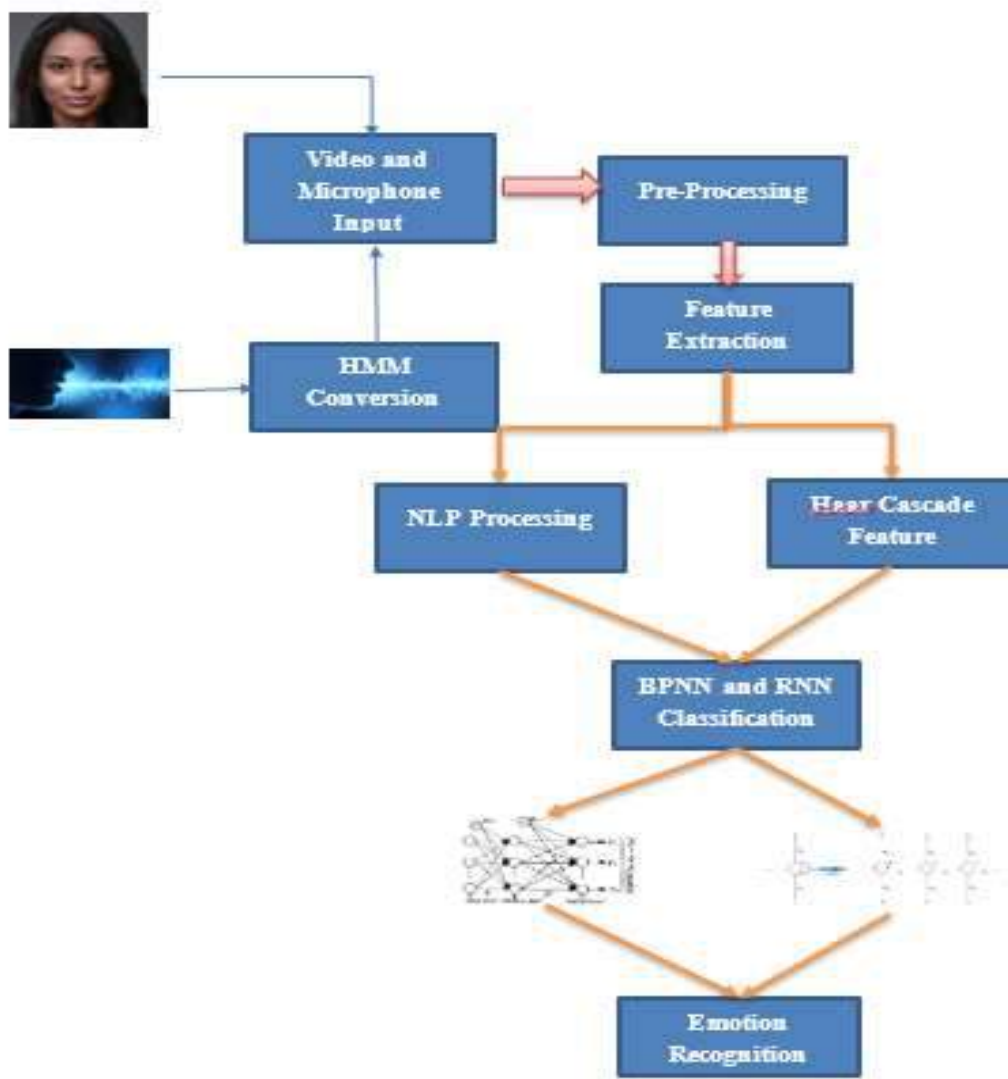
A structure made up of parts and rules describing how these parts interact with one another is called a system architecture. The foundation for visualizing a product description is a system architecture diagram, which provides an overview of the product structure. Three different kinds of system designs are recognized: mixed (which is a combination of partially distributed and partially integrated components). It is demonstrated that the kind of architecture is determined by the kind of interface. There are more interfaces in integrated systems, and they are also not well-defined. An application architecture diagram aids in the identification of applications, sub-applications, components, databases, services, etc. as well as their relationships. It offers a high-level graphical representation of the application architecture. Refer to Business and Application Services (EAM). System: An application that is bundled.

If you restrict yourself to four layers, they may be determine as

- 1) Algorithm
- 2) Programming language or compiler
- 3) processor/memory

I/O, Other abstraction definitions may contain three layers

- 1) Application
- 2) System software
- 3) Hardware

**Fig 1.1 : System Architecture**

Video and Microphone Input

Transducers, like microphones, transform sound waves into electrical signals. Telephones, hearing aids, public address systems for concerts and public gatherings, film production, live and recorded audio engineering, sound recording, two-way radios, megaphones, and radio and television transmission are just a few of the numerous uses for microphones. They are also utilized by computers for knock sensors, ultrasonic sensors, speech recognition, and voice recording. Today, a variety of microphone types are in use, each using a unique technique to translate a sound wave's fluctuations in air pressure into an electrical signal. The most popular types are the condenser microphone, which employs a vibrating diaphragm as its microphone, and the dynamic microphone, which uses a coil of wire hung in a magnetic field. Two types of piezoelectric crystals are used in contact microphones: a capacitor plate and a crystal. To capture or reproduce a signal, microphones usually require a pre-amplifier to be connected to them.

HMM Conversion

A group of finite states joined by transitions is known as a hidden Markov model. Two sets of probabilities define each state: a transition probability and an output probability density function that, depending on the state, defines the condition probability of emitting each output symbol from a finite alphabet or a continuous random vector. The Hidden Markov Model (HMM) is utilized in this project's execution to process speech system input and convert it to text. Here, the user's details will be used to convert the text pattern to detect the signal. The state space of the hidden variables in the hidden Markov models discussed above is discrete, but the observations themselves are not. Can be either continuous (usually from a Gaussian distribution) or discrete (usually created

from a categorical distribution). or continuous; such distributions are usually Gaussian. It is also possible to expand hidden Markov models to include continuous state spaces. These models include those in which all hidden and observable variables have a Gaussian distribution and the Markov process over hidden variables is a linear dynamical system with a linear link among related variables.

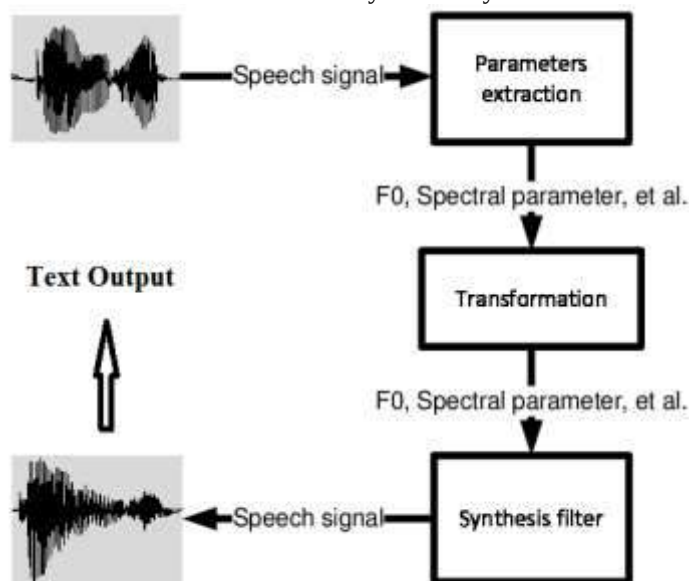


Fig 1.2: Speech Processing

Emotion Recognition

Emotion recognition has become an important field of research in the human-computer interaction domain. The latest advancements in the field show that combining visual and audio information leads to better results if compared to using a single source of information separately. From a visual point of view, a human emotion can be recognized by analyzing the facial expression of the person. More precisely, human emotion can be described through a combination of several facial action units.

RESULTS AND DISCUSSION

Since humans are multimodal learners, it is expected that automatic multimodal systems will perform better than automatic unimodal systems. The findings presented in this work support this hypothesis, as the bimodal approach produced an almost five percent (absolute) improvement over the facial expression recognition system's performance. Pairs of emotions that performed poorly in one modality were easily classified in the other; for instance, the facial expression emotion classifier was able to distinguish between happiness and anger, which were typically misclassified in the acoustic domain. Consequently, these emotions were precisely categorized when these two modalities were combined at the feature level. Sadly, sadness performed poorly since it is mistaken for a neutral mood in both areas. An examination of the confusion matrices for both feature-level and decision-level bimodal classifiers shows that, despite their similar overall performance, the recognition rates for each type of emotion were very different. Compared to the best unimodal identification system—the facial expression classifier—every emotion's recognition rate increased in the decision-level bimodal classifier (except happiness, which declined by 2%). Anger and neutral states were recognized at much higher rates in the feature-level bimodal classifier. Still, there was a 9% decline in the happy recognition rate. As a result, the application will determine the optimal method for combining the modalities. The study's findings show that, despite the audio-based system's lower performance compared to the facial expression emotion classifier, its characteristics nevertheless contain insightful emotional information that cannot be gleaned from the visual data.

These findings concur with those of Chen et al., who demonstrated that complementing information is presented by facial expression and auditory data. However, it makes sense to assume that some distinguishing emotional patterns can be identified by using either visual or auditory cues. When one of the models' attributes is incorrectly acquired, this redundant information is extremely helpful in enhancing the effectiveness of the emotion identification system. For instance, a person's facial expressions will be extracted with a high degree of error if they wear spectacles, have a beard, or both. Then, the visual information's limitations can be solved by using auditory features.

CONCLUSION

We investigate the distribution laws of several emotional signal features in the experiment by analyzing and contrasting time, amplitude energy, basic frequency, and formant feature parameters under various emotional states. We categorize five different emotional states based on this: calm, grief, happiness, surprise, and rage. The identification outcomes demonstrate that we can initially identify fundamental emotional categories using this basic prosodic information, and we can then apply these categories to



the emotion recognition system, which has a limited store and computation capacity and a loose recognition accuracy. In the meantime, the prosodic characteristics identify emotional categories with bi-modality and a greater identification rate by integrating with facial expression data. The rate of recognition hasn't increased much, despite an improvement in the emotional recognition performance when combined with facial expressions. This is mostly because the facial expression changes in the adjacent video frames have a similar association when it comes to acquiring emotional information. However, when we captured the instant face image for independent analysis, we did not account for this correlation. Conversely, the position and form of the organs on the face will alter in response to changes in the expression. While the Gaussian mixture algorithm-based image analysis method in this study has a greater identification rate for face contours, it does not provide a precise characterization of changes in the eyes, nose, mouth, and other facial organs. Based on the aforementioned two arguments, we must create a correction model linked to the expressions that contain a range of rules and use the model to alter the picture recognition results in order to genuinely improve the system's performance. Furthermore, the effectiveness of the recognition algorithm is a crucial component in real-time applications, in addition to augmenting the system's robustness and accuracy. Techniques like data compression and codebook reduction can also successfully raise the recognition rate. Future developments in human-computer interaction will inevitably lead to the creation of multi-modal recognition systems that integrate with voice, images, and other emotional information.

REFERENCES

1. Dellaert, F., Polzin, T., Waibel, A. Recognizing emotion in speech. *Spoken Language*, 1996. ICSLP 96. Proceedings. Fourth International Conference on, Volume: 3, 3-6 Oct. 1996. Pages: 1970 - 1973 vol.3.
2. De Silva, L. C., Miyasato, T., and Nakatsu, R. Facial Emotion Recognition Using Multimodal Information. In *Proc. IEEE Int. Conf. on Information, Communications and Signal Processing (ICICS'97)*, Singapore, pp. 397-401, Sept. 1997.
3. Chen, L.S., Huang, T.S. Emotional expressions in audiovisual human computer interaction. *Multimedia and Expo*, 2000. ICME 2000. 2000 IEEE International Conference on, Volume: 1, 30 July-2 Aug. 2000. Pages: 423 - 426 vol.1.
4. Cowie, R., Douglas-Cowie, E., Tsapatsoulis, N., Votsis, G., Kollias, S., Fellenz, W., Taylor, J.G. Emotion recognition in human-computer interaction. *Signal Processing Magazine, IEEE*, Volume: 18, Issue: 1, Jan 2001, Pages: 32 - 80.
5. R. Jafri, H. R. Arabnia, "A Survey of Face Recognition Techniques", *Journal of Information Processing Systems*, Vol.5, No.2, June 2009.



DEVOPS OPTIMIZED NAVIGATION: BUILDING A DEVOPS CI/CD PIPELINE

**M. Priyanka¹, K. Sindhuja², V. Madhuvani³, K. Prasoon Sowpithika⁴,
K. Kranthi Kumar⁵**

^{1,2,3,4}Students, ⁵Associate Professor

¹Department of Information Technology

¹Vasireddy Venkatadri Institute of Technology, Guntur, India.

Article DOI: <https://doi.org/10.36713/epra16292>

DOI No: 10.36713/epra16292

ABSTRACT

DevOps Optimized Navigation: Building a DevOps CI/CD pipeline aims to implement devops practices via building campus navigation for our college. The application displays different blocks of our college where the user can navigate. This system will be useful especially for new comers and people those who are unfamiliar with the campus layout. People equipped with any mobile phone can easily scan the QR Code to open the website and select the destination for navigation. The optimal path is visible via google maps. For DevOps, we have used Amazon Web Services(AWS) .GitHub is used as version control platform. A tool called Jenkins is used for continuous integration and continuous deployment which is a open source tool. Our Project is a flask application which is deployed using Docker container. Our project provides a solution that not only simplifies the navigation but also ensures responsiveness to different screen sizes and global accessibility to provide user friendly experience.

KEYWORDS – DevOps, GitHub, AWS Cloud, Jenkins, Docker, Flask, Navigation

I. INTRODUCTION

The indoor navigation system can be built for different purposes like college, hospitals, malls etc for new comers or those who are unfamiliar with the navigation system. Based on the user selection for destination, path will be shown from source to destination using google maps. It provides cost-effective and efficient indoor navigation without the need for additional sensor devices.[1]

In order to overcome the shortcomings of interior navigation, the study describes a web-based navigation system named "Campus Routing Using QR Code". It suggests an alternative to installing mobile apps that uses QR codes for both indoor and outdoor routing. By combining pre-made maps from a database with frontend and backend development, users may access navigation routes by scanning QR codes, which improves navigation efficiency—especially in settings like testing centres.[2]

The review paper explores the paradigm shift in software development brought about by the DevOps technique, highlighting its fundamental ideas of sharing, automation, collaboration, and measurement. It addresses the benefits of DevOps, such faster implementation times, higher output, and better system quality, while also addressing any drawbacks like the requirement for specialized knowledge and security issues. The article highlights successful DevOps deployments with case studies from organizations like Facebook and DocuSign. It also examines the future implications of DevOps, including its role in automation, AI integration, and platform-as-a-service offerings. All things considered, it comes to the conclusion that DevOps is a revolutionary strategy that improves software delivery speed and stability while opening the door for ongoing industry improvement.[3]

The goal of the study is to improve CI/CD procedures by utilizing Jenkins, an open-source automation server. Jenkins can help improve productivity and reliability in the development pipeline by automating operations like code integration, testing, and deployment. Jenkins helps development teams to adopt continuous delivery strategies by providing real-time notifications and performance analysis tools. This allows for quicker iterations and more seamless team collaboration. Generally speaking, Jenkins is essential to CI/CD process implementation and pipeline optimization for software delivery.[4]

In this research paper, we introduce a technological advancement to our college: indoor navigation with global accessibility and scalability for future adaptations. Employing DevOps practices, we utilize various tools including GitHub for version control. AWS (Amazon Web Services) is chosen for its superior availability, extensive services, and high demand. The study further investigates



the utilization of AWS EC2 instances to host Jenkins servers, ensuring scalable and reliable infrastructure for CI/CD automation. Additionally, Docker is employed to containerize Flask applications, ensuring consistent development and deployment environments while improving scalability and portability.

II. OBJECTIVES

- Enhance campus navigation for newcomers or individuals unfamiliar with the campus layout, thereby improving their overall experience.
- Utilize AWS (Amazon Web Services) as a cloud service to ensure global accessibility of the navigation.
- Incorporate DevOps practices to enable continuous integration and continuous deployment (CI/CD) by leveraging various tools such as GitHub, Jenkins, and Docker.

III. METHODOLOGY

A. Proposed System Architecture

The QR Code to our application will be available at the entrance of the college such that the user can scan the QR Code via mobile phone to open our website. It contains different blocks of our college where user can visit. After selecting path for destination, a path will be displayed from source to destination.

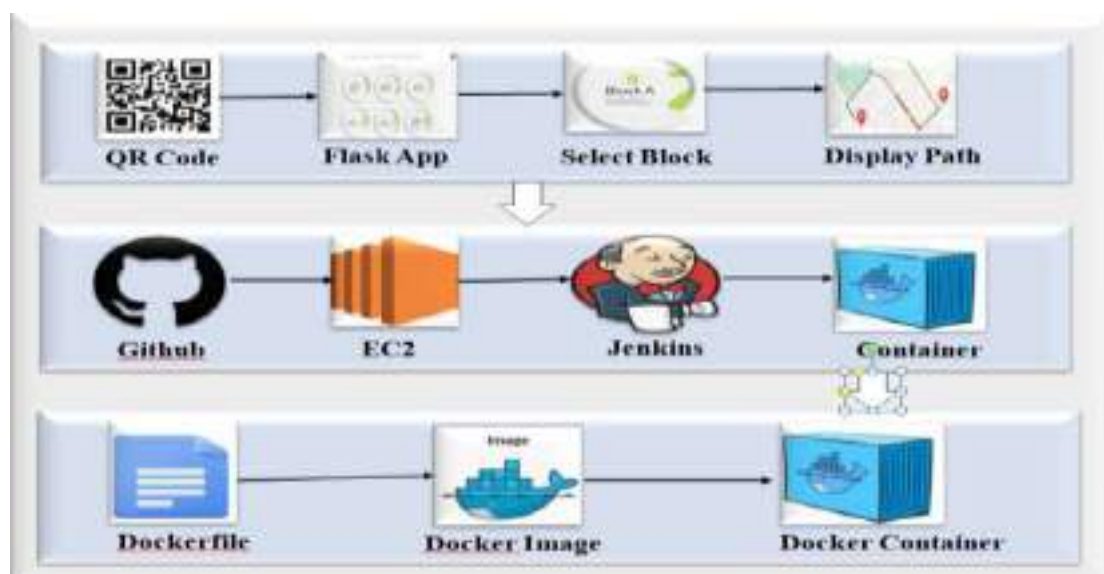


Fig.1: Proposed System Architecture

B. Implementaion of DevOps

1. AWS EC2 Instance – Demo Server

In order to initiate devops lifecycle, firstly push the entire code into github public repository. We will create an aws free tier account. From services , we will make use of EC2 and create an instance called Demo Server. Change the Instance state to running and you will get the output as shown in figure[2].

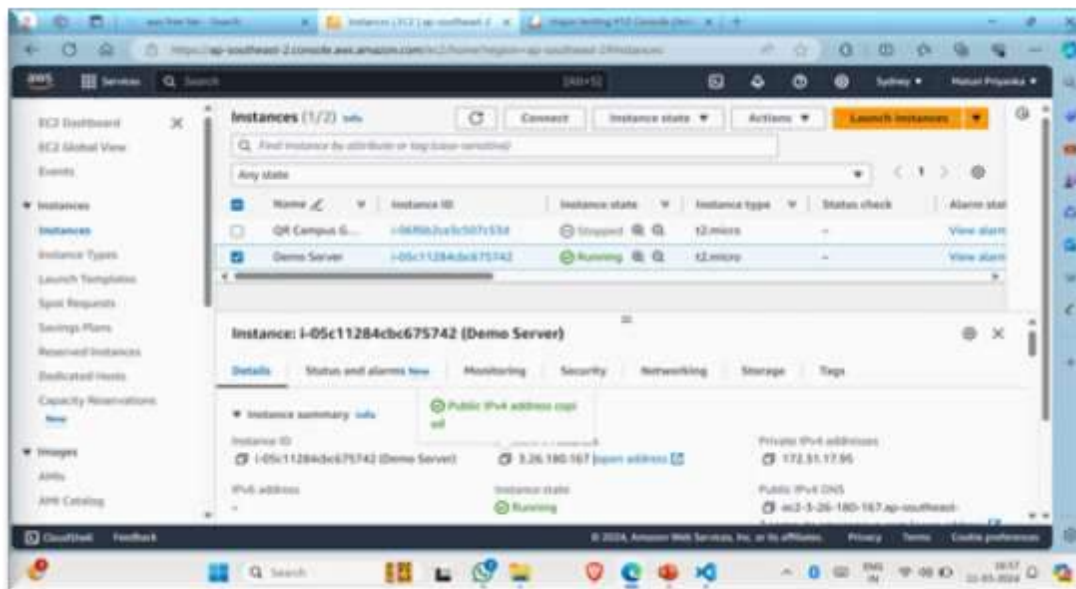


Fig.2:AWS EC2 Instance – Demo Server

2. Jenkins Dashboard

Use SSH for connecting the instance with the os terminal and install Jenkins in Demo Server instance. Jenkins can be accessed using Public IP Address of the instance and followed by port number(3.26.180.167:8080).

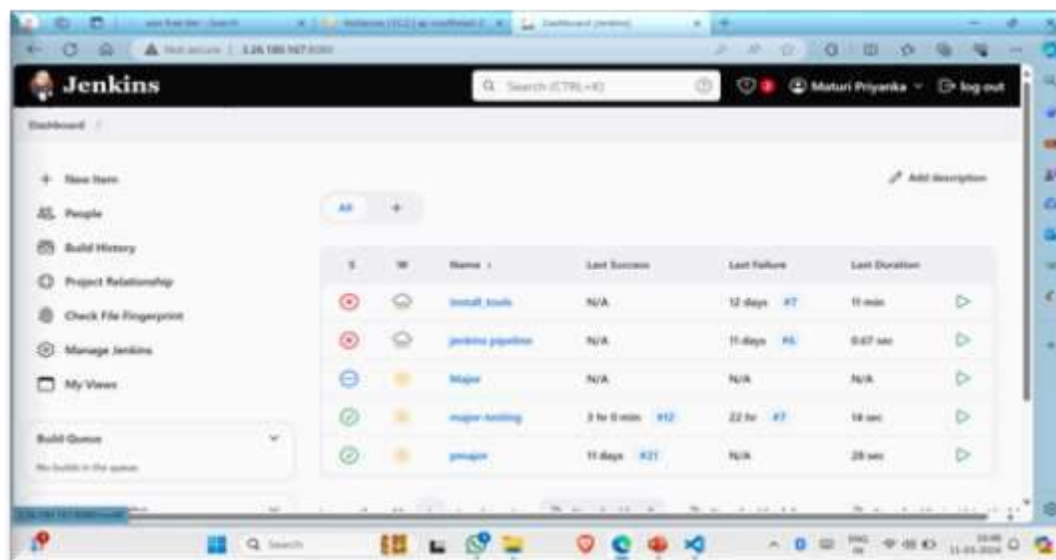


Fig.3: Jenkins Dashboard

3. Github Repo Structure for Docker Container

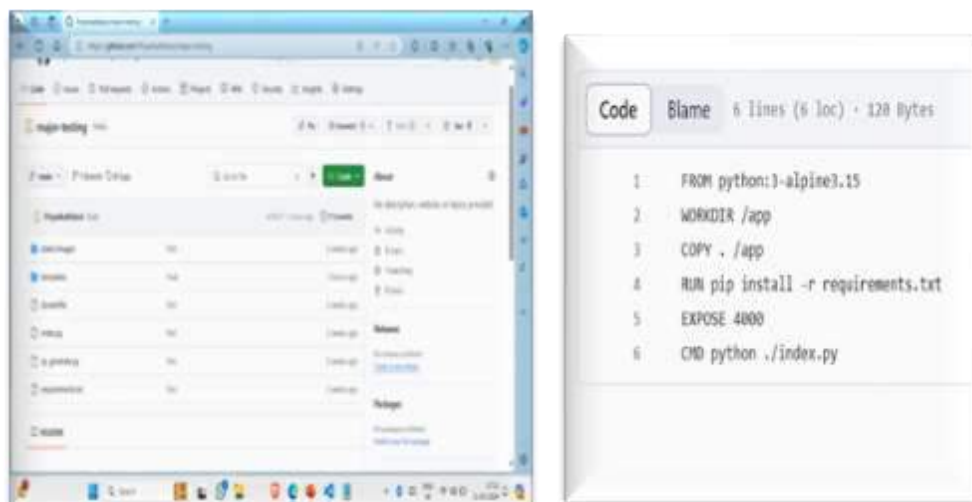


Fig 4 : Github Repo Structure for Docker Container

For docker container , the github repo must have dockerfile, index.html and requirements.txt. index.html is entry point for container. requirements.txt has all necessary packages that has to be installed like flask in case of our application. Dockerfile contains set of instructions to build docker image.

4. Connect Jenkins with Github:

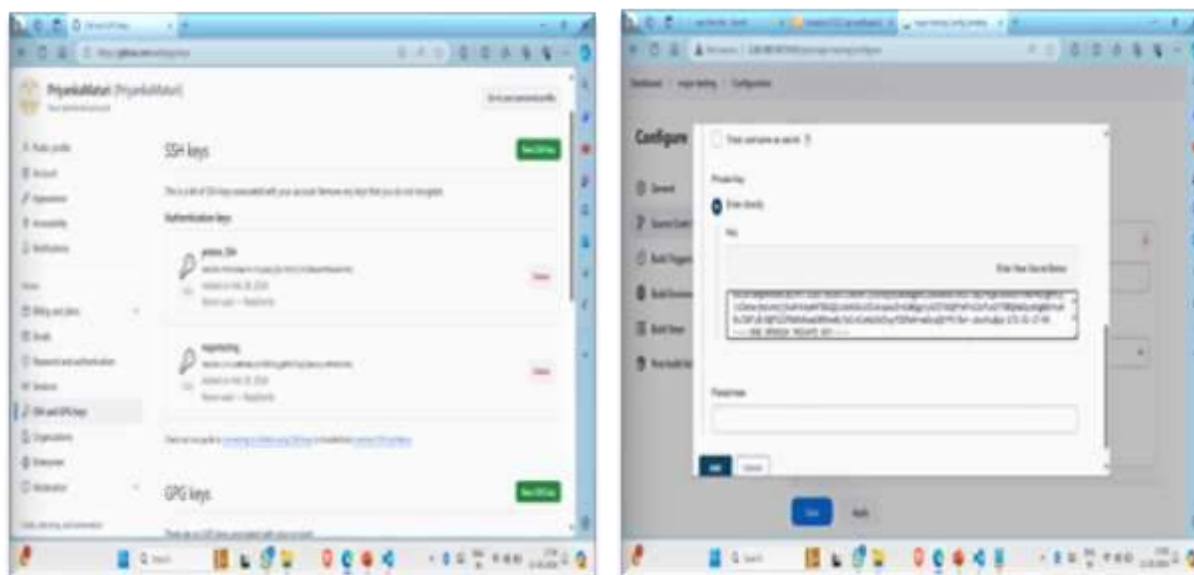


Fig 5 : Connect Jenkins with Github

Create public and private key for integrating github and jenkins using ss-keygen command in ssh terminal. Use the public key in github ssh keys and create a new item called major-testing in jenkins dashboard. Add Github project url and private key.

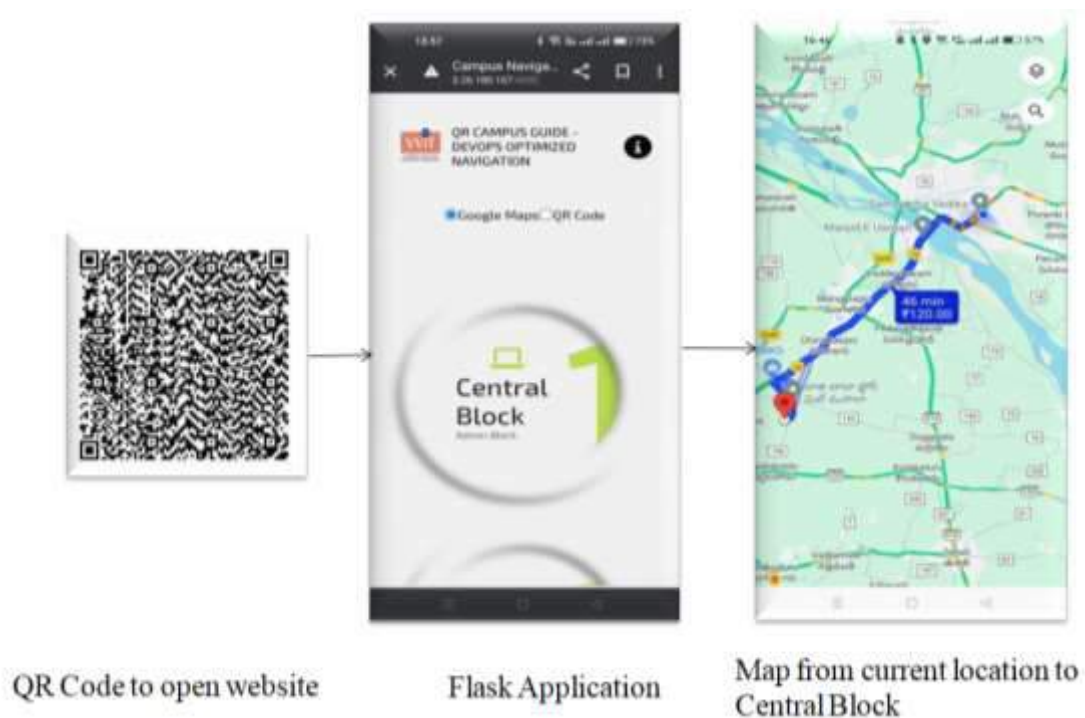
5. Successfully Deployed

In Jenkins Dashboard, select major-testing item. Click build now . After successful deployment you will get as shown in figure



Fig 6 : Deployment

IV. RESULTS





A. Desktop/Laptop Version



B. Mobile Version



V. SUGGESTIONS

- Cloud Service Providers: We have used AWS Cloud because of its huge contribution in market. We can compare the performance of our application in different cloud services like google, Azure, Alibaba, Oracle, IBM etc.
- Orchestration platform: Kubernetes is an open-source container orchestration platform that are usually used for more complex tasks in distributed environment. One can try making use of Kubernetes instead of Docker..

VI. CONCLUSION

In conclusion, the “DevOps Optimized Navigation : Building a DevOps CI/CD pipeline” project revolutionizes campus navigation



by offering an intuitive and efficient solution tailored to the needs of both newcomers and those unfamiliar with the campus layout. Through its user-friendly interface and integration of DevOps practices, it not only simplifies navigation but also sets a precedent for modern software development practices in enhancing user experiences.

VII. REFERENCES

1. Sushma, S Ambareesh (2017), "Indoor Navigation using QR Code Based on Google Maps for Ios ", IEEE : This research paper provided the foundational concepts and principles on which the project is based.
2. M Padmaja (2022) , "Campus Routing Using QR Code", RAEEUCCI , IOP publications : paper provided the foundational concepts and principles on which the project is based.
3. Aadil Hasan (2020), "DevOps Methodology" International Journal of Creative Research Thoughts (IJCRT),SSN : 2320-2882.
4. Rismanda Tyas Kusumadewi, Ronald Adrian, "Performance Analysis of Devops Practice Implementation Of CI/CD Using Jenkins" ISSN : 2477-2550(e) (Journal of Computer Science and Information Technology)
5. Dhaya Sindhu Battina, "Devops, A New Approach To Cloud Development & Testing" ,JETIR(Journal of Emerging Technologies and Innovative Research) , ISSN : 2349-5162.
6. S. Mysari and V. Bejgam, "Continuous Integration and Continuous Deployment Pipeline Automation Using Jenkins Ansible," Feb. 2020. doi: 10.1109/ic-ETITE47903.2020.239.
7. J. Benjamin and J. Mathew, "Enhancing the efficiency of continuous integration environment in DevOps," IOP Conference Series: Materials Science and Engineering, vol. 1085, no. 1, p. 012025, Feb. 2021, doi: 10.1088/1757- 899x/1085/1/012025.
8. Danur Wijayanto, Arizona Firdonsyah , "Implementation of Continous Delivery using Jenkins And Kubernetes with Docker Local Images", Sinkron : Jurnal dan Penelitian Teknik Informatika Volume 8, Number 4, October 2023 DOI : <https://doi.org/10.33395/sinkron.v8i4.12624>



BLOCKCHAIN BASED E-COMMERCE ONLINE APPLICATION

J. Divya¹, B. Harshitha², A. Harika³, A. Santhisree⁴, A. Kalavathi⁵

^{1,2,3,4}Students, ⁵ Professor

¹Department of Information Technology

¹Vasireddy Venkatadri Institute of Technology, Guntur, India.

Article DOI: <https://doi.org/10.36713/epra16271>

DOI No: 10.36713/epra16271

ABSTRACT

In existing E-commerce application all customers and product details will be stored and managed in single centralized server and if this server crashed due to too many requests and or if server is hacked then services will not be available to other customers and to overcome from this problem, we are migrating E-commerce application to Blockchain which will maintain data at multiple nodes/servers and if one node down then customers can get data from other working nodes. Another advantage of Blockchain is inbuilt support for data encryption and immutability (data cannot be altered by unauthorized users) and it will consider each data as block/transaction and associate each block storage with unique hash code and before storing new records. Blockchain will verify hash code of previous blocks and if all nodes' blocks verification successful then data is considered as secured.

KEYWORDS – Blockchain, Decentralize, E-Commerce, Smart Contracts, Solidity, Hash code.

I. INTRODUCTION

Ecommerce is one of the leading industries around the world. Ecommerce platforms require tremendous power and storage to manage large amounts of data and other services. Even though the industry has superior functioning at present, there are ways to enhance it further, which is possible through blockchain technology. Blockchain can help e-commerce businesses to handle data more efficiently. The platforms can store information about users, products, orders, deliveries, manufacturers, sellers, and much more in an organized manner in a blockchain network. Blockchain is well-known for its security features that provide the ecommerce sector with extra layers of security. It cuts down the intermediaries and promotes peer-to-peer transactions. We get many added features like quick transactions, reduced chargeback frauds, customer reviews verification, personalized product offerings. With traceability, blockchain guarantees end-to-end product tracking to the customers.

II. OBJECTIVES

1. Implement a secure e-commerce system using blockchain to protect customer data and ensure service availability.
2. Utilize blockchain's decentralized nature to prevent single points of failure and enhance system reliability.
3. Ensure data integrity and prevent unauthorized alterations through blockchain's immutable ledger.
4. Create user-friendly modules using Django for product management, orders, and user interactions to streamline e-commerce operations.
5. Design and develop a user-friendly website to host the aforementioned applications, making them accessible to farmers and agricultural stakeholders. The objective is to create an intuitive platform where users can easily input data and receive actionable insights to optimize their farming practices.
6. Adjust the model to make it more accurate and user-friendly.

III. LITERATURE SURVEY

For a literature survey tailored to the project of migrating an e-commerce application to a blockchain-based system, it's essential to focus on scholarly articles, journals, and case studies that provide insights into both the technical and business aspects of such a migration. This survey will cover foundational concepts, technical implementations, benefits, challenges, and real-world applications relevant to integrating blockchain technology into e-commerce platforms.

[1] Crosby, M., et al. (2016). Blockchain Technology: Beyond Bitcoin. Applied Innovation Review, Issue 2. These works introduce the concept of blockchain as a decentralized ledger, explaining the technology's fundamentals, including its encryption, immutability, and consensus mechanisms.

[2] Christidis, K., & Devetsikiotis, M. (2016). Blockchains and Smart Contracts for the Internet of Things. IEEE Access. These



works introduce the concept of blockchain as a decentralized ledger, explaining the technology's fundamentals, including its encryption, immutability, and consensus mechanisms.

[3] Wüst, K., & Gervais, A. (2018). Do you need a Blockchain? 2018 Crypto Valley Conference on Blockchain Technology (CVCBT). This paper critically evaluates scenarios where blockchain is a suitable solution, discussing the challenges in migrating existing applications to blockchain, including scalability, transaction costs, and regulatory issues.

[4] Iansiti, M., & Lakhani, K. R. (2017). The Truth About Blockchain. Harvard Business Review. This article provides an in-depth look at the strategic value of blockchain technology, including its impact on trust, efficiency, and transparency in business transactions, with implications for e-commerce

[5] Zhu, H., & Zhou, Z. Z. (2018). Analysis and Outlook of Applications of Blockchain Technology to Equity Crowdfunding in China. Financial Innovation. While focusing on equity crowdfunding, this study offers insights into how blockchain technology has been applied in real-world scenarios, serving as inspiration for e-commerce applications. It discusses the practical benefits and lessons learned from these early adopters.

[6] Croman, K., et al. (2016). On Scaling Decentralized Blockchains. In 3rd Workshop on Bitcoin and Blockchain Research. This work addresses the technical limitations of current blockchain technology, such as scalability and performance issues, which are critical to consider when developing a blockchain-based e-commerce platform.

IV. METHODOLOGY

During this project work the approach followed can be described in the following steps. They are

1. User Authentication
2. Model Development
3. Website Development
4. Integration
5. Testing
6. Deployment
7. Monitoring & Maintenance

User Authentication

Signup: This module enables users, both consumers and suppliers, to create their accounts on the e-commerce platform. During signup, users provide their essential information such as name, email, and password. After successful signup, they can log in using their credentials.

Login: The login module allows registered users to access their accounts by entering their username and password. Successful login provides access to the platform's features and functionality.

Model Development

We have two users suppliers and consumers.

In supplier modules we have

- **Add Product:** this module allows suppliers to list their products on the platform. They can provide details such as product name, description, price, and upload product images. This module ensures that new products are seamlessly added to the e-commerce platform.
- **Update Quantity:** This module allows suppliers to manage their product inventory efficiently. They can update the quantity of each product listed on the platform. This ensures that customers see accurate stock information when browsing products.
- **View Orders:** This module provides a summary of the orders placed by consumers for the supplier's products. Suppliers can track order status, delivery details, and other relevant information.

So, in consumer modules we have

- **Browse Products:** Within this module, customers can search and view product listings. They can filter products based on various criteria, helping them find the items they want to purchase.
- **Place Order:** Here, consumers are provided by a click here link. By clicking on it they can place the orders

Website Development

Developed the frontend using HTML, CSS, and JavaScript frameworks like React.

Implement responsive design techniques to ensure optimal performance across devices and screen sizes.

Integrate blockchain-related features into the frontend, such as Solidity and ethers payment options and real-time transaction tracking.



Integration

Integrate the trained machine learning and deep learning models into the website's backend. Develop APIs or scripts to handle user inputs, invoke the appropriate models, and generate recommendations or diagnosis results.

Testing

Test the functionality and performance of the website and its applications. Conduct unit tests, integration tests, and user acceptance tests to ensure that the system functions correctly and provides accurate recommendations and diagnoses.

Deployment

Deploy the website and its applications on a web hosting platform or server. Ensure that the website is accessible to users over the internet and that it can handle concurrent user requests and data processing tasks.

Monitoring & Maintenance

Clean Implement monitoring tools to track website performance, user interactions, and model accuracy over time. Regularly update the models with new data and improvements to ensure the effectiveness of recommendations and diagnoses.

Provide ongoing maintenance and support for the website, addressing any issues or bugs that arise and incorporating user feedback for further enhancements.

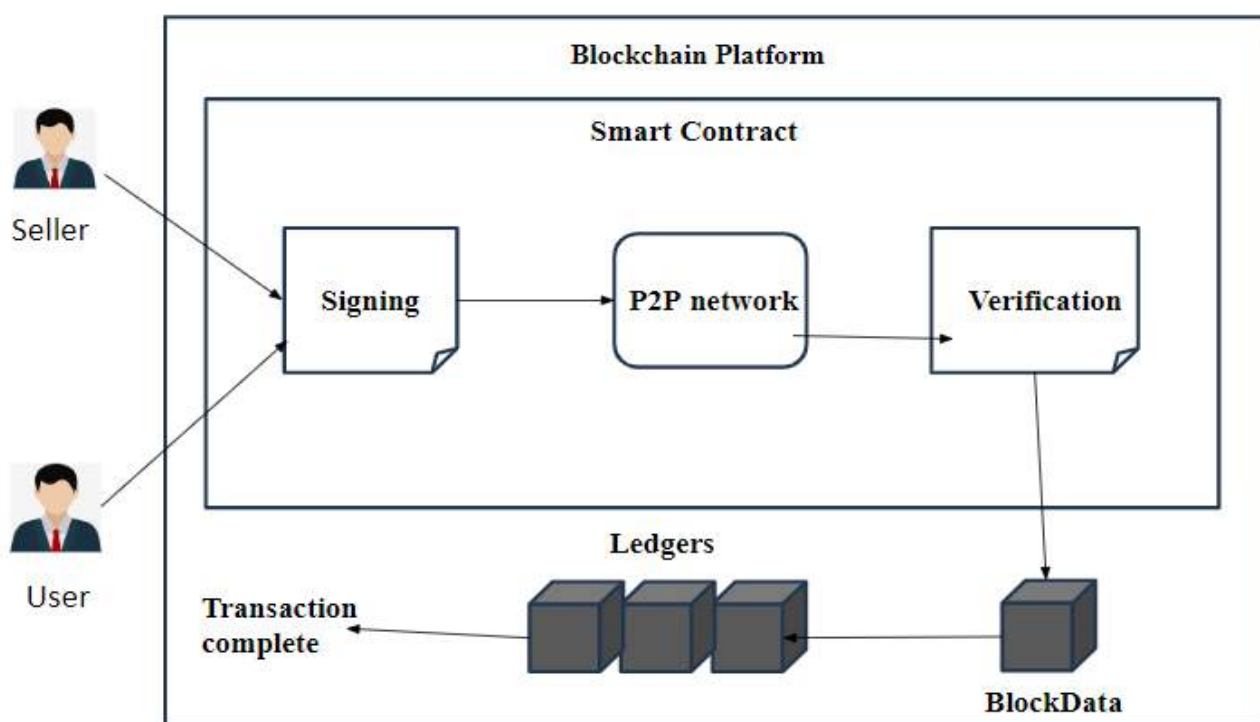


Fig.1: System Architecture



V. RESULTS

Our output screens are as follows:

1. Welcome Page



Fig.2: Welcome Page

2. User Signup page



Fig.3: New User Signup page



3. Login Page



Fig.4: Login Page

4. Products Update Page

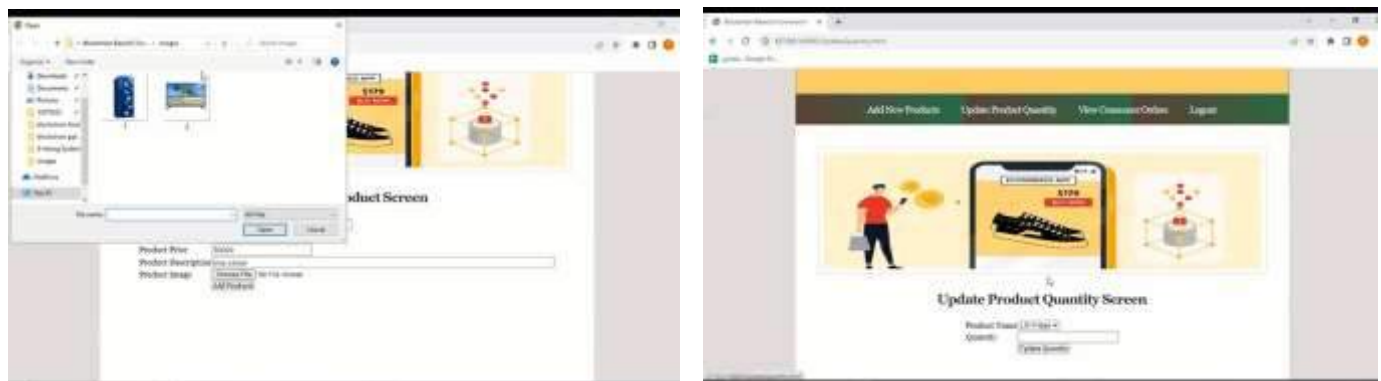


Fig.5: Updating the Product Quantities



5. Products Explorer Page

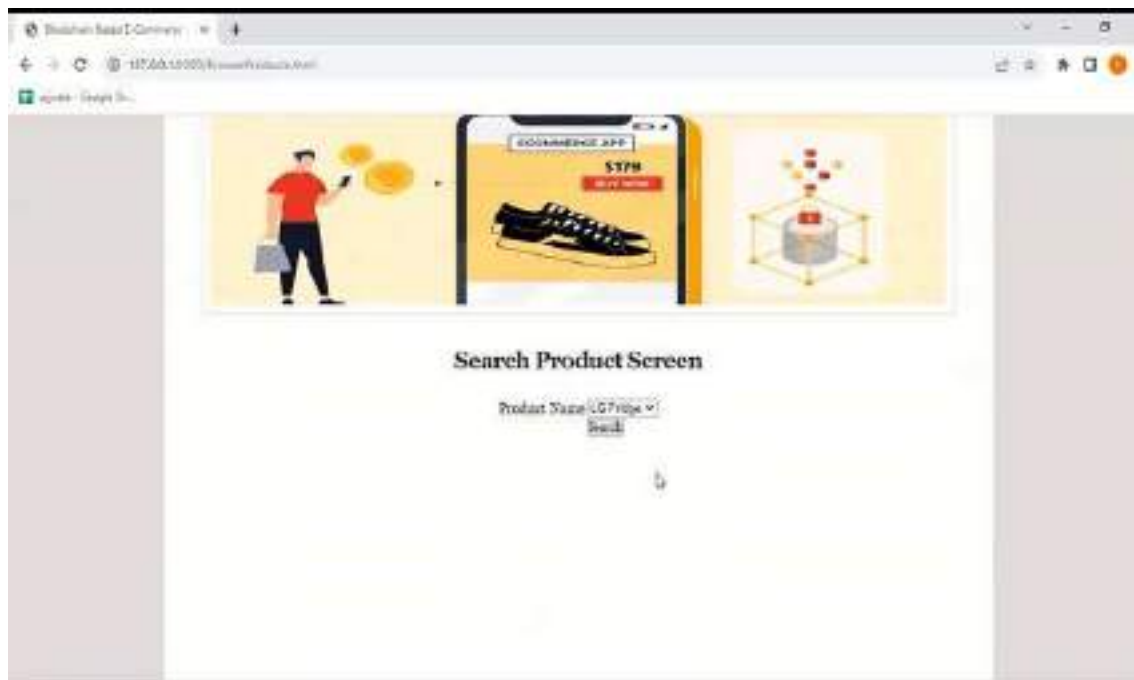


Fig.6: Products Explorer

6. Products Visualization



Fig.7: Visualizing the products



7. Product Cart Page

**Fig.8: Product Cart Page****VI. CONCLUSION**

The project successfully implements blockchain technology to significantly enhance security by preventing single points of failure and ensuring data integrity through immutable transactions. The adoption of blockchain's decentralized nature results in a highly reliable e-commerce system that remains available even in the face of server crashes or security threats. User-friendly modules for product management, orders, and interactions streamline e-commerce operations, improving the overall efficiency of the platform. By integrating blockchain and IPFS for data storage and retrieval, the project lays the foundation for a secure and scalable ecommerce ecosystem that is well-prepared for future advancements in technology and security.

VII. FUTURE SCOPE

Implement blockchain-based reward systems and loyalty programs to incentivize customer engagement and retention. Tokenized rewards can be seamlessly integrated into the e-commerce platform, providing users with tangible benefits for their participation. Store product reviews and ratings on the blockchain to ensure their immutability and authenticity. This can help combat fake reviews and provide consumers with reliable information when making purchasing decisions.

Utilize smart contracts to automate various processes such as payments, order fulfillment, and dispute resolution. Smart contracts can facilitate trustless transactions, reducing the need for intermediaries and streamlining operations.

IX. REFERENCES

1. "Blockchain for E-commerce: A Framework and Case Study" by Hughes, A., Dwivedi, Y.K., Misra, S.K., Rana, N.P., Raghavan, V., Akram, M.U.
2. "The impact of blockchain technology on e-commerce" in the International Journal of Information Management by Li, Z., Kang, J., Yu, K., Ye, F., Zheng, X., Forrest, J.Y-L (2020).
3. "Decentralized Blockchain-Based Electronic Marketplaces" by Notheisen, B., Cholewa, J.B., Shanmugam, A.P. Published in Communications of the ACM.
4. Hughes, A., Park, A., Kietzmann, J., & Archer-Brown, C. (2019). Beyond Bitcoin: What Blockchain and Distributed Ledger Technologies Mean for Firms. *Business Horizons*, 62(3), 273-281.
5. Mukherjee, B., Heberlein, L. T., & Levitt, K. N. (1994). Network intrusion detection. *IEEE network*, 8(3), 26-41.
6. Smith, J. K., Johnson, A. B., & Brown, C. D. (2021). Blockchain Integration in E-commerce Platforms. *Journal of E-commerce Research*, 12(3), 45-58.
7. Roy, K.; Islam, N.; Khan, T.; Khan, M.M. A novel approach to data storage using blockchain technology. In *Proceedings of the 2019 International Conference on Information Technology (ICIT)*, Shanghai, China, 20–23 December 2019; pp. 245–250
8. Zyskind, G.; Nathan, O. Decentralizing privacy: Using blockchain to protect personal data. In *Proceedings of the 2015 IEEE Security and*



- Privacy Workshops, San Jose, CA, USA, 21–22 May 2020; pp. 180–184.*
9. Khan, M.A.; Salah, K. IoT security: Review, blockchain solutions, and open challenges. *Future Gener. Comput. Syst.* 2018, 82, 395–411.
 10. Fujimura, S.; Watanabe, H.; Nakadaira, A.; Yamada, T.; Akutsu, A.; Kishigami, J.J. BRIGHT: A concept for a decentralized rights management system based on blockchain. In *Proceedings of the 2019 IEEE 5th International Conference on Consumer Electronics-Berlin (ICCE-Berlin)*, Berlin, Germany, 2–6 September 2019; pp. 345–346.
 11. Zhou, F.; Liu, Y. Blockchain-Enabled Cross-Border E-Commerce Supply Chain Management: A Bibliometric Systematic Review. *Sustainability* 2022, 14, 15918.
 12. Papadopoulou, P.; Kanellis, P.; Martakos, D. Investigating Trust in e-Commerce: A Literature Review and a Model for Its Formation in Customer Relationships. 2023.
 13. Chevalier, S. Global Retail E-Commerce Market Size 2014–2023 [WWW Document]. Statista 2021.
 14. Albayati, H.; Kim, S.K.; Rho, J.J. Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach. *Technol. Soc.* 2020, 62, 101320.
 15. Jain, G.; Kamble, S.S.; Ndubisi, N.O.; Shrivastava, A.; Belhadi, A.; Venkatesh, M. Antecedents of Blockchain-Enabled E-commerce Platforms (BEEP) adoption by customers—A study of second-hand small and medium apparel retailers. *J. Bus. Res.* 2022, 149, 576–588.
 16. Chao, S. Construction Model of E-Commerce Agricultural Product Online Marketing System Based on Blockchain and Improved Genetic Algorithm. *Secur. Commun. Netw.* 2022, 2022, 4055698.



HELMIST INVASIONS IN CHILDREN: CAUSES, CLINICAL PICTURE, DIAGNOSIS, TREATMENT AND PREVENTION

Sh.M. Ibatova, F.Kh. Mamatkulova

Samarkand State Medical University, Republic of Uzbekistan

ANNOTATION

Helminthic infestations are widespread diseases caused by parasitic worms - helminths. Worldwide, more than 1.5 billion people, or 24% of the population, are infected with helminthic parasites. More than 870 million children live in areas with widespread helminths and need treatment and prevention of helminth infestations [1,2]. Helminthiasis is most diverse and widespread in regions with a hot and humid climate and a low socio-economic standard of living.

KEY WORDS: *helminthic infestations, helminths, children, diagnosis, treatment, prevention*

RELEVANCE

Helminthic infestations (helminthiasis) are widespread throughout the world. According to the World Health Organization (WHO), more than 25% of the world's population is infected with helminths. [1-10]. Over 350 species of helminths can infect the human body. Worldwide, more than 1.5 billion people, or 24% of the population, are infected with helminthic parasites [11-15]. More than 870 million children live in areas with widespread helminths and need treatment and prevention of helminth infestations [16-18].

About 65 species of helminths are registered in the CIS countries, of which 18-20 species are frequently encountered, which are of greatest medical importance due to their wide distribution and significant damage to public health. Helminthiasis is most diverse and widespread in regions with a hot and humid climate and a low socio-economic standard of living.

REASONS FOR WORMS IN CHILDREN

The prevalence of cysts, eggs and intermediate forms of development of parasites in the child's environment and insufficient attention to hygienic procedures in children of preschool and school age are the main reasons for the wide spread of childhood helminthiasis.

The routes of invasion of different types of helminth infections are different:

1. Nematodes. Helminth eggs are released by the carrier during defecation and mature in the soil for 2-3 weeks, after which infection occurs through water and food that have had contact with soil contaminated with helminth eggs and cysts.
2. Ascariasis. A child swallows food or water contaminated with ascaris eggs, larvae develop from the eggs in the intestines, and then they migrate through the blood vessels of the liver and heart to the lungs to soon complete their development cycle, rising through the bronchi to the root of the tongue and being swallowed again. Roundworms often cause pathologies of the gastrointestinal tract (GIT) and lung diseases. The source of roundworm eggs can be stray dogs.
3. Enterobiasis. This form of pathology is transmitted through everyday contact of one infected person with another and therefore affects entire groups.
4. With cestodias and trematodes, infection occurs through contaminated water and insufficiently thermally processed food of animal origin.

The pathogenesis of childhood helminthiasis includes acute and chronic phases. The first stage lasts from 2 to 8 weeks from the moment of infection, the symptoms are easily confused with signs of an allergy. The chronic phase is characterized by microtraumas of tissues and internal organs resulting from the mechanical impact of parasites on them. This phase is accompanied by general intoxication of the body as a result of the accumulation of waste products of worms. It happens that helminthiasis in children is asymptomatic until concomitant disorders develop. The complicated course of the disease increases the risk of developing cancer pathologies in the child's body.

CLINICAL PICTURE OF HELMINTISES IN CHILDREN

The acute phase of childhood helminthiasis is characterized by:

- cramping pain around the navel or without a specific localization, appearing regardless of food intake
- recurrent itchy rash affecting the skin;
- fever and chills;
- cramping pain around the navel or without a specific localization, appearing regardless of food intake



- soreness of the lymph nodes;
- joint pain;
- myalgia;
- shortness of breath and chest discomfort;
- stool disorders;
- flatulence;
- belching;
- nausea.

Manifestations of intoxication due to helminthiasis are:

- 1. loss of appetite,
 - 2. disturbance of night sleep (restlessness, sounds during sleep or frequent awakenings);
 - 3. grinding teeth;
 - 4. irritability, moodiness, aggressiveness.
- Toxic effects of parasites on the central nervous system may cause seizures.

In severe forms of helminthiasis, a child may develop pulmonary syndrome, which is characterized by a prolonged asthmatic-type cough. With trichinosis and trichocephalosis, tissue swelling occurs (swelling of the face, accompanied by the risk of developing Quincke's edema).

With ascariasis, the larvae from the gastrointestinal tract penetrate the blood vessels and from there spread to the internal organs, which can cause pleurisy and coughing up blood.

Toxocariasis is transmitted to humans from dogs and manifests itself in the form of allergic reactions (choking attacks, skin rash, etc.).

Helminths are also a powerful factor in sensitizing the body. Against the background of nematodes, atopic dermatitis intensifies and the course of other allergic diseases (including bronchial asthma, hay fever) worsens. Allergic reactions during helminthiasis occur torpidly and are almost resistant to traditional antiallergic therapy. Eosinophilia in a general blood test is both a sign of allergies and a sign of parasitic diseases, but with helminthiasis it does not occur very often (only 3-5% of cases). In some situations, helminths lead to a significant increase in the level of total IgE.

Helminths weaken the functioning of the immune system, as a result of which the child suffers from frequent respiratory diseases, he may develop pustular or fungal lesions of the skin and mucous membranes, caries. With helminth infections, the child often has inadequate reactions to preventive vaccinations.

Helminths cause intestinal dysbiosis, inhibiting normal intestinal microflora and weakening the local immunity of the gastrointestinal tract. Characteristic features of microbiocenosis during helminthic infestations are a decrease in the total amount of *E. coli* and an increase in the number of non-fermenting bacteria, a decrease in the number of lactobacilli, and an increase in coccal flora. Against the background of dysbacteriosis, functional disorders of the gastrointestinal tract and allergic pathology worsen, secondary (reactive) changes in the liver, biliary tract and pancreas develop\

Over time, the body is poisoned by waste products of worms. The patient's fatigue increases, his appetite worsens or, on the contrary, increases, and headaches appear. The functioning of the digestive tract is disrupted: abdominal pain, diarrhea, constipation, nausea or vomiting appear. The consequences can be very unpleasant - from skin rashes to bronchial asthma.

The most common types of helminthiasis are enterobiasis and ascariasis. With enterobiasis (caused by pinworms), intense itching occurs in the anus, intensifying at night. This occurs because pinworms lay eggs in the skin of the perianal area. At night, the itching in the anus and perineum is so severe that the child wakes up and cries. As a rule, such children sleep very restlessly and often grind their teeth at night. The child usually scratches the itchy areas, and helminth eggs get under the nails, on bedding and linen, and can spread throughout the apartment. This creates conditions for the child to re-infect himself and infect others.

In children with pinworms, appetite worsens, vomiting, nausea or drooling, and aversion to food appear, especially in the morning. Most complain of paroxysmal pain in the abdomen, often in the umbilical region. Unstable stools are noted. The child's mood also changes: he becomes capricious, unbalanced, and complains of fatigue and weakness. The level of hemoglobin in the blood often decreases.



With ascariasis (it is caused by roundworms), due to the migration characteristics of the parasite in the body, a paroxysmal severe cough may begin. Skin rashes often appear. Ascariasis when parasitized by a large number of helminths can be complicated by intestinal obstruction, obstructive jaundice, and pancreatitis.

In severe cases of helminthic disease, disorders of the nervous system develop: prolonged headaches and dizziness appear. Obsessive movements, so-called tics, may occur - blinking, sniffing, twitching shoulders, etc.

DIAGNOSTICS

Blood tests and serological tests are informative for diagnosis. Traces of the activity of lower worms in the body of an infected child are present in all biological fluids and secretions (blood, feces, bile, sputum), as well as on the skin around the anus. Samples of these secretions and cells can be used as material for laboratory research. A mandatory appointment when diagnosing helminthiasis is a coprogram and scraping of cells from the perianal area. The diagnosis is obvious by direct detection of helminths in the stool. You can take a routine stool test for worm eggs at the sanitary-epidemiological station.

In diagnostics, hardware tests play an important role:

- radiographic images;
- Ultrasound;
- MRI and CT;
- endoscopic examination;
- taking a sample of epithelium and muscle;
- probing and analysis of the contents of the duodenum
- skin allergy tests.

These methods make it possible to assess the damage caused by parasites: they identify cysts of parenchymal tissues and the brain and determine the location of helminths.

TREATMENT

In order to determine treatment tactics, it is important to clarify the type of helminth, the stage of the disease, the duration of the invasion, the presence or absence of concomitant diseases, especially gastroenterological ones. When treating helminthic infestations, albendazole and mebendazole demonstrate the greatest spectrum of action, therefore these two drugs are recommended by WHO for the treatment of almost all the most common helminthiasis [19-24]. Effective and safe therapy with anthelmintics requires strict adherence to doses and treatment regimens.

WHO recommends periodic anthelmintic treatment (deworming) without prior individual diagnosis among all at-risk people living in endemic areas. Treatment should be carried out once a year if the prevalence of soil-transmitted helminth infections exceeds 20%, and twice a year if this figure in the community exceeds 50%. Deworming is carried out with the drugs albendazole and mebendazole.

Targeted treatment of helminthic infestations in children is carried out with drugs that destroy helminths at different stages of their development. At the end of the course of therapy, a repeat cycle of tests is prescribed to confirm the effectiveness of treatment.

Therapeutic measures for infection with worms are very diverse; in any case, a set of procedures is needed to deworm the body of children. It is not always necessary to prescribe chemical medications, which are usually highly toxic. The therapeutic effect obtained from the use of biologically active complexes suggests that they are good assistants in the complex treatment of those infected with worms. Therefore, in programs for cleansing the body of worms and other parasites, both special anthelmintic drugs and natural biologically active complexes are prescribed.

The choice of antiparasitic drug is made taking into account the type of helminths, the phase of development of the pathology, and associated complications. Anthelmintic drugs that are effective against several types of pathogens are more often used. Thus, drugs from the benzimidazole group are prescribed for infection with roundworms, nematodes, trichinosis and trichocephalosis.

The key to successful deworming of a child is the simultaneous administration of anthelmintic therapy to the entire family or team. During treatment, it is necessary to maintain a hygienic regime to prevent re-infection.

To prevent allergies that occur due to helminthiasis, antihistamine drugs are used. If there are obvious signs of intoxication, symptomatic therapy is prescribed.

Thus, helminthic infestations are a fairly common and pressing problem in the clinical practice of doctors. In this review, we once again focused attention on modern approaches to the diagnosis, treatment and prevention of this pathology in children.



FORECAST

With timely diagnosis and adequate treatment, the prognosis is favorable. To avoid relapses, it is necessary to follow preventive measures (personal hygiene rules, minimizing contact with unfamiliar animals, eating thoroughly washed vegetables and fruits).

PREVENTION OF HELMINTISES IN CHILDREN

- Boiling water and heat treatment of products;
 - Use of personal hygiene products;
 - Washing kitchen utensils with detergents;
 - All family members must follow hygiene rules and try to avoid close contact of the child and his personal belongings with pets;
 - On the street it is important to ensure that the child does not pick up various objects; do not allow contact with animals;
 - It is important to instill in your child personal hygiene skills (wash hands with soap after going outside and going to the toilet);
 - It is advisable to periodically wet clean the house, wash toys with soap, especially if you have pets, as well as toys brought into the house from a walk; vacuum carpets, upholstered furniture and soft toys;
 - Do not give your child unwashed vegetables and fruits, insufficiently heat-treated meat and fish, raw water from natural reservoirs.
- A specific course of medications to prevent helminthic infestations should be carried out in the off-season twice a year with broad-spectrum drugs.

LITERATURE

1. Avdyukhina T.I., Konstantinova T.N., Prokosheva M.N. A modern view of the problem of helminthiasis in children and effective ways to solve it // *Attending physician*. - 2004. - No. 1. - P. 24-29.
2. Aleksandrova V.A., Odintseva V.E. Comparative characteristics of the diagnosis and treatment of helminth-protozoal infestations in children // *Attending physician*. - 2008. No. 10. - P. 4-9.
3. Brooker S Estimating the global distribution and disease burden of intestinal nematode infections: adding up the numbers – a review. *J Parasitol* 2010; 40 (10): 1137–44.
4. Ibatova Sh.M., Mamatkulova F.Kh. Mamatkulova D.Kh. Giardiasis in Children. *International Journal of Medical Science and Clinical Research Studies*. Volume 02 Issue 03 March 2022 P.251-253.
5. Ibatova Sh.M., Abdurasulov F.P., Ruzikulov N.Y. Features of clinical manifestations of lambliosis in children. *EPRA International Journal of Research and Development (IJRD)*. Volume: 7 | Issue: 1 | January 2022 P. 38-41.
6. Sh. M. Ibatova, D. S. Islamova, F. Kh. Mamatkulova. Features of clinical manifestations of giardiasis in children. *Scientific and practical journal "Doctor akhborotnomasi"* No. 1 (102) 2022, pp. 36-39.
7. Ibatova Sh.M., Mamatkulova F.Kh., Gaffarova M.T., Jalolova Sh. A. Complex therapy of giardiasis in children. *Scientific abstract journal New day in medicine*. No. 6 (44) 2022. P. 128-132.
8. Ibatova Sh. M., Mamatkulova F. Kh., Ruzikulov N.Y. The Clinical Picture of Acute Obstructive Bronchitis in Children and the Rationale for Immunomodulatory Therapy. *International Journal of Current Research and Review*. Vol 12 Issue 17. September 2020. - P.152-155.
9. Ibatova Sh. M., F. Kh. Mamatkulova, N. B. Abdukadirova, Yu. A. Rakhmonov, M. M. Kodirova. Risk Factors for Development of Broncho-Ostrutive Syndrome in Children. *International Journal of Current Research and Review*. Vol 12. Issue 23 December 2020.-P. 3-6.
10. Ibatova Sh.M., Mamatkulova F.Kh., Rakhmonov Y.A., Shukurova D.B., Kodirova M.M. Assessment of the Effectiveness of Treatment of Rachit in Children by Gas-Liquid Chromatography. *International Journal of Current Research and Review*. Vol 13, Issue 06, 20 March 2021. P.64-66.
11. Sh.M. Ibatova, F.Kh. Mamatkulova, D.S. Islamova. Efficiency of combined application of apricot oil and aevit as a regulator of lipase activity of blood serum in children with vitamin D-deficiency rickets. *Journal of Critical Reviews*. // ISSN- 2394-5125. VOL 7, ISSUE 11, 2020. P.1266-1274.
12. Sh.M.Ibatova, D.T.Rabbimova, E.S.Mamutova, N.B.Abdukadirova, M.M.Kadirova. Gas-chromatographic appraisal of application of apricot oil and aevit in complex therapy of vitamin D- deficiency rickets in children. *International Scientific Journal Theoretical & Applied Science*, 24.04.2019 , Philadelphia, USA, P.333-336.
13. Sh.M. Ibatova, F.Kh. Mamatkulova. D.S. Islamova. Efficiency of combined application of apricot oil and aevit as a regulator of lipase activity of blood serum in children with vitamin D-deficiency rickets. *Journal of Critical Reviews*. //ISSN VOL 7, ISSUE 11, 2020. - P.1266-1274.
14. Sh.M. Ibatova, Mamatkulova F.Kh., Rakhmonov Yu.A. Gas chromatographic evaluation of the efficiency of apricot oil and aevita in complex therapy of rachit in children. *EPRA International Journal of Multidisciplinary Research*. Volume: 8 | Issue: 1 | January 2022. P. 132-136.
15. Ibatova Sh.M., Rustamova Kh.Kh. Optimization of treatment of vitamin D-deficient rickets in children. *EPRA International Journal of Research and Development. IJRD* Volume: 7, Issue: 4, April 2022. P. 117-120.
16. Shoir M. Ibatova, Feruza Kh. Mamatkulova, Gulnoz A. Kholikova, Dilrabo Kh. Mamatkulova. Some indicators of lipid and phosphorus-calcium metabolism in children with rickets receiving conventional treatment. *International Journal of Health Sciences*, 6(S4), 2022. 3628–3638.
17. Control and prevention of geohelminthiasis in the countries of the WHO European region. Collection of reference and methodological materials. Ed. V. Davidyants, E. Chernikova, V. Lungu. WHO, 2017. *Pediatrics. Consilium Medicum* 2019 | №4/Ped



18. Kulakova L., Singer S.M., Conrad J., Nach T.E. Epi-genetic mechanisms are involved in the control of *Giardia lamblia* antigenic variation // *Mol. Microbiol.* - 2006. - Vol. 61(6). - 1533-1542.
19. Mochalova A.A., Ershova I.B. A look at the problem of helminthiasis and parasitosis at the present stage. *Current infectology*. 2014; 2 (3).
20. Prokhorova A.D. Diagnosis and treatment of acute parasitic diseases in children. *Local pediatrician*. 2019; 4:2-3.
21. Onishchenko G.G. The state of the incidence of parasitic diseases in 1998 and measures to stabilize it in the Russian Federation. *Honey. parasitology and parasitic diseases*. 2000; 1:3-7.
22. Research priorities for helminth infections. World Health Organization, TDR Disease Reference Group on Helminth Infections. *World Health Organ Tech Rep Ser* 2012; 972: xv-xvii, 1-174, back cover.
23. Pullan RL, Smith JL, Jasrasaria R, Brooker S Global numbers of infection and disease burden of soil transmitted helminth infections in 2010. *J Parasit Vectors* 2014; 7:37.
24. Timchenko V.N., Levanovich V.V., Abdukaeva N.S., Vasiliev V.V., Mikhailov I.B. Parasitic infestations in the practice of a pediatrician. - St. Petersburg: ELBI, 2005. - pp. 60-68.



ANALYSIS OF INDICATORS CHARACTERIZING THE INNOVATION AND INVESTMENT ACTIVITIES OF INDUSTRIAL ENTERPRISES AND CLASSIFICATION OF INFLUENCING FACTORS

Jurabekov Mamurjon

Tashkent State Technical University named after Islam Karimov

ABSTRACT

This article describes the characteristics and factors of industrial coke production in order to assess the harmonious aspects of innovation and investment issues, mainly based on world experience. However, the theoretical basis of innovation and investment at one level of application, the author's approach is presented in what characteristics it acquires for industrial enterprises.

KEYWORDS: *innovation, investment, sustainability, financial flow, modernization, fundamentals of strategic management.*

In a number of economic literature, the classification of factors influencing the organization of innovation and investment activity, their grouping according to characteristics, was formed as a separate topic of research and relevant studies were carried out. Today, the main goal of most studies is to simplify the economic assessment of innovation and investment activities and change its methodological approaches based on legal frameworks. As a result, digitalization, programming and algorithmization of assessment methods are rapidly transforming into the operational activities of enterprises. In this case, this is not industrial competition, but competition between science and its power, and technical and economic changes occur in proportion. Acceleration of innovation and investment activity covers not only the sequence of research, but also its impact on the industry infrastructure, its compatibility with national economic programs and the potential for support, setting a unique trend.

A number of economists have studied a system of indicators reflecting the scale and efficiency of innovation and investment activities of industrial enterprises; we will consider their grouping and description below (Table 1.3).

1. Table 3

A system of indicators reflecting the scale and efficiency of innovation and investment activities of enterprises.¹

No	Indicator	Economic description of the indicator
(Contributions to innovation and investment projects) indicators characterizing the effectiveness of investments		
1	Net profit not included in price	Represents the cumulative effect (cash flow balance) for the reporting period. It must have a positive score (a negative score indicates that the project is harmful).
2	Net present value NPV	Reflects the overall absolute results of innovation and investment activity and its final effect. Shows the difference between discounted income and capital investment over a certain period of time.
3	Investment return index H1	Reflects the degree of return intensity, that is, the amount of income corresponding to each unit of investment,
4	Discounted investment return index NP1	Reflects the ratio of the amount of discounted income to the amount of investment allocated by the company. If $NP1 > 1$, the project is effective (positive profitability).

¹ Pronyaeva L.I. Analysis of the effectiveness of innovation and investment activity in the process of reproduction of fixed capital // Innovation policy and investment activity. 41(206)-2010.



5	Internal rate of return IRR.	It shows the minimum measure of profitability that can justify the investment made during the planned period of the project.
6	Additional capital costs Y_{copy}	It reflects the minimum investment costs included in the enterprise's activities and represents the lowest level of profitability that covers these costs.
7	Justification period T	Determines the period of time during which investment costs must be covered by net profit.
8	The profitability calculation ratio is ARR.	It represents the ratio of average after-tax profit to the average amount of investment, depending on the amount of depreciation income.
Indicators characterizing the scale of innovation and investment activity		
1	Coefficient of scale of innovation and investment activity	Shows the share of costs for research and development work in the total costs of the enterprise.
2	Reproductive process priority factor	It shows the ratio of innovation and investment projects and the total volume of investments in the capital of the enterprise.
3	Priority of innovation and investment activities	It shows the ratio of R&D costs and costs of development and technological work in the sum of the total costs of the enterprise.
4	Efficiency of innovation and investment activities	The share of expenses on ITTKI that gave a positive result in the total amount of expenses on innovation and investment activities is shown.
5	Structure of financing of innovation and investment activities	The share of financing from own sources in the total volume of investments in innovation and investment projects is shown.
6	Structure of investments by efficiency of innovation and investment activities	The share of investments directed to ITTCI, which gave a positive result, in the amount of total costs for innovation and investment activities is shown.
Indicators characterizing the effectiveness of the results of innovation and investment activities		
1	Increase in income received as a result of the introduction of new developments,	Reflects the amount of additional income received as a result of the implementation of an innovation investment project.
2	Changes in stock returns as a result of innovation	The impact of the implementation of an innovation-investment project on the efficiency of using fixed assets is shown.
3	Profit from sales as a result of the introduction of new developments	It shows the amount of profit received as a result of the implementation of an innovation investment project.
4	Net profit received as a result of the implementation of new developments	It shows the final result (efficiency) obtained as a result of the implementation of an innovation and investment project.
5	Profitability of innovative assets	Shows the effectiveness of using new developments relative to net profit.
6	Return on investment	The effectiveness of capital investments aimed at implementing an innovation and investment project is shown.
7	Payback period for investments in innovation	Determines the period of time required to recoup capital investments with profit during the entire period of operation of new developments.
8	Complex budget effect of an innovation and investment project	Determines the overall profitability of an innovation investment project over a certain period of time intended to generate income.

Before analyzing the indicators of innovation and investment activity, first of all, it is necessary to understand the nature of the analytical analysis of the project, the economic feasibility of the costs that make up the estimated cost of investment, and also calculate the possibility of positive results from investments in research and development.

The second condition for the methodology for analyzing the effectiveness of innovation and investment activities of enterprises is to determine when assessing income and cash receipts from investments:

- The start time of the project and the amount of net profit;
- Duration of income from the main capital asset received during the project;
- Probability of profit or loss.

The period for generating income from the main capital asset obtained as a result of the project is determined by forecasting its life cycle - this is the most likely period when the proposed investment will generate income, and the duration of the investment period is The period for calculating depreciation of the object until major repairs or refurbishment can be determined by the period.



When assessing the return on investment, the uncertainty of income generation is taken into account. Also, when choosing a discount rate, the risk level of the project is taken into account (average cost of capital, average interest rate on a loan or rate on a long-term loan, etc.).

The methodology for analyzing the effectiveness of innovation and investment activities is based on a set of certain criteria. In each case, priority is given to criteria that currently reflect the interests of owners or investors.

If the profitability of the project comes first, then the calculation is based on the return on investment index or internal rate of return. The higher the internal rate of return, the higher the investment efficiency. In industries with the highest level of technological change, the payback period of the project exceeds profitability.

When analyzing the scale of innovation and investment activity, the amount of costs for research and experimental construction work in the total amount of enterprise costs, priority areas and the effectiveness of the reproduction process and innovation activities are determined. Investment activity is assessed. The division of the enterprise was determined, the composition of sources of innovation and investment projects was studied.

Assessment of the effectiveness of the results of innovation and investment activities of an enterprise is based on the characteristics of indicators reflecting the final results of the project, as well as the ratio of results and costs obtained as a result of development, production and use of innovations.

1. Table 4

Main features of innovation, investment and innovation-investment analysis.²

Object of analysis	Subject of analysis	Purpose of analysis	Information sources
Innovation activities	Innovation processes	Assessment, diagnosis and forecasting of the main elements of innovation activity	Accounting and statistical data
Investment activities	Investment processes	Assessment, diagnostics and forecasting of resources, costs and results of investment activities	
Innovation and investment activities	Innovation and investment processes	Assessment, diagnostics and forecasting of resources, costs and results of innovation and investment activities	

It is necessary to develop a system of appropriate indicators to analyze the effectiveness of innovation and investment activities at the micro level. Theoretical and methodological works in the field of investment activity and innovation analysis use various indicators used to justify the acceptability of investment decisions and the effectiveness of innovation.

Innovation and investment analysis is an integration of two types of analysis and is important because it can provide multifaceted information when making management decisions and at the same time has its place in improving their quality.

LIST OF USED LITERATURE

1. Mukhitdinova K.A. *TECHNICAL AND ECONOMIC STATE OF OIL DRILLING AT THE FIELD OF THE ENTERPRISE "MUBARK NGP"*. - 2022.
2. Alisherovna M.K. *Issues of development of foreign economic activity in the Republic of Uzbekistan with the help of foreign investments* // *Asian Journal of Research in Business Economics and Management*. - 2022. - T. 12. - no. 7. - pp. 6-10.
3. Alisherovna M.K. *The use of communication networks in optimizing the work of investment projects* // *Trans-Asian Journal of Marketing and Management Research*. - 2022. - T. 11. - no. 5 and 6. - pp. 49-52. Bobozhonova Z. Sh., Abdullaeva D. *Innovative development of industrial production based on the synergetic principle* // *Problems of modern science and education*. - 2016. - no. 36 (78). - P. 64-66.
4. Shokirovna B.Z., Mukhayo Y., Khurram o'g'li X.S. *TOPIC: DIRECTIONS FOR DEVELOPMENT OF INNOVATIVE BUSINESS ACTIVITY IN UZBEKISTAN* // *Scientific impulse*. - 2023. - T. 2. - no. 16. - pp. 42-45.

² In short, D.A. *Features of innovation and investment analysis of the activities of an IT company in the Republic of Tatarstan*. <https://core.ac.uk/download/pdf/197425328.pdf> Accessed 18 August 2022.



HISTORY OF PROPAGANDA CAMPAIGN UNDER THE SOVIET ADMINISTRATION SYSTEM IN UZBEKISTAN

Xurshidjon Boymirzaev Karimdjanovich

Associate Professor, (PhD)

Faculty of History of Namangan State University, Uzbekistan.

ABSTRACT

During the Soviet era, the party's full control over all spheres of society was established. Science and culture, literature and art, and the media are fully involved in the activities of the Communist Party. It is known that the Soviet government, which took over power in October's military coup, chose two ways of combating colonialism in Central Asia on a solid foundation. This paper analyses and concludes that the party's full dominance over all spheres of society was established during the historical period studied. Science and culture, literature and art, and the media are fully involved in the propaganda and propaganda work of the Communist Party. As a result, the national culture, the departure from the national spirituality, and the development of communist ideas.

KEY WORDS: *Soviet, government, dominance, people, propaganda, agitation, empire, communion.*

INTRODUCTION

The history of Uzbekistan during the Soviet rule (1917-1991) occupies a special place in the history of our nation due to its contradictions and complexities. With the Bolsheviks coming to power in October 1917, the colonial policy of the Russian Empire began. It is known that the Soviet government, which took over power in October's military coup, chose two ways of combating colonialism in Central Asia on a solid foundation.

The first way is to force the indigenous people to seek independence and national liberation by force and force. The way was done by the Soviets with the help of the Red Army, equipped with modern military equipment. This path continued until the mid-1930s. The second path was on the ideological front. This was followed by the means of peaceful struggle, that is ideological, political and ideological influence on the minds of the Soviet government and the wider society[1. – P, 35.].

ANALYSIS

During the 75-year reign of the Bolshevik regime, the Soviet man was able to create a propaganda and propaganda mechanism that was part of the Soviet lifestyle.

The “leader” of the peoples V. I. Lenin's slogan, “Unite the proletarians of the whole world!” Was the propaganda machine of the state to be built. “Party and Party Literature”, “Literary Work”, that is, the media, books and movies, were the initiators of a single “universal business”. The Soviet government also did everything possible to create a “nationalist and essentially socialist” system and culture in Uzbekistan.

Through education, science, literature, art, and the media, the idea of slavery, subjugation, obedience, Russification and assimilation was gradually systematized, pushing all nationalism out of people's minds and into the shell of “socialist”, “internationalism”. Particular attention was paid to the establishment of exhibition schools for promotion. For example, in 1919 in the old part of Tashkent in Beshyogoch there was opened the first and second grade school named after Almai. He had a boarding school with him. The sessions were organized in such a way that the main purpose of the training was to break away from the national foundations[3. – P, 46-48.].

The textbooks in Uzbek were many times more than Russian textbooks. However, along with educational literature, many portraits of Marx, Trotsky, and Lunacharsky, such as pure propaganda, have been published.



The Soviet state founded the Glavlit organization in 1922. It is the organization that has been in full control over the media over the years. The Glavlit employee has created a powerful system that monitors every publication and filters every word and address.

The fact that the Glavlit staff in 1939 increased to 6027, and by 1947 to 6453, testified to the widespread control.

The most influential means of propaganda is the literature. The Communist Party of Uzbekistan has established the Proletarian Writers Association of Uzbekistan in place of the "Red Pen" Society established by them. The name of the above organization also means that the party serves for the promotion of the party. In addition, the main idea of the Soviet system was to introduce the necessary and unconditional generation of children into the minds of children from early childhood and childhood. This process continued in schools, universities, pioneer groups, and Komsomol organizations[2. – P, 29.].

In the 1930s and 1930s special organizations and departments were established to promote the Soviet system. The propaganda and propaganda department of the Communist Party has been sealed as the highest governing body in all Soviet history.

In addition, the "leader of the nations" V. I. On the instruction of Lenin, from the very beginning of the Soviet Union, the Main Department of Political Studies was established. In May 1935, Stalin divided the organization into five divisions, namely, publications and publications, party propaganda and outreach, school, science, cultural and educational affairs.

In the early years of his rule, the Soviet government widely used the media to promote party politics. After the October Revolution, Turkestan began to cut down on national publications. The divergent direction of newspapers and magazines has shifted to the uniformity embodied by the Bolshevik idea[1. – P, 112.].

Between 1918 and 1920, dozens of newspapers and magazines in Bolshevik language were published in the local languages and Russian languages. The mass media was interpreted as a tool of the party's apparatus, and the journalists were "officers on the ideological front."

The media has grown to be a means of propaganda and propaganda. As a result, the media has been promoted as a proponent of strengthening the political system and mass ideological education. Stalin has said directly on this issue: Publications are what make newspapers, magazines and brochures the best in the world. There is no better media outlet in the world than newspapers, magazines and brochures. Publications can convince one or another of the truth[3. – P, 54.].

Perhaps Stalin here refers to the bitter truths of history that our people have experienced. The Soviet propaganda machine has worked so hard that history shows itself.

In 1922, 232 newspapers were published, and by 1932 more than 7,500 newspapers were published in the USSR. By 1940 their number had grown to 8,800.

CONCLUSION

In summary, the party's full dominance over all spheres of society was established during the historical period studied. Science and culture, literature and art, and the media are fully involved in the propaganda and propaganda work of the Communist Party. As a result, the national culture, the departure from the national spirituality, and the development of communist ideas.

REFERENCES

1. Shamsutdinov R., Karimov Sh. *History of Homeland - Tashkent*. 2010. 283 p.
2. Juraev M., Nurillin R, S. Kamolov et al. *Uzbekistan during Soviet colonialism \ Tashkent*. 2000. 141 p.
3. Margaret R. Somers, "What's Political or Cultural about Political Culture and the Public Sphere? Toward an Historical Sociology of Concept Formation," *Sociological Theory* 13:2 (1995), pp. 113-144 (p. 133).