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In an era defined by rapid transformation and global interconnectedness, research assumes a central role in shaping informed societies and sustainable futures. Meaningful progress in science, technology, and the humanities is rooted in systematic inquiry and disciplined scholarship. The strength of a nation today lies not merely in its resources but in the intellectual engagement of its people and their capacity to respond creatively to the challenges of a knowledge-driven world. Cultivating such an academic ecosystem remains vital for social advancement and educational excellence.

Higher education institutions worldwide are increasingly recognised as hubs of innovation and research leadership. As countries prioritise research-driven growth, India has steadily strengthened its presence in international scholarly conversations. In response to these developments, St. Mary's College (Autonomous), Thoothukudi, continues to reaffirm its dedication to promoting a vibrant research culture. The Research Forum of the college functions as a catalyst in this endeavour, encouraging critical thinking, originality, and scholarly discipline among emerging researchers.

With the objective of enhancing academic competence and empowering students, the forum consistently facilitates academic events such as seminars, workshops, orientation programmes, and conferences. These initiatives provide young scholars with valuable opportunities to sharpen their research skills, explore interdisciplinary perspectives, and engage with current intellectual debates. The present issue of *Marian Quest* showcases a selection of student research papers that demonstrate analytical depth, methodological rigour, and an increasing awareness of research ethics and standards. All contributions have undergone expert evaluation to ensure academic credibility and quality.

We record our deep appreciation to the management for its unwavering support and encouragement in fostering a research-oriented academic environment. We are equally grateful to the reviewers for their time, expertise, and constructive feedback, which have significantly enriched this publication. Our sincere thanks are also due to the contributors and the members of the Research Forum, whose collective efforts have brought this issue to fruition.

We are confident that *Marian Quest* will continue to evolve as a dynamic scholarly platform, promoting intellectual engagement and contributing meaningfully to the academic life of St. Mary's College (Autonomous), Thoothukudi.

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marianresearchforum@gmail.com



Guidelines for Submission of Articles

Marian Quest the Bi-annual Multidisciplinary Research Journal of St. Mary's College (Autonomous), Thoothukudi, publishes articles of high reputation and innovation. The articles intended for publication must be typed in A4 size format, 1.5 line space and Times New Roman Font 12. Tamil papers should be in Bamini Font. The latest writing manual for MLA Hand book should be followed in Literature articles. Footnotes, References, Citation Marks should also be included in the research paper.

For reviewing and correction purpose, kindly send one hard copy with the soft copy. Full paper generally consists of the title, pictures, charts, graphs etc., along with Footnotes.

Instructions to contributors (for Science Articles)

Title : It should be short & informative

Keywords : Five or six keywords indicating the contents of the manuscript.

Address of Authors : It includes author's name, institution name, telephone number (office only), and e-mail address. Author for correspondence should be indicated with an asterisk (*).

Main Heading : Each article should be divided into the following main headings: Abstract, Introduction, Materials and Methods, Results and Discussion, Conclusion, Acknowledgement and References.

All articles are, as a rule, referred to experts in the subject concerned. Those recommended by the referees alone will be published in the journal.

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Enhanced Crime Hotspot Prediction and Visualization for Women's Safety Through Deep Learning

A. Asmi

Department of Computer Science, St. Mary's College (Autonomous) Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Crime hotspots are geographic areas with elevated levels of criminal activity compared to other regions. Women in these hotspots are at increased risk of experiencing various forms of criminal behavior, including sexual harassment, assault, domestic violence, and human trafficking. Identifying these hotspots is crucial for effective crime prevention and resource allocation by law enforcement agencies. This project presents Safety Locator to identify and map crime hotspots where women are particularly vulnerable. The system utilizes the Deep Explainable Decision Tree model, a machine learning algorithm that analyzes historical crime data to predict the criminal activity in specific areas. The Deep Explainable Decision Tree model classifies data into crime hotspot categories and visualizes these areas on Google Maps. By analyzing factors such as the number and type of reported crimes and crime locations, the system generates a detailed map highlighting high-risk areas. This map can be shared with the public to increase awareness and promote safety. The development process includes data pre-processing, feature selection, model training and prediction. Safety Locator aims to assist law enforcement agencies in preventing crime and enhancing public safety. By creating safer environments for women, the system supports efforts toward gender equality and improved quality of life.

Keywords

Crime hotspot, women safety, Explainable Decision Tree, machine learning, safest route prediction.

1. Introduction

Crimes against women are of various types as crimes involving sex for economic gains including prostitution, wrongful confinement, trafficking, dowry extortion, rape, assault, harassment at work place, gang-rape, acid-attack, kidnapping, and other immoral acts are injurious to the society. In present scenario cases of murder, rape, molestation, sexual abuse, and eve-teasing etc. Women feel discrimination, harassment and domestic violence at work. Use of money and muscle

power to save accused. Politics in the name of caste, religion take benefit as well. India at 108th place according to Global Gender Gap Index 2017. Violence against women and girls is rooted in gender-based discrimination and social norms. Women are so helpless in the Indian society where many female goddesses are worshipped but still people don't respect women. It is high time when the social revolution is needed to root out this evil from Indian society and given respect and recognition to our women. Crime hotspots are areas that have high crime intensity. These are usually visualized using a map. They are developed for researchers and analysts to examine geographic areas in relation to crime. Hot spots are areas with a high occurrence of crime. These areas can be anywhere. These hot spots are areas where crime is more likely to occur, and law enforcement agencies often focus their resources and efforts in these areas to prevent and reduce criminal activity. A holistic framework integrating crime prevention, response, and analysis with an emphasis on women's safety. Utilizing GIS techniques their system identifies crime hotspots and integrates mobile applications, wearable gadgets, and community participation for real-time safety measures^[1]. Crime hot spots can be identified through various methods such as analyzing crime data, conducting community surveys, and mapping criminal activity patterns. By identifying crime hot spots, law enforcement can use targeted strategies to prevent and reduce crime in those areas.

2. Materials and Methods

2.1. Data Analysis Technique

Explainable AI (XAI) Algorithm

Crime hotspot prediction uses machine learning to identify locations with a high likelihood of criminal activity. The deep learning and big data analytics to analyse crime patterns in three U.S. cities. Their research leveraged AI models to detect trends, enhance predictive accuracy, and support law enforcement in crime prevention strategies^[2]. Since law enforcement agencies need to understand and trust AI-generated predictions, Explainable AI (XAI) is crucial.

- **Trust:** If officers understand how the AI predicts hotspots, they can use the insights effectively.
- **Accountability:** Helps in understanding why certain areas are labelled as crime hotspots.

2.2. System

Design

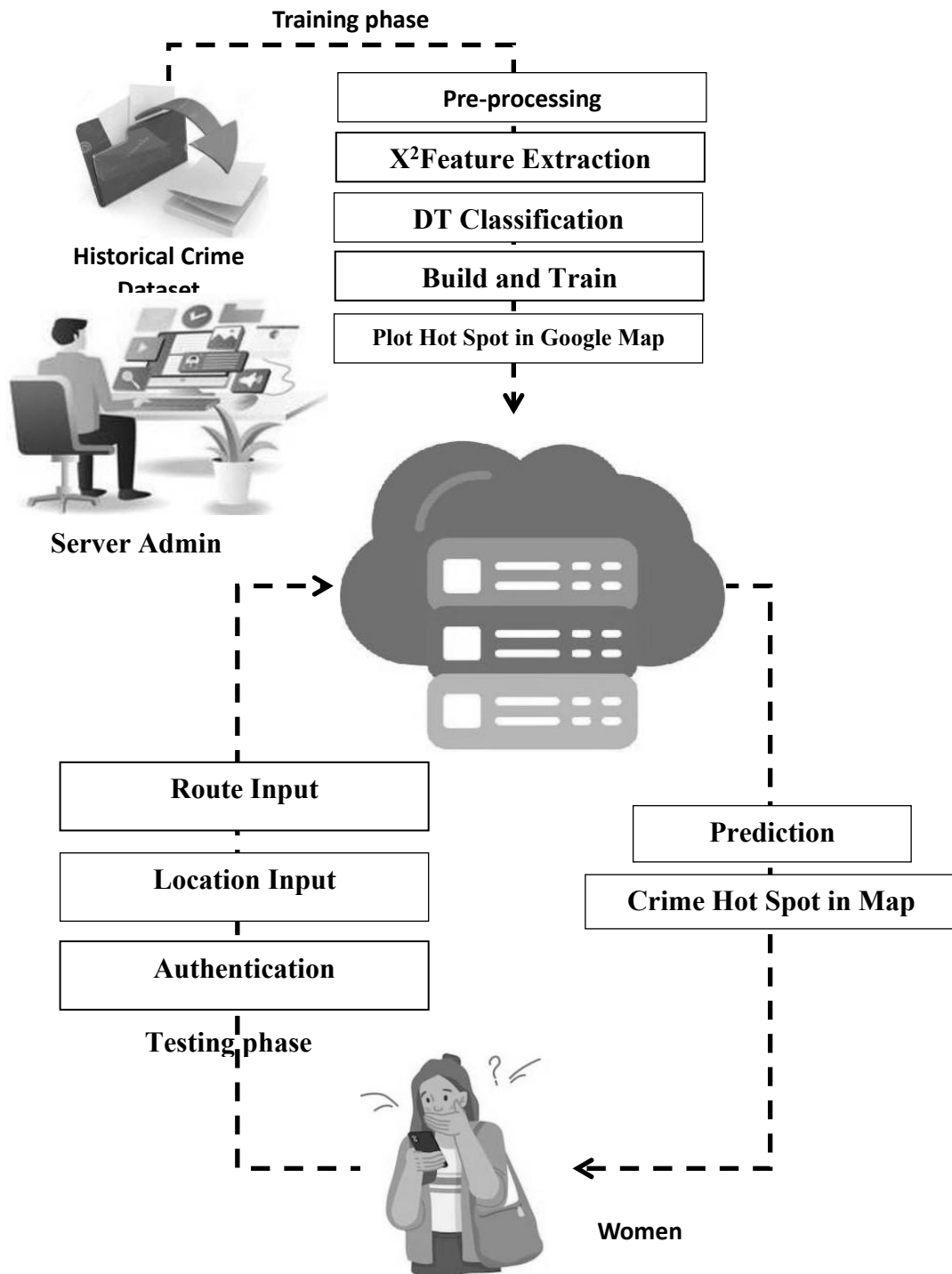


Figure 1. Architecture Design of Crime Hotspot Prediction System

Decision Tree Algorithm

A Decision Tree is a supervised learning algorithm that helps classify locations as high or low crime risk areas based on historical data.

- **Data Collection:** Crime patterns are influenced by historical records (robbery, assault, burglary), environmental factors (street lighting, population density), and time-based trends (weekdays vs. weekends, time of day). Understanding these elements helps enhance safety and crime prevention strategies.
- **Feature Selection and Splitting:** The model selects key crime indicators (e.g., crime count in past weeks, proximity to police stations).
- **Training the Model:** The Decision Tree learns from past data to classify areas as crime hotspots or safe zones.

xDT (eXplainable Decision Tree) Algorithm

- **Feature Handling:** It can handle large datasets with multiple features (like crime type, location, time, etc.) and make predictions about crime hotspots.
- **Speed and Accuracy:** xDT provides faster training and higher accuracy, which is crucial when predicting crime patterns in large cities or multiple regions.
- **Feature Importance:** It can also show which factors (e.g., time of day, neighbourhood, weather) are most important for predicting crime hotspots.

Machine Learning Algorithm

The machine learning techniques for crime prediction, using datasets from Chicago and Los Angeles. Their models improved crime forecasting accuracy, identifying high-risk areas and future crime trends^[3]. A smart policing technique using machine learning to predict crime types and risk scores^[4].

- **Pattern Recognition:** Machine learning algorithms can recognize patterns in crime data, helping to identify areas that are more likely to experience crimes.
- **Predictive Power:** With historical crime data (time, location, type of crime), ML can predict future crime hotspots based on past trends.
- **Adaptability:** It can adapt to new data over time, improving predictions as more data is fed into the system.

K-Means Clustering Algorithm

A graph-based clustering approach for relation extraction from crime data. Using natural language processing, they analysed crime reports to identify

relationships between entities, aiding law enforcement in crime pattern analysis and investigation^[5].

- **Crime Grouping:** K-Means can cluster different locations based on the number and type of crimes. For example, it can group areas with similar crime patterns (e.g., robbery, assault) into "hotspots."
- **Visualizing Hotspots:** The algorithm helps identify which areas have the highest concentration of crime, so law enforcement or city planners can focus on those areas.
- **Improved Decision Making:** By grouping similar incidents together, K-Means helps identify patterns that humans might miss.

Random Forest Algorithm

- **Robust and Accurate:** Random Forest improves the accuracy and robustness of crime prediction by combining the results of multiple decision trees.
- **Feature Importance:** Random Forest identifies important features (e.g., crime type, location, etc.), which can help determine the most influential factors in predicting crime hotspots.
- **Reducing Overfitting:** Since it uses multiple trees, Random Forest reduces the risk of overfitting, making predictions more reliable on unseen data.

2.3. Tools and Software used

Python

Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985-1990. Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is currently the most widely used multi-purpose, high-level programming language. Python programs generally are smaller than other programming languages like Java. Python language is being used by almost all tech-giant companies like – Google, Amazon, Facebook, Instagram, Dropbox, Uber. Python's syntax is simple and mirrors human language, making it easy for beginners to learn. The language emphasizes readability and reduces the complexity of the code. Python is an interpreted language, meaning the code is executed line-by-line by an interpreter, rather than compiled into machine code beforehand. This makes debugging and testing easier and faster. Python includes a vast library of modules and

functions, which makes tasks like file handling, web development, and database interaction easier. You don't need to write code for everything from scratch as you can rely on the standard library. Python code can be run on various platforms such as Windows, macOS, Linux, and others, without modification, making it highly portable. Python supports Object-Oriented Programming (OOP), which helps in organizing and structuring your code more efficiently. Python has an automatic garbage collection system, which means that it takes care of memory management by automatically cleaning up objects that are no longer in use.

3. Results and Discussion

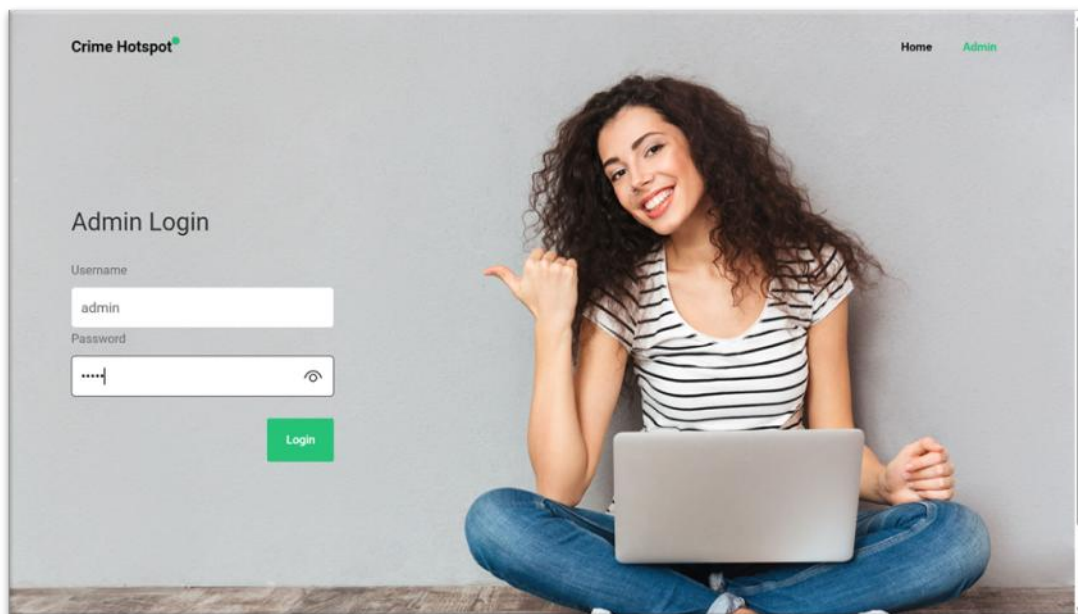


Figure 1. Admin Login

Figure 1. shows Admin Login with username and password

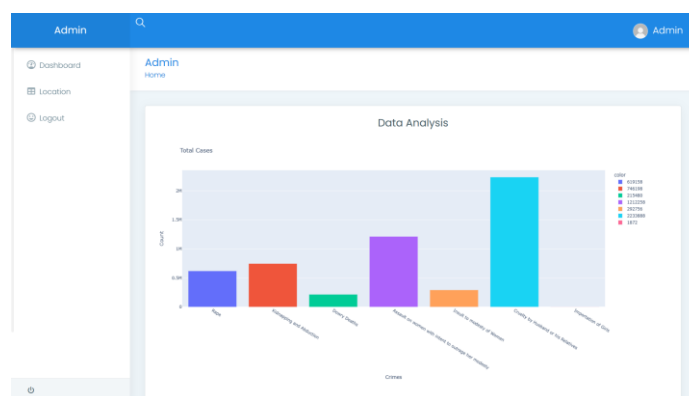


Figure 2. Data Analysis

In Figure 2. the data analysis chart showing total cases for different types of crimes. The bar chart uses different colours to represent different crime categories and height of each bar indicates the count

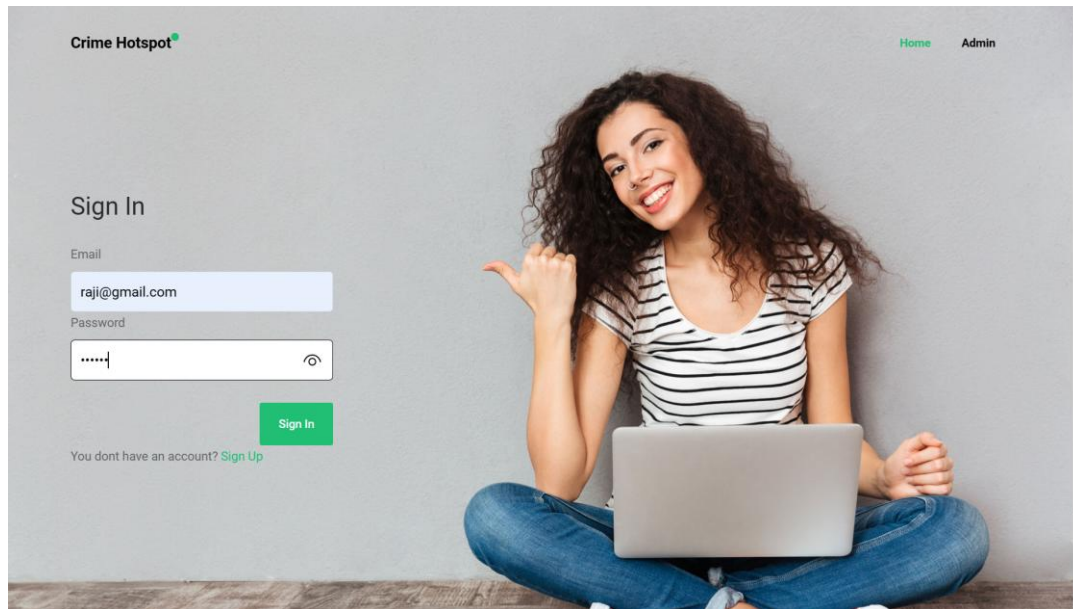


Figure 3. User Login

Figure 3. shows User signing in with email and password

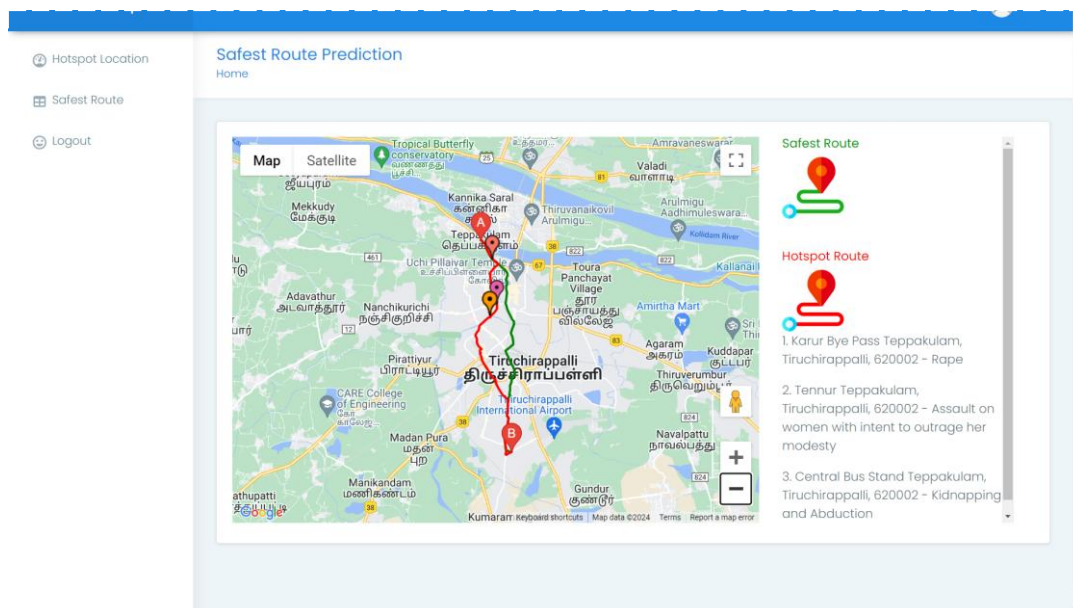


Figure 4. Safest route prediction

In Figure 4. a map of Tiruchirappalli shows the both safest and hotspot paths in different colours.

4. Conclusion

The proposed system is a useful tool to predict crime hotspots and provide recommendations to women for safer routes. The system employs the explainable Decision Tree (xDT) algorithm for crime hotspot prediction and integrates Google Maps API for visualization and location-based recommendations. The proposed system has many advantages over the existing manual systems and other data mining techniques. It provides a more accurate and efficient way of predicting crime hotspots, which will allow law enforcement agencies to take proactive measures to prevent crime against women. The system is also user-friendly, making it easy for end-users to access and utilize. Overall, the Crime Hot Spot Prediction and Localization System for Women Safety using xDT and Google Map API is a step towards creating a safer environment for women and empowering them to make informed decisions regarding their safety.

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AN ANALYTICAL STUDY ON VOTING BEHAVIOURAL PATTERNS OF INDIVIDUALS IN PONNAGARAM AREA OF THOOTHUKUDI DISTRICT

M. Nandhini* and Dr. A. Sudha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The behaviour of voting for a party in an election has important social implications, yet, due to strong mentalistic influences in electoral research, it has rarely been studied from the behaviour analytical perspective. In this article a behavioural analysis of voting among the people. It is concluded that such an analysis is both theoretically fruitful and empirically relevant. Voting is one of the most commonly used terms in contemporary age of democratic politics. Voting behaviour refers to the decision-making process of individuals when choosing a political party or candidate to vote for. It takes into account various factors such as cognitive considerations, personal traits, political issues, ideology, and past performance. People's voting behaviour is influenced by limited attention, simplification strategies, and the perceived relevance of information at a given moment.

Key Words: Vote, Election, Democratic, Determinants, Voting behaviour, Decision making, cognitive consideration, Ideology, etc.,

INTRODUCTION

Voting Rights in India

With elections under way in many states of India, all Indian citizens who are eligible to vote are given a chance to exercise their franchise and participate in the electoral process. The Indian Constitution has granted the right to vote to all Indian citizens of sound mind above the age of 18, irrespective of an individual's caste, religion, social or economic status. This right is universally granted to all Indians, with a few exceptions.

As a voter, you are entitled to certain rights and privileges as laid down by the Constitution, which safeguards the rights of the voter. It also lays down the conditions under which this privilege is granted to citizens. Voting is not a fundamental right, but is a legal right granted to citizens. So, what are the rights granted to voters in India? Given below are some of right and duties of voters.

Voting Eligibility in India

As per the Indian Constitution, all Indian citizens above the age of 18 years who have registered themselves as voters are eligible to vote. These individuals can vote in national, state,

district as well as local government body elections. No individual can be Detained or prevented from voting, unless they fulfill the criteria for disqualification. Every voter is allowed one vote only. A voter can vote at the constituency where he has registered himself only.

Eligible voters have to register themselves in the constituency where they live, upon which they will be issued photo election identity cards (also known as EPIC cards). Individuals are not permitted to participate in the electoral process if they have not registered or do not possess a voter ID card.

Any citizen may cast a vote in any of the upcoming elections as long as they have a valid voter ID:

- National-level elections
- State-level elections
- District-level elections
- Local government body elections

Voting behaviour

Behaviour refers to the decision-making process of individuals when choosing a political party or candidate to vote for. It takes into account various factors such as cognitive considerations, personal traits, political issues, ideology, and past performance. People's voting behaviour is influenced by limited attention, simplification strategies, and the perceived relevance of information at a given moment.

Individual Choice:

In a democracy, rules are elected by the people. Abraham Lincoln says in democracy refers to, “the government of the people, by the people, for the people” the term democracy is derived from a Greek language and means “rule by the people”. In a democratic form of government, the political leaders are elected by the citizens only. During elections, people vote for representative of a political party of their choice, the political party wins, forms the government.

The Legal Voting Age:

The legal voting age in India is 18 years.

Factors influencing of voting behaviour

- Socio-economic factors
- Money factor

- Political factors
- Regional and Local factors
- Media influence
- Cognitive factors

Importance of voting in India

Importance of voting right in India the right to vote is of immense importance in India as it is the cornerstone of India's democratic system. It provides citizens with the opportunity to participate in the decision-making process of the country and hold their elected representatives accountable. Voting is a fundamental right in India, and it plays a crucial role in shaping the country's future. Every Single Vote Matters, as it has the power to change the outcome of an election. In fact, there have been instances where a single vote has decided the fate of a government.

- Voting is not just a right, but also are responsibility every citizen
- Voting is away to Exercise Democratic Power.
- Election Commission ensures that elections are free, fair, and transparent.
- Voting is essential for India's democratic fabric.

Right vote for right person

The phrase "Right vote for right person" means that voters should cast their vote wisely by choosing a candidate who is competent, honest, and capable of serving the people effectively. It emphasizes the responsibility of voters to select leaders based on merit, integrity, and vision rather than personal biases, social pressure, or external influence.

Why Should Citizens Vote?

In India, "Right to Vote" is a constitutional Right provided to every citizen over 18 years of age. But, voting right is treated as optional as we don't have any law which says that voting is compulsory for every citizen. Therefore, many voters, especially in urbanites, youth, etc., treat the polling day as a day of rest and holiday. While not exercising the vote may not cause any immediate harm but the long-term consequences are very disastrous.

Scope of the study

The study of voting behavior focuses on understanding how and why individuals make decisions in election it is a key area in political science, psychology, and sociology. The study of voting behaviour help policymakers, political parties and researchers predict election outcomes and understand democratic participation trends.

Objectives of the Study

- To analyse the key factors influencing voting behaviour
- To find out the awareness of upcoming election among the respondents
- To analyse some measurements to improve democratic rights mainly focusing on right to vote.
- To study the role of media, political campaigns, and social influences.

METHODOLOGY

The methodology used for this study is analytical. Data is collected from both primary as well as secondary sources. Structured questions are used to collect data from eligible voters regarding their voting preference and habits. Secondary data includes government election reports from websites, magazines, newspaper, journals, books, new articles.

Sampling method

Simple random sampling method was used for the study, with a sample size of 110 sample respondents.

Method of data collection

Studying voting behaviour involves analysing how and why individuals vote, considering factors like demographics, political awareness, social influences, and economic conditions.

DATA ANALYSIS TECHNIQUES

Descriptive Analysis:

Percentage distribution, mean, and frequency tables were used to summarize the data.

Statistical Techniques

Co-efficient correlation techniques were used to determine the relationship between two factors: that is factors affecting voting behaviour and awareness of upcoming election. These are the two factors to determinants the major voting behaviour.

LIMITATION OF THE STUDY

- Possible response bias in self-reported surveys.
- Limited sample size may not fully represent the entire voter population.
- Influence of social and political events on response at the time of data collection.

Table: 1
Awareness of upcoming election

S.No	Awareness of upcoming election	No. of the Respondents	Percentage
1	Highly aware	46	42%
2	Somewhat aware	16	14%
3	Neutral	22	20%
4	Not very aware	24	22%
5	Not aware at all	2	2%
	Total	110	100

Source: Primary data

Regarding upcoming election, the respondents are categorized based on their awareness level. Majority 42% of the sample respondents are highly aware of the upcoming election, 14% of the sample respondents are partial aware of the upcoming election, 20% of the sample respondents are neither have neutral about the upcoming election, 22% of the sample respondents have limited aware of the upcoming election process, and a small fraction (2%) of the respondents have no awareness of the upcoming election.

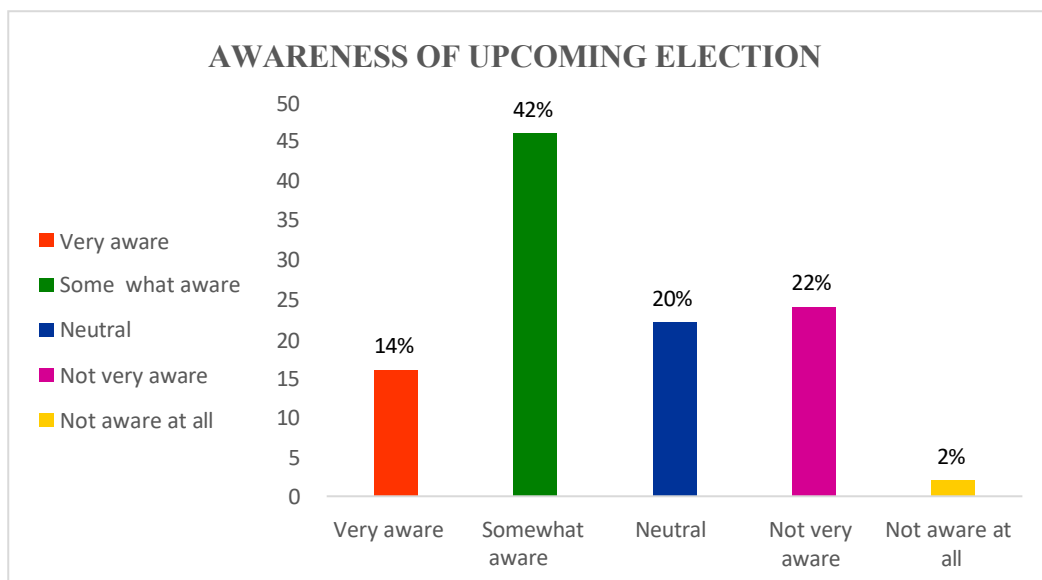
Figure: 1
Awareness of upcoming election


Table:2
Selection of candidate for the election

S. No	Selection of candidate for the election	No. of the respondents	Percentage
1	Who seems nice?	0	0
2	Honest	35	32%
3	Trustworthy	8	16%
4	Sincere	24	22%
5	Someone with experience	26	24%
6	New candidate	7	6%
	Total	110	100

Source: Primary data

The table presents data on the criteria that respondents consider when choosing a candidate in an election. Zero respondents based their decision on a candidate simply appearing nice, 32% of the respondents believe the honesty in a candidate, 16% of the respondents portion is trustworthiness, 22% of the respondents look for sincerity in a candidate, 24% of the respondents prioritizing it experience, and finally 6% of the respondents prefer new candidates respectively.

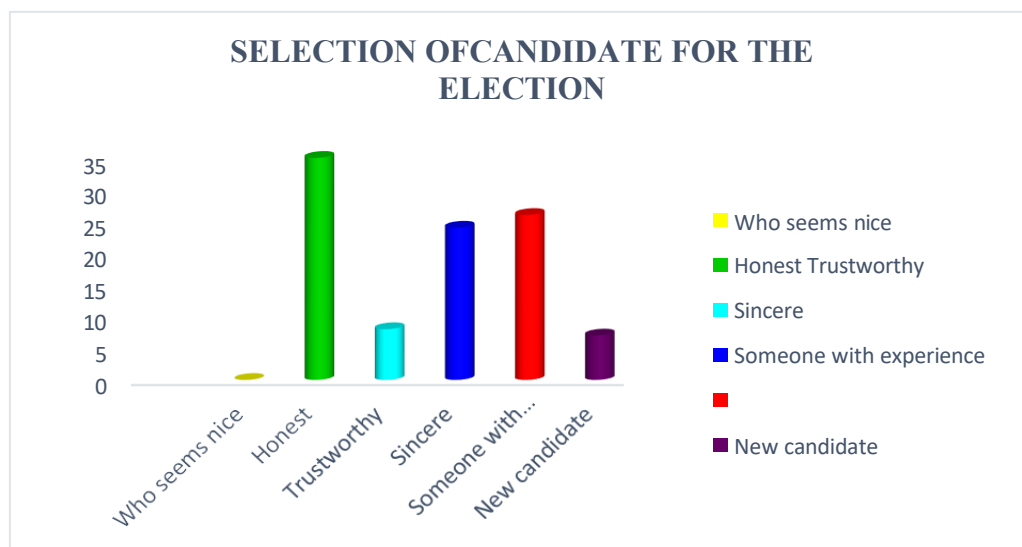
Figure: 2
Selection of candidate for the election


Table:3
Factors affecting voting behavior of the people

S. No	Factors affecting voting behaviour	No. of the Respondents	Percentage
1	It's my rights	43	39%
2	Media influence	32	29%
3	Party identification	22	20%
4	Family & Peer influence	13	12%
	Total	110	100

Source: Primary data

The table presents on the main influences that drive voter's decision during election. 39% of the respondents vote because they see it as their fundamental rights, 29% of the respondents are influenced by media highlighting the role of news and social platforms in shaping political options, 20% of the respondents indicates that some voters rely on party loyalty, 12% of the respondents showing that personal beliefs and external sources respectively.

Figure: 3
Factors affecting voting behaviour

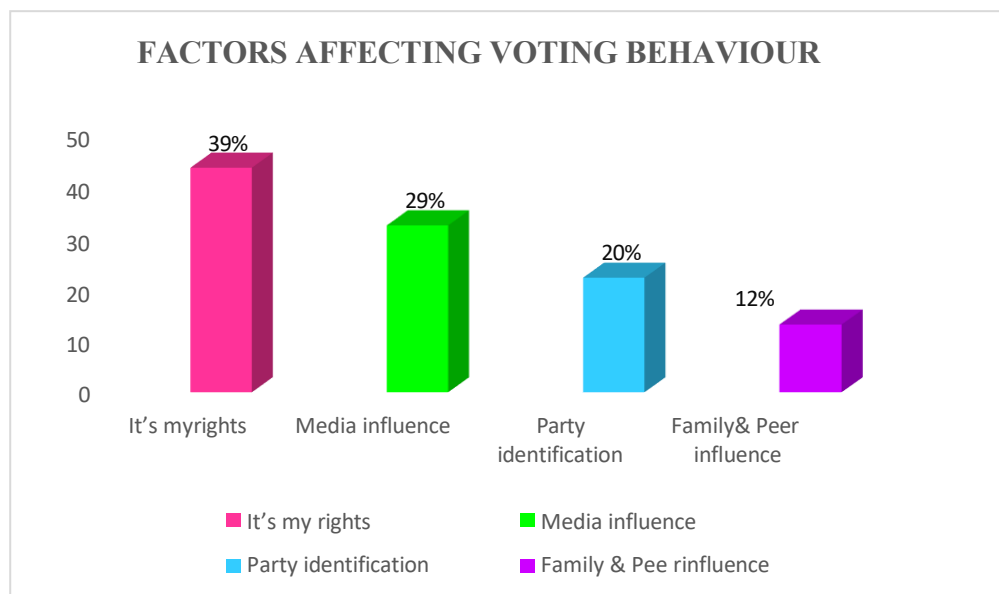


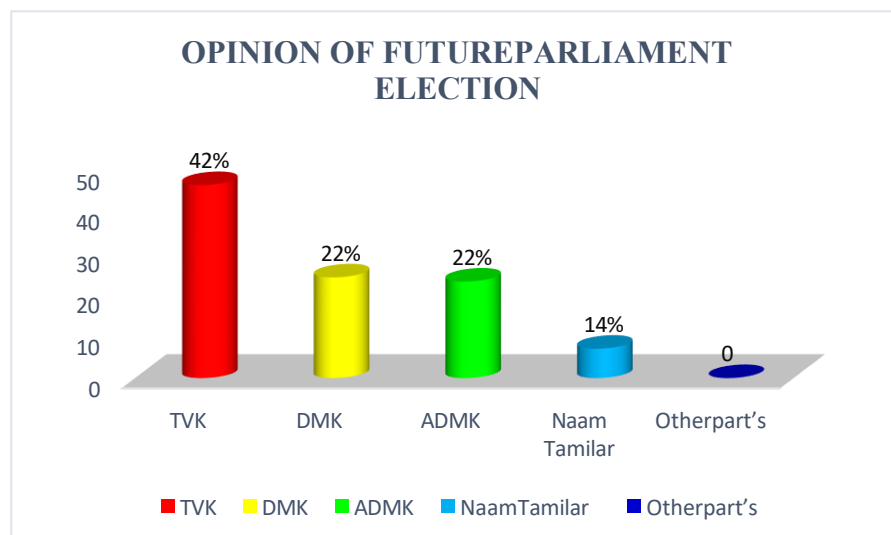
Table: 4
Opinion of future parliament election

S.No	Opinion of future parliament election Parties	No. of Respondents	Percentage
1	TVK	46	42%
2	DMK	24	22%
3	ADMK	23	22%
4	Naam Tamilar	7	14%
5	Other parties	0	0
	Total	110	100

Source: Primary data

This table clear that respondents opinion of future parliament election. Opinion regarding their preferred political parties in a future election. The highest 42% of the respondents support to TVK, it's indicating strong public preference, 22% of the respondents favoured is DMK, it's making significant competitor to TVK, also 22% of the respondents supported by ADMK almost equal to DMK, 14% of the respondents supports to Naam Tamilar, Zero response for other parties among the 110 respondents respectively.

Figure: 4
Opinion of future parliament election



CALCULATE THE CORRELATION CO-EFFICIENT BETWEEN TWO VARIABLES CORRELATION CO-EFFICIENT

The correlation between two factors that is factors affecting voting behavior and awareness of upcoming election.

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

$$r=0.62$$

RESULTS

This indicate a moderate positive correlation, meaning that the awareness of the upcoming election increases, the factors influencing voting behavior (Such as rights, media influence, party identification, and peer influence) also tend to be more prominent.

Explanation of Correlation between Two Variables:"Factors Affecting Voting Behavior" and "Awareness of Upcoming Election"

Correlation measures the strength and direction of the relationship between two variables. In this case, we analyze how factors affecting voting behavior (such as rights awareness, media influence, party identification, and peer influence) are related to awareness of the upcoming election (levels of awareness among respondents).If awareness of the election is high, people are more likely to engage in voting, influenced by media, party affiliation, and peer discussions. If awareness is low, voting behavior might be less affected by external influences, leading to lower voter turnout. A correlation helps us determine whether these two aspects are connected.

FINDINGS

1. 42% of the people highly aware of the upcoming election.
2. 78%of respondents believe civic education should be included in schools.
3. 58%believe voter fraud is a significant election issue.
4. 32%of the respondents believe the honesty in a candidate selection.
5. Majority39%of the people vote because they consider it their rights.
6. Majority42% TVK is the most favored party for the future parliamentary election.

SUGGESTIONS

1. Awareness of upcoming election increases impact of factor influencing(Rights, Media influence, Party identification, and Peer influence)

2. Introduce civic education as a core subject in schools to include practical lessons on voting, democracy, human rights and governance etc.
3. Use biometric verification (finger prints, facial recognition) to reduce impersonation
4. Voters prioritize honesty, experience, and sincerity when selecting the candidates.
5. Many individuals' voting decisions are influenced by family traditions, community beliefs, and peer discussions.
6. Majority of the people don't support of these two parties. (DMK, ADMK)

CONCLUSION

Voting behavior is influenced by various factors, including personal values, political awareness, social influences, and party affiliations. Individuals tend to prioritize aspects such as honesty, experience, sincerity, and policy effectiveness when selecting candidates. Emotional and psychological factors, including party loyalty, media influence, and campaign strategies, also impact decision-making. Civic education plays a crucial role in empowering individuals to make informed voting decisions. An educated electorate is more likely to assess candidates based on integrity, experience, and policies rather than external influences like caste, religion, or propaganda. Voting for the right person ensures effective leadership, good governance, and social development. Therefore, strengthening civic education is essential to fostering a responsible and participatory democracy where citizens make choices that benefit society as a whole.

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EVALUATING THE CONSUMER BUYING BEHAVIOR AND PREFERENCES TOWARDS COLD-PRESSED OIL IN THARUVAIKULAM AREA OF THOOTHUKUDI DISTRICT

N. Michael Ramya* and Dr.B.Mahesh Vanitha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The usage of the cold pressed oil has increased in recent days. Health-conscious consumers are adopting healthy eating practices. As a result, products that contain functional nutrients and are beneficial for health have gained wide acceptance all over the world. Cold-pressed oils do not contain added chemicals and preservatives. It provides health benefits to the consumers such as reduction in cholesterol levels, boosts brain health, and improves skin and hair, and others. The interest in natural and organic food, including oils and fats, has grown in the last few years. The cold-pressed extraction concept was uniquely used to extract oils from oilseeds, and these cold pressed oils have a great significance in cosmetics, medicinal purposes and are also used in cooking. A study was conducted in Tharuvaikulam area of Thoothukudi District to investigate the consumer awareness level, preferences, buying behavior and opinion on cold pressed oils and their willingness to buy.

Key words: Cold-Pressed Oil, Organic food, nutrient-rich oil, high-quality seeds, medium-chain triglycerides, omega-3 fatty acids, edible oil

Introduction

Cold-pressed oil is a pure, nutrient-rich oil extracted through a mechanical process that preserves its natural flavor, aroma, and nutritional value. Unlike refined oils, cold pressing uses controlled pressure without heat or chemicals, ensuring that essential fatty acids, antioxidants, and vitamins remain intact. This method, rooted in traditional techniques like the Kacchi-Ghani process, results in oils that are ideal for low to medium-heat cooking. While they have a shorter shelf life, cold-pressed oils offer superior health benefits, making them a popular choice for those seeking natural, minimally processed foods. Cold pressing focuses on preservation. Cold pressing keeps temperatures low throughout, unlike conventional methods that use high heat and chemicals. This helps the oil keep its natural flavours, colours, and nutrients.

Cold-pressed oil is made through a mechanical process that extracts oil from seeds, nuts, or

fruits without the use of heat or chemicals. After understanding cold-pressed oil meaning, let's understand the key steps involved in making cold-pressed oil:

1. **Selection of Raw Materials:** The process starts with selecting high-quality seeds, nuts, or fruits. Common sources include sunflower seeds, sesame seeds, coconut, mustard seeds, and more.
2. **Cleaning:** The raw materials are thoroughly cleaned to remove any dirt, dust, or impurities that might affect the quality of the oil.
3. **Crushing/Grinding:** The cleaned seeds or fruits are then ground into a paste or broken down into smaller particles. This process is done using mechanical crushers or cold-press machines.
4. **Cold-Pressing:** The paste is placed in a cold-press machine, which uses a hydraulic press to extract the oil. This is done without applying external heat, ensuring that the oil retains its natural nutrients, flavours, and antioxidants. The oil is extracted by applying pressure to the paste, allowing the oil to separate from the solid parts (called “cake” or “meal”).
5. **Filtering:** After extraction, the oil may undergo filtration to remove any remaining solid particles. This step is optional, depending on the desired final product.
6. **Storage:** The cold-pressed oil is stored in dark, airtight containers to preserve its freshness and prevent oxidation.

Popular Types of Cold-Pressed Oils and Their Uses

1. Coconut Oil

Coconut oil is extracted from the flesh of mature coconuts and is known for its rich, tropical aroma. It is solid at room temperature but melts when heated, offering a unique texture and consistency. This oil is rich in medium-chain triglycerides (MCTs), which are known to boost metabolism and provide quick energy. It also contains lauric acid, known for its antibacterial and antifungal properties, making it a popular choice for natural health remedies.

2. Sesame Oil

Sesame oil is derived from sesame seeds and has a rich, nutty flavour. It's a staple in many Asian cuisines and is high in antioxidants and healthy fats, which help fight inflammation and support cardiovascular health. Sesame oil is also rich in sesamol, a natural compound known for its potential anti-ageing benefits.

3. Groundnut Oil (Peanut Oil)

Groundnut oil is extracted from peanuts and is known for its mild flavour and high smoke point. It is rich in polyunsaturated fats and vitamin E, which support skin health and heart function. This oil is commonly used for frying and grilling, providing a light taste without overpowering the dish.

4. Mustard Oil

Mustard oil is extracted from mustard seeds and has a sharp, pungent flavour. It's rich in monounsaturated fats and omega-3 fatty acids and is often used in Indian and Southeast Asian cooking for its bold taste. Mustard oil contains erucic acid, which, when used in moderation, is known to benefit heart health.

To enhance your meals, use cold-pressed oils in smoothies, drizzle over finished dishes, or create homemade salad dressings. Replace butter in baking for a healthier alternative, and use oils like olive or sesame in marinades.

- Cold-pressed oils are packed with vitamins, antioxidants, and essential fatty acids that benefit the skin.
- Cold-pressed oils nourish the hair, providing essential nutrients for growth and shine.
- Cold-pressed oil is made by mechanically pressing the seeds or nuts without using heat, which helps preserve the natural nutrients and flavours. Refined oil, on the other hand, is processed using heat and chemicals, which can strip away nutrients and alter the oil's taste.

Objective of the study

1. To identify the factors that influence consumer buying behavior towards cold-pressed oil.
2. To analyze the level of satisfaction among consumers towards cold-pressed oil.
3. To determine the relationship between consumer buying behavior and satisfaction towards cold-pressed oil.
4. To analyze the role of product quality, price, packaging, and brand reputation in influencing consumer buying behavior towards cold-pressed oil.
5. To determine the effectiveness of marketing strategies used by cold-pressed oil manufacturers and retailers.

Review of Literature

- Arya V., Vikash and Kiran, (2021) conducted a study to understand the factors influencing purchase decision for edible oils, buying and consumption patterns of the

product, the preference of demographic clusters, the frequency of changing edible oil type, the effect of promotional activities on purchasing habits and found out the extent of brand loyalty among consumers.

- . **Dr. Rajni Pandey, (2022)** The author offers data on consumer awareness of edible oil through this study. The researcher looks at customer satisfaction with edible oil as well. According to the study's findings, most participants (70%) were unaware of the advantages of using healthy cooking oil. Thus, there is a pressing need to increase public awareness of the health risks associated with edible oil.

METHODOLOGY

The methodology adopted for the present investigation including selection of the household respondent and objectives of the study together with source of data, sample, selection, period of study, scope and significance of the study and statistical tools used for data analysis. The research work depends, mainly on primary data collected through survey, personal interviews and questionnaire. The use of secondary data to a limited extent is made wherever necessary. Primary data is collected through questionnaire, observation and discussion.

PRIMARY DATA

To collecting primary data, questionnaires have been distributed to the sample respondents to get information regarding the case study.

SECONDARY DATA

The secondary data also collected from various journals, books, newspaper, etc.

SAMPLE SIZE

For the present study from the consumer buying behavior and preferences towards cold-pressed oil at tharuvaikulam area Thoothukudi district. Totally 130 sample respondents selected by using simple random sampling method. The data was collected by personal interview using structured questionnaire.

TOOLS FOR ANALYSIS

Based on the nature of data and relevance of information required, linear – regression and statistical tools like percentage, bar diagram and averages were used for the analysis of data.

PERIOD OF THE STUDY

This study period is November 2024 to February 2025.

ANALYSIS OF DATA

TABLE-1

Awareness of cold - pressed oil

S. No	Awareness of cold pressed oil	No of the Respondents	Percentage
1	Yes	112	86
2	No	18	14
	Total	130	100

Source: Primary data

This table clear that the awareness of cold – pressed oil of the respondents. 86% of the sample respondents they know about it benefits of cold pressed oil and 14% of the sample respondents theydon't know about cold pressed oil respectively.

Figure -1.1

Awareness of cold -pressed oil

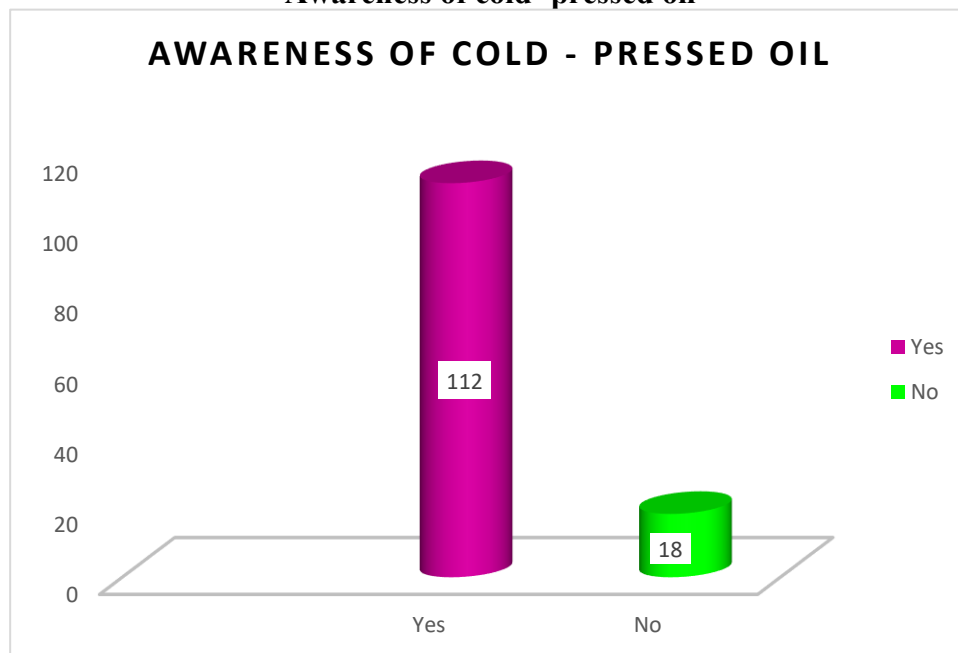


TABLE-2

Sources of Awareness About Cold – pressed oil

S. No	Sources of Awareness About Cold – pressed oil	No of Respondents	Percentage
1	Social media	18	14
2	Friends \ Family	68	52
3	Online Advertising	39	30
4	Medication	5	4
	Total	130	100

Source: Primary data

This table clear that Sources of Awareness About Cold – pressed oil about Cold- pressed oil of the respondents. 14% of the respondents to know the cold pressed oil through the social media, 52% of the respondents to know with the help of friends/family, 30% of the respondents to know the through online advertising, and 4% of the respondents know the

instructions from the medication respectively.

Figure -2.1

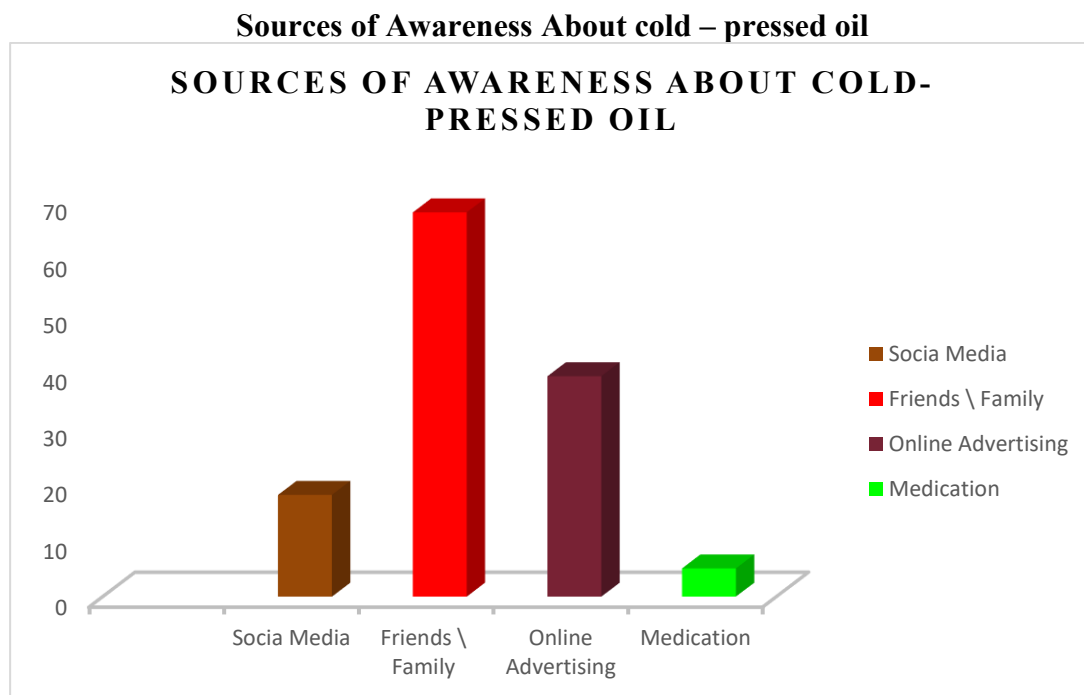


TABLE-3

Purposes of Cold - pressed oil

S. No	Purposes of Cold - pressed oil	No of the Respondents	Percentage
1	Cooking	42	32
2	Health Remedies	21	16
3	Skincare	7	6
4	Haircare	60	46
	Total	130	100

Source: primary data

This table shows that purposes of cold – pressed oil among the respondents. 32% of the respondents for buying the cold pressed oil for the purpose of cooking, 16% of the respondents buying the oil for the purpose of health remedies, 6% of the respondents to buying the oil for skincare and 46% of the respondents are hair care respectively.

Figure -3.1

Purposes of Cold - pressed oil

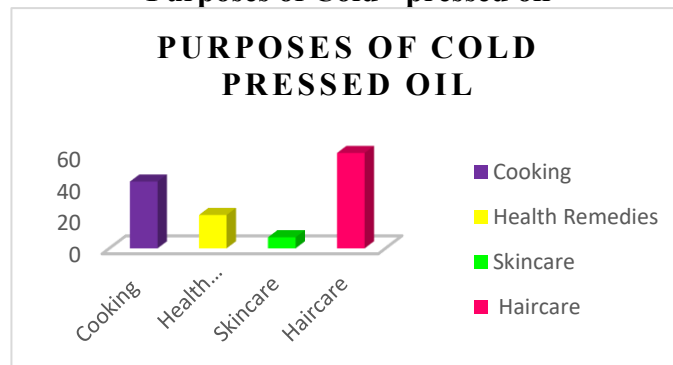


TABLE-4

Mode of Purchase Cold pressed Oil

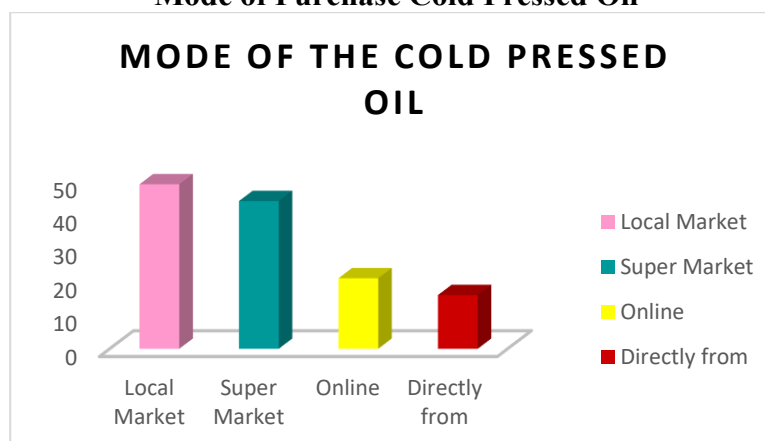
S. No	Purchase Mode	No of the Respondents	Percentage
1	Local Market	49	38
2	Super Market	44	34
3	Online	21	16
4	Directly from	16	12
	Total	130	100

Source: Primary data

According to this table clear that mode of purchase cold pressed oil of the respondents. 38% of the respondents purchase of local market, 34% of the respondents of purchase of super market, 16% of the respondents purchase of online, and 12% of the respondents purchase of directly from respectively.

Figure -4.1

Mode of Purchase Cold Pressed Oil



Linear - Regression:

Linear - regression formula used to analysis the relationship between two variables the quality and price of cold-pressed oil per month.

$$a = \frac{[(\sum y)(\sum x^2) - (\sum x)(\sum xy)]}{[n(\sum x^2) - (\sum x)^2]}$$
$$b = \frac{[n(\sum xy) - (\sum x)(\sum y)]}{[n(\sum x^2) - (\sum x)^2]}$$

Result:

$$Y = a + bx$$

$$Y = 2.51 + 0.94x$$

Linear - regression is a model that estimates. The linear - regression relationship between price & quality. It there is only one independent variable, or multiple linear regression if there are multiple factors affecting the price. In real life, price might depend on quality, brand & demand.

Findings:

- 86% of the respondents are aware of cold – pressed oil.
- Maximum of the respondents are belonging to the category of friends/family.
- The majority 64% of the respondents are hair care.
- 38% of the respondents of purchase cold – pressed oil in local market.

Suggestions:

- Expand availability in supermarkets, organic stores, and online platforms.
- Highlight pressing dates on labels and use clear packaging.
- Some consumers prefer oils used in traditional cooking. Promote cold-pressed oil as a return to heritage cooking practices.
- Consumers trust recommendations from friends and family. And encourage customer testimonials and referral programs.

Conclusion:

The growing consumer preference for cold-pressed oil is primarily driven by health consciousness and the demand for natural, chemical-free products. Consumers increasingly recognize the nutritional benefits of cold-pressed oils, such as their high antioxidant and vitamin content, making them a popular choice among health-conscious individuals. However, many buyers still lack awareness of the differences between refined and cold-pressed oils, highlighting the need for educational marketing campaigns. Price sensitivity also plays a significant role, as these oils are often perceived as premium products, leading to the need for affordable packaging options

and promotional discounts to attract a wider audience.

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CRITICAL EVALUATION OF SOCIO-ECONOMIC CONDITIONS AND LIVELIHOOD CHALLENGES AMONG DOMESTIC SMALL SCALE BUSINESS WORKERS AT VEPPALODAI AREA OF THOOTHUKUDI DISTRICT

U. Aathi Lakshmi* and Dr. A. Sudha

PG Department of Economics, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

This study investigates the socio-economic conditions of domestic small-scale business workers in Veppalodai area of Thoothukudi District. A mixed-methods approach was employed, combining survey responses from 110 domestic small-scale business workers with in-depth interviews. The findings reveal that these workers face significant challenges, including low incomes, limited access to credit and markets, and inadequate social security benefits. The study also highlights the importance of social networks and community support in helping these workers cope with their socio-economic vulnerabilities. The results have implications for policymakers, practitioners, and researchers seeking to improve the livelihoods of domestic small-scale business workers.

Keywords

Domestic small-scale business, homemade food and snacks, social networks, community support.

INTRODUCTION

Domestic small-scale home businesses play a vital role in local and national economies by creating employment, generating income, and promoting self-reliance. They offer flexible work opportunities, especially for women, retirees, and individuals seeking financial independence. Domestic small-scale home businesses contribute significantly to household income and local economies. These businesses, often operated with limited resources, face various socio-economic challenges and opportunities. This project aims to analyze their financial conditions, market access, government support, and overall sustainability. In rural area, the socio-economic conditions of small business workers are often characterized by low income levels, limited access to education and healthcare, unstable employment, dependence on seasonal work, and a lack of formal benefits like social security, often leading to a

precarious financial situation; however, these workers also play a crucial role in the local economy by providing essential goods and services within their communities, especially in areas with limited access to larger markets.

Different types of domestic businesses are done by our sample area:

1. Homemade food and snacks delivery
2. Flower Garments
3. Stitching Clothes
4. Jewellery making
5. Making palm Jaggery
6. Cooking things services
7. Rice flour business
8. Basket Weaving

Homemade snacks

Starting a homemade savory snacks business in a rural area can be a great opportunity, especially if you focus on traditional flavors, affordable pricing, and local ingredients. Here's a step-by-step guide to help you get started:

Identify Your Products

Choose savory snacks that are popular in your region, easy to make, and have a longer shelf life. Some items are included:

- Savory items like Seedai, Murukku, Banana Chips, Tapioca Chips, Mixtures, Spiced Peanuts, Chana, Papads, Samosas.
- Sweet items like Boonthi, Sweet Paniyaram, Aadirasam, Susiyam, Ellu sweets Appam, Glop jamun,

Preparing for homemade snacks



Preparation of homemade Food

Here some sample respondents are doing homemade food. Basically the sample respondents are agriculture labors. Majority the of the domestic workers use fresh and locally available vegetables for making preparation of food. This helps reduce costs and supports the local economy. Like dosa, pongal, vada, puri Tamarind rice, meals, and non-vegetarian dishes, homemade Savory's and sweets items



Flower Garments

Selling flowers in a domestic small business" means running a small, locally based business within a home country, where the primary product sold is flowers, often including arranging and designing bouquets for various occasions like birthdays, weddings, or simply as gifts, typically catering to customers within the local community.



Stitching Clothes

If you don't already have sewing skills, consider taking a short tailoring course available in the rural area. Majority of the rural area the government provide some employment schemes for rural area people. So that the people make a business to easy way.

Stitching clothes can be a great way to earn income, both man and women actively do their job. With minimal investment and some basic sewing skills, a home-based tailoring business can cater to local needs. Major the works could be completed by the sample respondents. The respondents showing different types of stitching, embroidery, and modern designs and etc. Majority of the rural women people depending on the stitching clothes. In this various domestic small scale business the stitching clothes respondents get more income other than domestic workers.



Jewellery making

Our government provides the necessary facilities for the rural people for arranging Jewellery making. "Patron scheme" was created by the government with the aim utilizing the contribution of the community for continues maintenance and undertaking new development work for the rural people. As it is requires minimal investment and can be also done from home. Under the scheme a persons who contribute Rs.1000 they can join for the scheme. It can be a great business for rural people. After the joining of this scheme people they can started their business. In this business rural people are making handmade jewellery like this Earrings, Necklaces, bracelets, Rings, and anklets made from various materials like beads, wires, and metals. Customized jewelry pieces made according to customer specifications.



Making palm Jaggery

Palm jaggery also known as gur, is made by boiling the sap of palm trees until it thickens into a syrup. Palm jaggery is a natural sweetener made from the sap of the palm tree. Palm tree step by Tapping the palms, Filtering the sap, Boiling the sap, Stirring the sap, Removing foam, Checking the consistency, Pouring into molds.



Palm jaggery is a traditional sweetener made from the sap of palm trees, such as date palms or toddy palms. It is a healthier alternative to refined sugar and has a high market demand. Most of the people coming from various places to get it from the rural domestic business workers. The palm jaggery one of the healthier product of the rural business. Palm jaggery not only for sale in domestic country it's also export in the international level. Majority of the dieticians recommend for the palm jaggery instead of sugar.

Providing Cooking vessels services for functions

Most of the cooking in rural India is done using biomass. Rural home business that provides cooking vessels for functions is a great idea for the home domestic workers. Majority of the rural people need for large cooking vessels for their weddings, home festivals, community events. These types of domestic workers offering rental service for the cooking vessels. Decide rental rates based on vessel size, usage duration, and additional services like transport or cleaning. They offering Complete Cooking Setup like burners, gas cylinders, and serving utensils and also provide transport for the vessels to and from the event location. In this type of domestic workers earn more income from this service. Offer discounts for bulk orders or frequent customers.



Rice flour business

Rice flour grinding business in a rural area can be profitable, especially if there is high demand for rice flour in the people community. In this modern world both parents are working conditions they don't have a time to do work in their kitchen. So they can choose easy way for rice flour grinding. Majority of the rural people are low income people they couldn't invest. So they prefer the job for rice flour business. They decide whether to sell directly to customers and supply to the shop. So they can get income their job.



Aari work

“Aari work” refers to a type of intricate hand embroidery technique originating from the Mughal era in India, where a specialized hooked needle called an “Aari” is used to stitch delicate designs onto fabric, often incorporating elements like zari (metallic thread), beads, and sequins, creating fine and detailed patterns typically seen on sarees and other traditional garments.



Aari embroidery is done by tightening the cloth to be embroidered upon the khatia (cot) or adda frame and then doing the thread work on portions on the stretched cloth with an aari or crochet-hook like instrument.

Limitations of the study

- Many small-scale home businesses operate informally and are not officially registered, making it difficult to identify and reach participants.

- Self-reported data on income, working conditions, and business performance may be over- or under-exaggerated due to personal biases.
- Due to resource constraints, the sample size may be too small to generalize findings to all home business workers.
- Regional and cultural differences may affect business practices, limiting global applicability

Scope of the study

The scope of a study on small-scale home businesses in Thoothukudi, Tamil Nadu, could encompass the establishment, growth, challenges, and potential of these businesses, focusing on their contributions to the local economy and community, examining factors like financial access, marketing strategies, and community support.

Significance of the study

- Helps policy makers create better support system
- Guides NGOs and financial institutions in funding small business
- Provides insights for entrepreneurs to improve their businesses

Objectives of the study

- To find out the socio economic conditions of small scale home domestic workers
- To analyze the income and employment conditions of domestic small-scale business workers
- To know the types of domestic business in the sample area among the sample respondents

REVIEW OF LITERATURE

Research by Meagher (2019) suggests that integrating home-based workers into national labor laws is crucial for ensuring fair wages and working conditions.

Malik and Wahid (2023) found that lack of digital literacy, high internet costs, and infrastructure limitations prevent many home business workers from fully benefiting from digital transformation.

METHODOLOGY

The methodology for researching democratic small-scale home business workers involves a combination of qualitative and quantitative approaches to ensure a comprehensive understanding of their socio-economic conditions, challenges, and opportunities.

Sample Size

The study included a sample size of 110 respondents from the study area

Sample Technique

A Simple random sampling was used in this study.

Data Collection Methods

Both primary data collection and secondary data collection methods were utilized

Primary Data

Structured and semi-structured questionnaires will be used to collect data from small-scale home business workers. Questions will focus on income levels, working hours, decision-making structures, access to financial resources, and social security benefits.

Secondary data

Secondary data also collected from newspaper, journals, reports from organizations, local NGOs, and website etc..

Table: 1

Types of home business of the respondents

S. No	Types of home business	No. of the respondents	Percentage
1	Flower Garments	15	14%
2	Homemade Snacks	25	20%
3	Stitching Clothes	13	12%
4	Jewellery Making	13	12%
5	Flour Sales	28	25%
6	Aari Work	10	12%
7	Preparation of Blackberry	2	6%
8	Basket Weaving	2	2%
9	Cooking Things Services	2	2%
	Total	110	100%

Source: Primary data

This table shows that work of the respondents. 14% of the respondents are flower garments, 20% of the samples respondents are homemade snacks workers, 28% of the sample

respondents are stitching clothes, 12% of the sample respondents are jewellery making, 4% of the sample respondents are flour sales, 12% of the sample respondents are aari work, 6% of the sample respondents are preparation of blackberry, 2% of the sample respondents are basket weaving, 2% of the sample respondents are cooking thing services respectively.

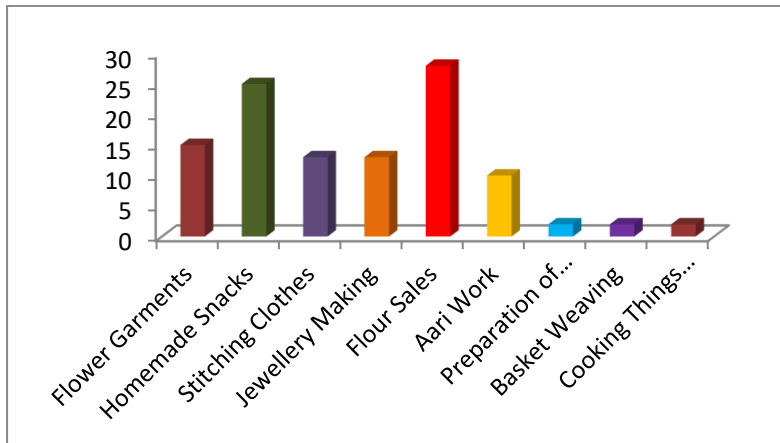


Table: 2

Monthly Savings of the respondents

S. No	Monthly Savings	No. of the respondents	Percentage
1	1000-3000	25	22%
2	3000-5000	40	36%
3	5000-7000	37	34%
4	7000-9000	6	5%
5	More then 10000	2	2%
	Total	110	100%

Source: Primary data

The table presents data on the monthly savings of the respondents. 22% of the respondents save between 1000-3000 per month, 36% of the respondents save between 3000-5000, 34% of the respondents save between 5000-7000 per month, 5% of te respondents save between 7000-9000 at least 25% of the respondents save more than 1000 per month respectively.

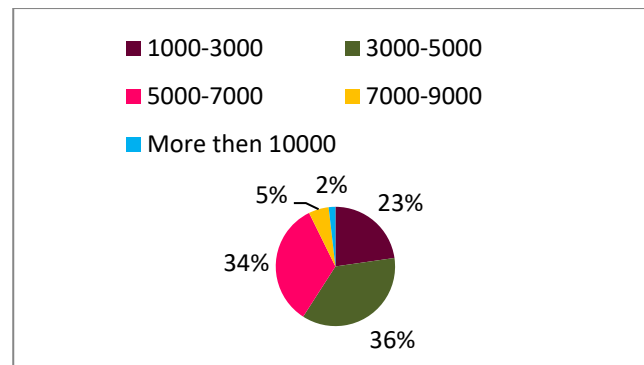


Table: 3

Household Expenditure

S.No	Household Expenditure	No. of the respondent	Percentage
1	3000 – 6000	70	64%
2	6000 – 9000	33	30%
3	9000 & above	7	6%
	Total	110	100%

Source: Primary data

The table in the image presents household expenditure data based on primary sources. It categorizes respondents' household expenditures into three ranges 64% of the respondents their monthly expenditure is ₹3000–6000, 30% of the respondents their expenditure category ₹6000–9000, finally 6% of the respondents their expenditure amount is above ₹9000 respectively.

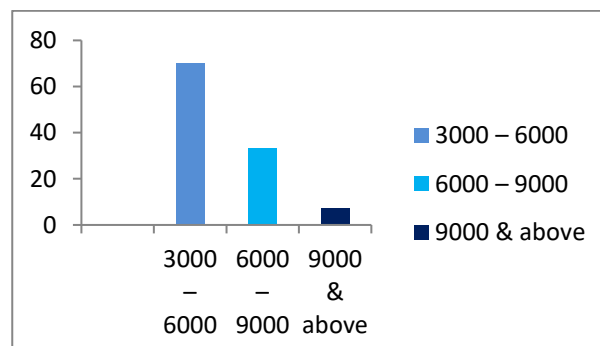


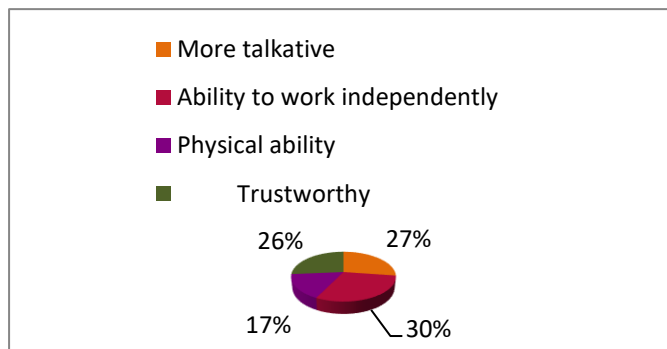
Table: 4

Most important skills of domestic workers

S. No	Important skills	No. of the respondents	Percentage
1	More talkative	30	26%
2	Ability to work independently	33	30%
3	Physical ability	18	16%
4	Trustworthy	29	28%
	Total	110	100%

Source: Primary data

The table presents data on the most important skills as perceived by the 110 respondents. (30%) 33 respondents consider the ability to work independently as the most important skill. (28%) 30 respondents value trustworthiness highly.(26%) 29 respondents think being more talkative is essential. (16%) 18 respondents believe physical ability is the most critical skill.



HYPOTHESES

RELATIONSHIP BETWEEN MONTHLY INCOME AND EXPENDITURE OF THE SAMPLE RESPONDENTS

Co- efficient Correlation:

The Pearson correlation coefficient between Monthly Savings and Household Expenditure is -0.82 (approximately).

$$r = \frac{n(\sum xy) - (\sum x)(\sum y)}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

$$r = -0.82$$

Interpretation:

This indicates a strong negative correlation, meaning that as household expenditure increases, monthly savings tend to decrease. When to variable like income and expenditure move in opposite direction. Therefore the above hypothesis proved.

Hypothesis:

Domestic scale business workers often face challenging socioeconomic conditions such as

- Earnings are generally low and irregular
- Most of the workers operate with minimal profit margins.
- No fixed salary (Income depends on orders and market demand)
- Lack of proper workspace or infrastructure
- Long working hours.
- Limited access modern technology or tools
- Many workers have limited formal education
- Lack of awareness about online platforms
- Lack of support in legal registration, branding or export

FINDINGS

1. Flour grinding is the (25%) maximum occupation among respondents.
2. The majority (36%) of the respondents saving amount is Rs. 3000-5000
3. The Highest proportion of the respondents (64%) their monthly expenditure category is Rs. 3000-6000.
4. 30% of the respondents their skill is ability to work independently

SUGGESTION

1. Offering microloans or grants to expand small business to improve economic stability.
2. Encourage skill development side businesses and financial planning to improve savings potential.
3. Compare monthly income and expenditure for each respondents to determine if there is any surplus for savings
4. Promoting skill development, job training, and entrepreneurship can help increase household income and improve financial stability.

CONCLUSION

Domestic small-scale home business workers often operate in informal or semi-formal sectors, facing both opportunities and challenges. Their socio-economic conditions are shaped by factors such as income stability, market access, education, gender roles, and government support.

Small-scale home businesses are essential for economic development, providing self-employment opportunities to marginalized communities. However, these workers face significant socio-economic challenges, including financial instability, lack of market access, and inadequate policy support. Strengthening financial aid, digital skills training, and social security programs can enhance their sustainability and economic contribution.

Many home-based workers earn minimal and fluctuating incomes, making financial stability difficult. Due to a lack of formal recognition, many struggle to obtain loans or business funding. Especially for women, balancing household responsibilities with business operations is a common issue.

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Miriam Toews' *All My Puny Sorrows*: A Study of the Catastrophic Losses of Sisters in the Tradition of Sister-texts

Pearlin Amirtha Gnanam C.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Miriam Toews' novel *All My Puny Sorrows* is a poignant exploration of the complexities of family relationships, grief, and the search for identity. The story revolves around the lives of two sisters, Elfrieda and Yolandi, who grow up in a tight-knit Mennonite community in Canada. As the narrative unfolds, the sisters' bond is tested by the harsh realities of life, including mental illness, trauma, and loss. The novel delves into the theme of losing a sister and a home, as Yolandi grapples with the aftermath of Elfrieda's attempted suicide and subsequent hospitalization. The physical and emotional distance between the sisters serves as a metaphor for the disintegration of their childhood home and the community that once nurtured them. Toews masterfully captures the anguish and disorientation that accompany the loss of a loved one and the fragmentation of one's sense of belonging. Ultimately, *All My Puny Sorrows* is a powerful exploration of the human condition, one that underscores the resilience of the human spirit in the face of adversity.

Keywords: Sisterhood, loss and grief, connections, relationship, community.

The relationship between sisters forms the core of Miriam Toews's writing. According to her, the "theme of sisters" includes "something that is very close to her," "of missing sisters," "of needing sisters," "the special love that sisters share or the antagonism sisters share," and more. Toews's first-person narrators, Naomi Nickel (Nomi), Hattie Troutman, and Yolandi Von Riesen (Yoli), deal with the death of their elder sisters, Natasha (Tash), Min, and Elfrieda (Elf), in "*All My Puny Sorrows*." Losses

of real and imagined homes in the past, the present, and the future are tightly linked to these more catastrophic losses of sisters. The younger sister romanticises the older sister's escape from the persecution of the birth community, which is expressly identified as the Mennonite settlement of East Village, Manitoba, in *A Complicated Kindness* and *All My Puny Sorrows*. In the eyes of the younger sister, the older sister takes compassion and love into a new and less rigid home-space,

shedding the burden but carrying the light.

Toews not only references these writers in *All My Puny Sorrows*, but also casts them as supporting characters in Yoli and Elf’s romance. In a letter to Elf, for example, Yoli closes by quoting from a letter sent from Jane Austen to Cassandra; she compares Emily Dickinson’s “hour of lead” (62) to Elf’s depression; she recalls letters from Elf referring to Virginia Woolf and the “intricacy of despair” (26); and she labels the life insurance left to her by Elf as “a la Virginia Woolf” in its provision of a “room of my own” (271).

Toews, through Elf and the title of the novel, directs Yoli and the readers to another nineteenth-century writer, Samuel Taylor Coleridge and specifically to his 1794 poem, “To a Friend, together with an Unfinished Poem,” which introduces the brother- sister relationship:

In fancy (well I know)
From business wand’ring far and local cares,
Thou creepiest round a dear-lov’d Sister’s bed
With noiseless step, and watchest the faint look,
Soothing each pang with fond solicitude,
And tenderest tones medicinal of
love. I too a SISTER had, an only
Sister--
She lov'd me dearly, and I doted on her!
To her I pour'd forth all my puny sorrows... (6-14)

Coleridge and Toews, who are both interested in the origins of suffering, healing, and sorrow, challenge notions about a one-way interaction between the suffering patient and the caring nurse who provides care. Elf alludes to Edvard Munch’s *The Sick Child* (160). Yoli and Elf, Toews’ twenty-first-century Canadian fictional sisters in *All My Puny Sorrows*, coexist with these carefully chosen references to literary and artistic nineteenth-century figures, both male and female, and their sisters.

In Canadian literature, the most well-known nineteenth-century sisters are Catharine Parr Traill, who is joyful and practical, and Susanna Moodie, who is critical and complains. Literary responses to Traill and Moodie, based on their own literary exchanges and talks, portray the two as competitive and complimentary, repositories for and extensions of one another, opposites and doubles. Toews does not

mention Traill and Moodie in *All My Puny Sorrows*, but the familiar tradition of sisters competing with and completing each other, being “almost the same person” (137) and “enemies who loved each other,” (38) is common in sister-texts, including Toews’ trilogy.

Christina Downing argues in “Psyche’s Sisters: Real-Imagining the Meaning of Sisterhood” that likeness and difference, intimacy and otherness “cannot be overcome,”

(11) but form that paradox, that tension, which lies at the very heart of the sister relationship.

All My Puny Sorrows, a middle-aged story about sisters in their forties, explores the difficulty of saving and refusing salvation. It delves into grief in the face of loss and laments the loss of beauty, as reflected by the older sister and the comfortable home, neither of which can be sustained--not even by the intense sisterhood so powerfully conveyed by Miriam Toews. This link was written in response to her personal grief over her sister Marjorie’s suicide in 2010, who she describes as her closest reader and critic. It is not just about the “other” sister’s influence on the writing sister or the literary output. Toews’ most recent novel revolves with sisters and sisterhood. Yoli’s feeling that, “My sister was so thin I imagined that I could see the outline of her heart” (160). It is a sensation shared by the reader, who sees not only Elf’s heart, but also the heart of the author, moving the reader into a position of witness or even “sisterhood.”

Toews’ writing in the early twenty-first century delves deeply into the core theme of the self in relation to the other, as manifested in sister-love and sister-loss. Tash’s departure from the original household, which includes separating from her younger sister, and Min’s desperate cry to bring Hattie home represent the struggle between the need for sisters to be both separate and together. The complexities of this conflict help readers prepare for the heartbreaking losses in *All My Puny Sorrows*, as the tension between separation and unity becomes excruciating. Yoli, haunted by Elf’s suicide attempts, gradual fading away, violent death, and eventual absence, must confront profound concerns about separation and connection on personal, communal, and grand proportions.

Fragments in *All My Puny Sorrows* include Yoli’s early comment that her grandparents came from “a tiny Mennonite village in Siberia” (18) where “terrible things happened to them there in the land of blood” (18) and her friend Julie’s

shrugging and disturbingly casual explanation that it was only her grandmother who was massacred in Russia: “She couldn't run because she was nine months pregnant. My grandfather made it with the other kids” (103). The parents’ generation is silent- in Yoli’s words “any hint of the place, the slightest mention of anything Russian, and my parents would start clawing the air” (18) while Yoli wonders about her mother’s comment that suffering “is something that is passed from one generation to the next to

the next, like flexibility or grace or dyslexia” (18). Although *All My Puny Sorrows* accepts the “contagion theory” of trauma and questions the impact of the past on the present, it does not rely solely on rewriting through looking back in order to move forward, but rather moves inward when the home in so many forms, including that of the sister, is torn away. (47)

In *All My Puny Sorrows* the anguish of sister-love and sister-loss - home-love and home-loss contributes to the rewriting and reshaping of what is perceived as the familiar Canadian Mennonite family and story, breaking open the vertical family tree, linear timeline, excluded margin, and retraced diaspora. Through the intimacy of reparative nostalgia and the engagement of the heart, these restrictive lines expand and break open, forging new horizontal connections that provide consolation through the activation of the imagination and the inclusion of dream and vision.

In the case of *All My Puny Sorrows*, the “presence of absence” is expressed by the narrator and author and is located in the loss of the sister, both fictional and real. The cultural mourning is twofold: first, for the idealised childhood home and the past shared with the older sister; and second, for the promise and security of the new home, also idealised, as established for the next generation through the example of that older sister. The object of mourning is concrete and personal, resting in the actual sister rather than in the vaguer and more elusive ethnic and cultural collective of the homeland and the past.

Like the emigre writers of the 1920s and 1930s, Yoli focuses on her own youth and hometown, imbuing it with Edenic aspects. She tells Elf that the mourning doves in Toronto “make me sad and happy and nostalgic I guess for my childhood, our childhood, and the prairies and that feeling of waking up with nothing to do but play,”

(119), and she remembers childhood as “the magical kingdom that was my world”

(188).

Such nostalgia corresponds to what Rubenstein characterises as the “deeper register,” which involves ‘grief for something of great worth that appears hopelessly lost - even if it never truly was, or never could have existed, in the manner in which it is ‘remembered.’ Rubenstein’s version acknowledges “compensatory and even liberating dimensions within the frame of the narrative.” (5,6). In Yoli’s case, nostalgia for the idealised home emerges from the literal disappearance of home, the intensity of which results in “the presence of absence.”

In *All my Puny Sorrows* the ensuing camping trip “in the Badlands of South Dakota” (3) undertaken by the family to kill time between houses is, according to Elf, like being in a ‘mental hospital” (3) or a “refugee camp” (3) or a “halfway house for recovering neurotics” (3). Eventually Elf, through the gift of her exquisite musical talent, establishes a beautiful home in Winnipeg with her partner, Nic - a home described by Yoli as one filled with music, literature, culture, ideas, and light. From the centre of that home, Elf’s life as a musician extends into Europe and around the globe. Yoli paints an impossibly perfect picture which makes beautiful sense to home as the idealised version. Like, the glass piano within Elf’s body that is always on the brink of shattering, the exquisite perfection of Elf and her home, although not literal or believable, is true.

It is helpful to keep in mind this concept of “playing with size” when approaching *All My Puny Sorrows*, a novel in which the ideal sister and home are obviously larger than life and partake of that inflated quality of the “beloved” that keeps them forever beyond reach.

Elf’s loss, as experienced by Yoli, represents the loss of a version or vision of a perfect and protective home that never existed or could exist. Yoli finally discovers, via the prism of nostalgia and the presence of absence, that home does not stand still and is never entirely secure - it is always in motion and change.

Yoli mourns the loss of Elf, as well as the shared memories and narratives of her childhood home, family, and neighbourhood. Downing (167) stresses the intimate ties between “sisterhood and storytelling,” while Jennifer Silverstone adds that “siblings can hold the family narrative for each other and become the containers for each other of the history of their childhood” (235).

Yoli portrays Elf and her home as ideals of beauty, whilst her companion Julie and her home are depicted as chaotic. Yoli’s lifestyle is similar to Julie’s,

although she draws from both the extremes. Similarly, she identifies closely with her cousin, Leni, but sees Leni's melancholy and suicide as connected with Elf. In the framework of the insular Mennonite migration and settlement process, she humorously portrays Julie as a friend and second cousin, and Elf as a cousin and sister (51). When she first discovers Elf's relationships with "fictional sisters" in literature, she is jealous but quickly feels relief in the realisation that her own "grief could be diluted a bit, spread out amongst all of us women, us sisters, even though only one of us was real" (268). Thus, the community of sisters expands into a larger, more open, and fluid formation while the concept of home simultaneously becomes less rigid.

In her sadness and fear prior to Elf's suicide, Yoli humorously but desperately fantasizes about reuniting past families and homes, claiming she wants "to live in a tiny, isolated community in a remote part of the world where all we have to look at is each other and we are only ever a few metres apart." "It would be like an old Mennonite community in Siberia, but happier" (113). The construction of a home and a community

based on the representation of what was left behind in Russia is an intentionally exaggerated example of retelling the break event. Yoli and Toews' rewrite respects a sense of homelessness and the importance of the break event while experimenting with new shapes, tones, and directions.

If music saved Elf "for as long as she was alive," words would save Yoli, who writes to order her grief, reminding Elf in a letter written after her death that the Von Riesens were previously accused of being "only word people" - "a word family" (6). "The presence of absence" in the shape of sister and home forces Yoli to use and remember what Elf has left to her in the form of words. The most significant words for Yoli during the early period of mourning are those of the opening paragraph of *Lady Chatterley's Lover* to which Elf has directed her:

Ours is essentially a tragic age, so we refuse to take it tragically.

The cataclysm has happened, we are among the ruins, we start to build up new little habitats, to have new little hopes. It is rather hard work: there is now no smooth road into the future: but we go round, or scramble over the obstacles. We've got to live, no matter how many skies have fallen. (317 - 318)

Elf extends Yoli outward to non-Mennonite stories with lowering skies akin

to her own, using allusions ranging from Coleridge to Woolf to D. H. Lawrence. Through Elf's encouragement, Yoli is "building up new little habitats" in Toronto "among the ruins" of her past, knowing that her story is one of the many global narratives of loss and regeneration. Having lived fully in relationship with the other in the shape of the sister, Yoli uses this experience more broadly, resulting in a flexibility that accepts fewer fixed forms of family, community, and narrative - which opens things up because it needs to journey inside to the heart.

These softer and more cautious chiaroscuro letters balance off the boldness of images and letters on surfaces throughout the novel, such as Yoli's tattoo on her skin, the pictographs on the cliff at Lake Superior, and the red spray-painted AMPS around East Village. Yoli recalls the quotation on Elf's wall: "Something about the horizon of being" (34).

All My Puny Sorrows ends softly, with a dream, vision, or alternative ending to the "real" story, affirming the novel's fairy-tale qualities and addressing a question raised during the 1990 conference, which Kroetsch reiterated in the closing panel: "What gets excluded by the employment of a particular master narrative?" (225). Toews is able to reveal rather than conceal by focusing on the intimate and specific, as she talks for herself rather than others. She reveals the identifiable heart and the painful "land of blood" (18) of the sister, herself, and the present rather than the group or the history. The focus shifts from the prevailing master story and reactions to it to the intimacy of the heart.

When considering Mexico as a site for Elf to die, Yoli envisions "a hammock swaying gently like a cradle, a return to infancy, to the void, and then to nothing" (258). Wordsworth's poetry appears near the end of *All My Puny Sorrows*, although not in the form of a "ode." Lottie quotes: "It is a beautiful evening," which "rips at Yoli's heart" with its depiction of Elf worship at the "inner shrine" (282). In Toronto, Yoli is known as "Lottie's daughter," but in her dream, she is able to identify herself as Elf's sister when she answers the photographer's query about whether Yoli and Elf are in Zurich on a holiday with the heart-wrenching non-sequitur. "We told him we were sisters." The evocative image of the Von Reisen sisters walking "arm in arm like old-fashioned girls" recalls earlier literary sisters. (320 - 321) Elf is not simply the sister mourned, but through death and dying is also the comforter and companion.

Toews is not reinventing the break event or the prevailing centre and margin,

but rather creating states of flexible newness in which anything is possible. In terms of “the home ground of the Mennonite community,” Toews, as Ann Hostetler observes of Di Brandt, demonstrates that it “will always be one of the worlds in which the writer developed, one of the worlds she seeks to connect in a larger view of ‘home’ as the transitional and integrative space between multiple worlds” (85).

For Yoli and Toews, the fixer-upper in Toronto represents a state of grace in its comfort as a site of grieving accomplished through reparative nostalgia. The Toronto home confirms the severity of sister - loss and home - loss with its painful yet liberating reminder of the presence of absence. The void takes on substance within the house and heart, as consolation works from the inside out, rather than from the present to the past or from the edge to the centre. Yoli and Toews break through typical and common depictions of narrative, family, home, and community in order to develop softer and more visionary connections and relationships free of the constraints imposed by lines and shapes that emphasise loss through contrasts.

All My Puny Sorrows has a deep and widespread resonance because it reveals rather than conceals and, as a result, publicly mourns sister-loss and home-loss, seeking consolation and presence in the literary imagination, vision, and dream.

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Adolescent Turmoil and Psychological Resilience: A Reading of Preeti Shenoy's *It Happens for a Reason*

Priya Dharshini M.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Preeti Shenoy's novel *It Happens for a Reason* presents a poignant exploration of adolescent turmoil and psychological trauma. The protagonist's journey is marked by self-discovery, relationships, and the struggle to cope with past traumas. As she navigates the challenges of growing up, the novel sheds light on the interconnectedness of trauma, identity, and mental health. The novel masterfully weaves together themes of adolescent turmoil, psychological trauma, and resilience, creating a narrative that is both thought-provoking and emotionally resonant. Through its portrayal of the protagonist's struggles and triumphs, the novel provides a nuanced exploration of the human experience. The novel's examination of adolescent turmoil and psychological trauma raises important questions about the impact of traumatic experiences on mental health, relationships, and identity formation. The proposed research paper explores these complex issues and projects the challenges of growing up in such constrained environment in the light of the Freudian Psychoanalytic theory.

Keywords: Adolescent turmoil, Psychological trauma, Resilience, Formation, Mental health.

Psychoanalytic theory is the theory of personality organisation and the dynamics of personality development that guides psychoanalysis, a clinical method for treating psychopathology. The relation between psychology and physiology is very close, so much so that the recent advances in psychology may be ultimately traced to physiology. The first great triumph of physiological psychology is the application of the principle of reflex action to all activity, including that which is voluntary. Mental states do not exist by themselves. They have no stability and permanence which pertains to the objects of physiological investigations.

In the *Interpretation of Dreams*, Freud formulates the theory of bi-cameral mind, that is the unconscious mind and the conscious mind as follows:

“The duality of human mind is based on the pleasure principle and

the reality Principle. A man seeks pleasure from his activities. In human life, there is a conflict between his pleasures, personal desires and social sanctions. He asserts that dreams can be analysed, decomposed and deciphered, in the same way literary works can also be analysed” (598).

The human mind operates on the pleasure and reality principles, creating a conflict between personal desires and social norms and both dreams and literary works can be analysed in a similar way. The modern theory of psychoanalysis used in literature has two accepted meanings. Firstly, it means a method of treating mentally disordered people. Secondly, it also goes to mean the theories on human mind and its various complexities. Many untold psychological issues are faced by youngsters, such as trauma, depression and repression.

Sigmund Freud in his Psychoanalytical theory explains three modes of thought process – ‘id’, ‘ego’, and ‘superego’. Id acts fully under the control of unconscious mind; ego acts under the control of conscious mind; and superego is under the control of conscience. Id is pleasure-oriented and hence it never bothers about the comments of the external world and cultural heritage of persons. Whereas, superego concerns about morality, culture, heritage, laws, and ethics of the state. The ego is conscious mind which compromises both id and superego and directs to take a socially acceptable act. The interference of the id, the ego and the superego in decision-making is inevitable and it occurs invariably in all walks of life irrespective of time and context.

This research paper purports to analyse the psychological thought process of Freud applied to the characters in Preeti Shenoy’s *It Happens for a Reason*. The protagonist Vipasha is highly driven by the id mode. She falls in love with Ankush in her teen age. Their love is merely pleasure oriented. They had no idea about their future when they were in love. Their relationship ended up in pregnancy. Vee excelled in her modelling career. She had been praised for her voluptuous beauty. Ankush and Vee’s parents were not ready to face the society with the baby. They left her alone to face the hardships that are ought to be faced in this social world. Without any expectation, Vee had stood firm in her decision to have her baby. This shows her unconscious decision that makes her suffer the consequences of the same.

In *It Happens for a Reason*, superego mode is highly active in the mind of Vee’s mother. Vee’s mother shows a distant affection towards Vee. During the time

of modelling, Vee's mother expressed her pride with regard to her daughter. But, when she is out with the report of pregnancy, her mother automatically isolates her to serve her dignity. Even, Vee's father tries hard to help his daughter face the world with a courageous heart but her mother is totally away from these efforts. It is due to her concern about morality, culture and ethics.

Vee as a mother, she sticks to some moral values in her parenting. She avoids other proposals of marriage for the welfare of her son, Aryan. Her motherhood reflects the other mode of thought process in her. Her stern decision is to live for her child and take him to a better position. Though she has experienced a flutter of excitement when she discovered her pregnancy, she had felt heart-wrenched when her son made efforts to search his father. The act of ego, the role of conscious mind easily manages the other two thoughts. The way Vee handles her son as a 'new woman' and a 'single mother' is portrayed in a peculiar way.

The adolescent period is a notable part of every human being. The word adolescence comes from the Latin verb 'adolescere' which means 'to grow'. This period represents the intensive growth and changes in child's physical, mental, social and emotional life. It is a crucial period in one's life. The growth achieved, the experiences gained, responsibilities upheld and the relationships developed at this stage destine the complete future of an individual: Maturity acquired in these years plays the role of an adult in the society or culture. Maturity does not mean mere physical maturity, it also implies mental, emotional and social maturity. An adolescent's growth and developmental pattern along with some peculiar characteristics of this age results in many changes in their life.

Adolescence is often termed as the age of storm and stress. It has so many conflicting situations and problems of adjustment. The origin of such problems are the demands of adolescents. This is the period of maximum growth and development with regard to mental functioning. The intellectual powers like logical thinking, abstract reasoning and concentration are developed in this stage. Intelligence reaches its climax at this stage. Adolescents do not try to follow the track which everyone travels. They develop a fine imagination. They are almost critical of everything. Many writers, artists, poets, philosophers and inventors are born in this period. Adolescence is an age of action. Hero worship is a commonly exhibited behaviour in this period. Adolescents love adventures, wandering fairy tales and develop interest in reading such books. Their area of interest is wide. They have different hobbies

according to their tastes and temperaments. During this period, the adolescents learn to behave according to the norms of their society and culture. They sense their state of being and follow some moral or ethical code. The formation of strong sentiments during this period intensifies the process of moral development. The impact of religion and religious practices is felt for the first time at this age in one's life.

The social circle of an adolescent is very wide. Contrary to childhood, he becomes interested in opposite sex. They believe in intimate friendship. In this period, the social relationships and contacts increase and they tend to create a good deal of social sense. They feel hard to accept rejection especially among their peer group. The other significant change is their relationships with their parents and the family. They crave for independence. They want their personality to be recognised by their parents and the family. They do not prefer to be treated as a child. The main importance is provided to the values and beliefs maintained by their peer group than the advice of their parents. There lies a hidden or open rebellion between the adolescents and their parents. Emotional development is the greatest change that occurs during adolescence period. This is the period of heightening of all emotions like anxiety, fear, love, anger etc. Like an infant, again, adolescents undergo emotional instability and intensity and some individual experiences during this stage. The adolescent turns highly sensitive, inflammable and moody. Therefore, this period is designated as a period of stresses and strains.

The adolescents are not consistent in their emotional expressions. Their emotions fluctuate very frequently and quickly. The current of emotional flow is too intense. This takes their roots into sentiments. Self-consciousness, self-respect and personal pride becomes too much increased. Every teenager is very strong in his motto. What he feels, he feels it very strongly and when he reacts, he reacts vigorously. It is in this age that Ankush and Vee fall in love with one another. They meet in an ice cream parlour. Perhaps it had been fated that Vee's life would take a different turn. The stealing glances of Ankush, his tall figure and the glistening looks are admired by Vee. Their meeting shifts to chats through mails and further continues as outings after their board exams. Gradually, Ankush enquires about Vee's higher studies and future plans. He suggests her to be a model. He helps her to join in his uncle's agency and supports her to excel in her modelling career. He was her moral support. Their relationship continues to some extent. But, after the discovery of

pregnancy, Ankush sounds displeased. He clearly states that he is not ready to be a father. He tries hard to convince her to abort it and continue her career, But Vee is adamant.

During the adolescent period, Ankush enjoys the fantasies of his time. Changes occur in everyone's life. Some changes grow slowly but steadily. Some changes happen overnight. One can never go back to what was before. Likewise, Vee undergoes both the changes one after the other. Ankush is the one reason of all changes; he is the one who supports Vee with regard to her career, but their uncontrollable desire results in her pregnancy. He abandons her in the society when she refuses to abort the child. This leaves Vee perplexed: "How can my life have changed so drastically in less than a year?"

(10) Vee desires to have the baby out of her own choice too. Neither her parents nor Ankush has helped her in any way.

Aryan is the son of Ankush and Vee. Right from his birth, he lives only with his mother. He behaves with an extraordinary maturity. During the tragedy of the paw factor, an animal shelter run by his mother, Vee and Aryan are speechless. They care their pets with utmost care. Aryan grows with them. They are like his siblings. The death of the two Labradors, Shiro and Zoobi emerge as the unbearable tragedy. Dogs have always been a part in Vee's life. Vee and Aryan feel comfortable around them. This has been a challenging situation. Vee is forced to declare the fault with evidence. Soon, the news is broadcast and all other owners have taken back their pets. The paw factor is empty. Vee, who has been emotionally strong during various instances in her life, feels lost in this situation. Alexander Lowen in his book *The Voice of the Body* states: "As adults, we have inhibitions against crying. We feel it is an expression of weakness, or femininity or of childishness. The person who is afraid to cry is afraid of pleasure... Since rigidity develops as a means to block out painful sensations, the release of rigidity or the restoration of the natural motility of the body will bring these painful sensations" (33). In the novel, this hard situation is handled by Aryan in a matured manner. He hugs his mother and caresses her. He reflects the increasing maturity of an adolescent in the form of care.

Aryan is confident enough to take decisions and is always a responsible adult. Suchi, a friend of Vee, looks for a suitor. She tries hard to find a companion for Vee. Vee refuses but Aryan cheers her up. Gradually, Aryan finds a way to contact his father. He always pretends to be contented with his life. He never misses his father is

the conveyed answer of Aryan. He senses that his father has done some folly and his mother is unable to resist and she has shut the doors for him. Aryan doesn't want his mother to be hurt. so, without probing her, he searches a lot for his father's profile. He has found least details and is helpless. He has technically gathered some information from Suchi and has found that Manav is the common friend of Vee and Ankush. He has mailed him and then has contacted Ankush too. Being an adolescent, Aryan has courage to sort all the problems between his parents. His attempts to find his father come as a shock to Vee. As a single mother, she couldn't tolerate her son's challenging decision.

Adolescents, especially boys, growing with single parent experience greater opportunity for involvement in family issues and decision-making. They get less parental control. This greater responsibility and input into decision-making may have either positive or negative consequences. It depends on its timing and embeddedness in an authoritative family atmosphere. Across family types, adolescent development is enhanced by a warm, supportive relationship with a parent. It is accompanied by standards for mature behaviour and consistent discipline. The closeness among the child and the parent is the important link. It creates a conducive environment for emotional growth.

In single parenting, adolescents train themselves to be modifiable. Parental control, discipline and decision-making are related to family structure. These processes can influence outcomes posited to be more negative in many cases. They fail to adjust to their situation too. But Aryan is absolutely ideal. He serves as a disciplined student. His mature behaviour and effective communication show his way of upbringing. A mother's mental growth can be distinguished in many ways. S. Radhakrishnan in his *Essentials of Psychology* states the different levels of mental growth as follows:

We have sense-perception to start with. The senses form the gateways of our knowledge, and (to vary the metaphor) upon their basis is built up the further edifice of knowledge. Imagination, with its two kinds, productive and reproductive, is another stage of mental growth. Reproductive imagination is memory; productive imagination evolves novel construction on previous data. We have next conception, which is thought of the universal (18).

Knowledge begins with sense perception, followed by imagination — both

reproductive (memory) and productive (creativity) — which leads to conceptual thought of universal ideas.

The literature based on psychological trauma is characterised by a relative emphasis on environmental contributors to individual variations in posttraumatic response and recovery. Psychological trauma is a damage to the mind that occurs as a result of a distressing event. Trauma is the result of an overwhelming amount of stress that exceeds one's ability. Trauma may result from a single distressing experience precipitated in weeks, years, or even decades. The person struggles to cope with the immediate circumstances, eventually leading to serious, long-term negative consequences.

Trauma differs between individuals according to their subjective experiences. They react to their respective traumatic events differently. The renowned clinical psychologist, Karen Saakvitne says: "Psychological trauma is the unique individual experience of an event or of enduring conditions in what the individual's ability to integrate his or her emotional experience is overwhelmed, or the individual experiences a threat to life, bodily integrity, or sanity" (60). Psychological trauma occurs when an individual is overwhelmed by an event or condition that threatens their life, bodily integrity, or mental stability. This shows that the cognitive recollections of traumatic events affect the bodily states that initially accompanied those events

Vee is a single child. Her parents are busy with their work. Vee's father is a workaholic and a natural entrepreneur. Vee has a poor relationship with her parents. Vee's mother has some illegal affair with a man. Once when Vee is afraid to sleep alone, she enters her mother's bed room and there she hears a strange voice. From that day onwards, Vee has experienced many confusions and most of her expectations are hurt. The day Vee is about to leave to St. Hilda's Convent, she undergoes a strange trauma. She thinks and grieves: "My mother never bid emotional farewells and I think she must have left in relief that I was no longer her responsibility" (49).

Suchi turns out to be vee's good friend from her schooldays. She feels grateful that universe has conspired for them to be together as best friends and soul sister. Suchi's mother cares her daughter as well as Vee. Vee has longed for mother's care. After their final exams, for the first time, Vee has taken Suchi to her home. Vee's mother seems to be a modern woman. She serves as a great host. She has made

time to stay with Vee and Suchi. Everything shocks Vee. Suchi glares at Vee and she justifies Vee's mother. This makes Vee too enraged and too jealous. Suchi says:

You know what Vee; you are behaving like a spoilt brat. Your mother is making an effort and she is so sweet and kind. I think you are horribly biased against her.'...You are being obnoxious. You should know better. (76)

After schooling, Vee gets a chance to excel as a model. She has appeared in the cover of a great magazine. Vee's mother is much excited. She was over the moon after the achievement of Vee. She was ecstatic and Vee basked in the glory of her victory. Her eighteenth birthday has been celebrated as a big party. Her parents invite all their colleagues, neighbours, and relatives. They walk with pride. As days passed, when Vee encounters some health issue, her mother has held her hand in hand. She seems to be tensed. The time Vee opens about her pregnancy, she blurts out vigorously as a typical mother. Vee repels with her arguments. They spat out the words in a rugged manner. Kuppuswamy in his *Psychology and Life* explains about the parenting technique as follows:

Parents may sometimes show an attitude of ambivalence towards the child. Sometimes they shower affection on the child and sometimes they may reject the child and look upon him as a nuisance. They may feel that the child is a big burden and that he comes in the way of their own engagements and enjoyments (131).

Therefore, it is normal that parents exhibit ambivalence toward their child, alternating between affection and rejection, sometimes seeing them as a burden to their personal lives.

Vee's parents feel anxious about the society and its talk, But Vee is too adamant and to have her baby. After many contradictory fights, they have arranged a hospital in Kodaikanal. Again, she joins in a convent. At the sixth month of pregnancy, they landed up in Kodai. It is a pleasant surprise. Vee's father overwhelms with joy. But her mother hardly speaks to her. She strongly forbids her husband to care Vee and her child. She also seems to have undergone some trauma in her life. Her anguished yell to her husband clears it:

'I have had enough. I am tired of this. What if something happens to her? Or the baby? What if we have to re-live that whole nightmare again? You know what we went through and I can't face it again. Hell

– I know how hard it is. What the hell does she even know about raising a child? If she is a child, she should listen to us. She had a great career going and she was doing so well’ (118).

This shocks Vee. The word ‘nightmare’ affects her. The words of her mother hits her psychologically and she feels distressed. That day, the second part of Vee’s life begins. Before the birth of Vee, her parents had lost many children. So, Vee’s mother is afraid to shower her love and concern for her child. Later, she prepares herself to share her hidden affection. This leads her to fall in an illegal affair. In order to show her love, she chooses someone in the universe. She seems to consider this as the nightmare. But, Vee is not aware of this flashback. So, she feels dejected.

Right from childhood, Vee experiences bitter memories with her mother. The fact behind the rudeness of her mother is revealed later by her father. Even the death news of her mother doesn’t make sense to Vee in any way. She becomes stubborn: ‘For me, her death was the final closure in what had been one of the most disturbing relationships in my life. All I wanted from her was a little bit of love and acceptance. I remembered... Even in her death, I couldn’t forgive her. So deep was my pain’ (146). Emotions are complex mental states with the feeling element in a predominant degree aroused by the perception of objects which affect our conative tendencies. There is an expression for every emotion. This expression complicates the nature of the emotion by sending back organic and kinaesthetic sensations. Every emotion has its expression illustrated by an analysis of fear.

The young boy, Aryan, is a teenager. He is highly connected towards his mother. He understands his mother and wants her to live a better life. He has kept his mother occupied with joy at all times. Even at the time Vee scolds him for his poor grades, his look conveys, “I – can – defy – you – and – there – is – nothing – you – can – do – about – it.” (1). This pose is common among most of the teens when they reach a certain height. He analyses that his mother still feels a hollow pain whenever his father’s name is mentioned. Being an adolescent, he has an urge to find out the identity of his father and to solve the conflict among his parents. Aryan has felt a little insecure as he is under the control of his mother. He feels jealous when his friends discuss about their father and the happy life. Finally, his efforts have ripened fruitfully. Vee, Aryan and Ankush are in the ride of their lives together. Their reunion serves as a happy ending. Finally, the sayings of Manav, “it happens for a reason” (256) has come true.

In this research article, the trauma endured by Vee as a single child of dignified parents and as a single mother of her child Aryan is disclosed effectively. Her transposed way of parental care and looking after her son's needs are unique, in turn, Aryan, as a well raised adolescent, serves as the best son.

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The Journey of Self-Discovery in Sue Monk Kidd's *The Secret Life of Bees*

Rajapushpa P.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Sue Monk Kidd is an American author known for her novels exploring themes of feminism, spirituality, and self-discovery. This paper explores the journey of self-discovery in *The Secret Life of Bees*, focusing on the protagonist, Lily Owens. Haunted by the traumatic memory of her mother's accidental death and subjected to the emotional and physical abuse of her father, Lily embarks on a journey to uncover the truth about her past. This paper examines how Lily's struggle for safety, love, and self-actualization shapes her transformation from an insecure, guilt-ridden girl to a confident young woman.

Keywords: Coming of age, Identity, Parental abuse, Self-discovery

Self-discovery refers to the process where a character comes to understand more about their true nature, desires, beliefs, or values. This journey often involves challenges, introspection, and growth, leading the character to recognize their inner strengths or confront aspects of themselves they may have been avoiding. It can be portrayed through the character's actions, thoughts, and interactions with others, revealing how they change or evolve throughout the story.

The Secret Life of Bees by Sue Monk Kidd explores themes of love, identity, and resilience through the journey of a young girl seeking truth and belonging. A review from *Buried Under Books* describes it as a "tender coming of age story, full of wish fulfilment," emphasizing Lily's longing for maternal connection and the novel's emotional depth. At the core of Lily Owen's fourteen-year-old life is the haunting memory of the day she accidentally took the life of her mother while attempting to protect her in a fight with her abusive father. From the early age of four, Lily not only struggles with this entrenched guilt, but she also attempts to cope with a motherless life and a cruel father.

T. Ray's harsh treatment of Lily only fuels her desire to understand her mother better. She wants answers about why her mother left her, answers to her mother's identity, justice for her mother's death, and the love from a mother figure. But in order to find these answers, she must leave the abusive environment of her father's home in search of a safe haven. With the aid of her black nanny, Rosaleen, Lily embarks on a journey to Tiburon,

South Carolina, landing finally at the same safe haven her mother had visited ten years earlier, the home of the beekeeping Boatwright sisters. August, the eldest and wisest of these calendar sisters, and a host of other spectacular black women help create an atmosphere that promotes Lily's psychological development. Lily's coming of age is a slow and often painful process, replete with teenage angst and regression, but by the novel's end, she progresses from an abused, emotionally confused teen to a self-actualized young lady.

By fourteen, Lily's motherless existence led to several unpleasant ramifications in the matter of her appearance. She is so consumed with how she looks and whether she is behaving appropriately that she often feels like she is "impersonating a girl" instead of being one (7). The final insult to Lily's motherless status is that she is denied entrance into charm school—a move she was certain would improve her appearance and manners—because she did not have a "mother, a grandmother, or even a measly aunt" to present her a "white rose at the closing ceremony" (7). Lily is insecure and lonely, states which are only protracted by the lack of attention and abuse received by her father.

T. Ray's attempt at kindness in telling Lily the real story of what happened to her mother the day before first grade quickly turns from kind awkwardness to anger when she tells him she remembers that they were arguing. "Goddamn it, you were four years old," he yells, complaining that she cannot possibly remember the details of that day (14). Later, he softens when he tells her that she "didn't mean to do it," but this is as much kindness as Lily can expect

(15). Despite Lily's overwhelming need for love and affirmation in the years following her mother's death. T. Ray is an emotionally absent father but consistently verbally abusive in all their interactions.

When Lily, excited by the bees swarming in her room one night, wakes him to show him this phenomenon, he angrily says "Goddamn it, Lily, this ain't funny" when he sees no bees and threatens physical punishment (3). Unfortunately, she had grown accustomed to this sort of verbal abuse. Two nights before her fourteenth birthday, she is in the peach orchard—holding close to her chest some precious keepsakes of her mother's in order to feel closer to her—when T. Ray finds her in the middle of the night buttoning up her shirt. Believing her to have been with a boy, his menacing anger erupts as he tells her "you act no better than a slut"

(18). This time, he follows through with physical punishment by making Lily kneel on Martha White grits. Though she had been accustomed to this brutality since she was six, Lily never really grows used to the "powdered-glass feeling" beneath her skin or the

“swollen red welts” and “pinprick bruises that would grow into a blue stubble” caused by the grit torture (18) (19). The next morning, waking up a bit late, Lily is finally convinced that any love T. Ray has for her is gone when he takes her slice of buttered bread, throws it in the dog’s bowl, and insults her about starting work late.

In addition to T. Ray’s verbal and physical abuse, he also relishes in subjecting Lily to psychological abuse when he refuses to let her read while she works alone all day in the peach stand. Afraid it would “stir up ideas of college... a waste of money” for females, even though she had scored “the highest number a human being can get on their verbal aptitude test,” T. Ray makes sure Lily has a healthy fear of him (11). He “half kill(s)” her once when she sneaks a copy of *Lost Horizon* to the peach stand under her shirt, and a neighbour bragged on her at church for reading, exposing her guilt (11). Ironically, T. Ray’s “only kindness was for Snout, his bird dog, who slept in his bed and got her stomach scratched anytime she rolled onto her wiry back,” claims Lily, who had also seen T. Ray not even bat an eye when the dog had peed on his boots (2). Treating his dog with much greater affection than his own daughter, T. Ray continually devalues Lily, making her feel unloved.

According to Maslow’s hierarchy of needs, Lily’s physiological needs are being met for the most part. She is getting food, water, and sleep sometimes, but she does not always feel safe. Maslow believes that in order for someone to function effectively and move on to the next level of development, she must be in a safe, secure environment. Broken, abused, and desperately seeking the affections and safety of a sympathetic adult, Lily turns to her black nanny, Rosaleen. Rosaleen, whom her father had pulled from the peach orchard to cook and clean and be a “stand-in mother” after Lily’s mother died, was a large woman with a “big round face” and was “so black that night seemed to seep from her skin” (2). She had no children of her own, so for the past ten years, Lily had “been her pet guinea pig” (2). Though Rosaleen pretends not to care whether or not Lily gets stung by one of the bees in her room, Lily has figured out that Rosaleen’s heart is “more tender than a flower skin” when she buys Lily an Easter chick dyed purple. When T. Ray gives Lily a hard time about bird droppings on the floor, Lily realizes Rosaleen must love her “beyond reason” when she stands up to T. Ray and defends Lily’s pet (8).

At the beginning of the novel, Lily perceives Rosaleen as a protector someone who is willing to create a safer environment—something Lily needs desperately for her emotional growth. When Rosaleen comes to the house the day before Lily’s birthday and finds Lily’s knees red and swollen from kneeling on grits, she is visibly upset and consoles Lily, “Look what he’s done to you” (19). Having someone recognize T. Ray’s physical

abuse as inappropriate begins to validate Lily's feelings of self-worth and her anger and resentment with

T. Ray. This is the first step towards Lily's freedom.

Rosaleen pushes Lily to recognize the mistreatment of her father so that she is willing to stand up for herself. Ultimately, Rosaleen is the reason Lily is willing to forego all that is familiar, albeit cruel and neglectful, to search for her mother's identity. The confidence she gains from helping to protect Rosaleen fuels her desire for a healthier environment for both of them. Yet, Lily is still largely dependent on Rosaleen as a surrogate mother. We see her desperately searching for Rosaleen after their fight at the creek, praying to God that she not be gone, telling herself "Mother, forgive," much like she did when she thought of a reunion with own mother (44).

Rosaleen and Lily's reunion in the creek takes Lily a step further in her coming of age. Without artifice and in the dark water of the creek, naked, they are the same: two people, hurting, desperately needing the love and forgiveness of the other. Rosaleen's willingness to forgive Lily's hurtful comment reminds Lily that forgiveness is an important part of a growing relationship. Rosaleen's love for Lily creates a deep, abiding loyalty in Lily; she wants to protect and honour her.

May Boatright, June and August's younger sister, also teaches Lily some important lessons about life. Described as "not an altogether normal person" with an "odd grin" when Lily first meets her, May shows Lily how to find pleasure in the smallest of things like singing the honey song and how to mourn loss at her wailing wall (55). Lily loves to sing the honey song with May because of its silliness and because it makes Lily "feel like a regular person again" (67). May is clearly not a regular person because of the way she handles loss and dissension; anytime someone brings up an unpleasant topic like an argument between June and Neil or Rosaleen's awful head injury, May begins humming "Oh! Susanna." If this does not work, she heads out to her makeshift wailing wall, writes the source of the problem on a sheet of paper, and places it in the wall.

May teaches Lily that the way one handles negative emotion is to combat it with positive thinking and singing. She also teaches her that physically writing down a problem to physically process it is a healthy way to cope with negative experiences. Lily follows suit one night, writing down her mother's name, "Deborah Owens," and placing it in May's wall (81). When Lily discovers May trying to lead roaches out of the house with graham crackers and marshmallows, May reveals that Lily's mother had lived in the honey house, too, and had shown May this strategy. This affirms Lily's motives for remaining there and

trying to cope with her mother's loss.

Affirming Lily's secret that she is still unwilling to share, August tells Lily that "bees have a secret life we don't know anything about" (119). This is a confirmation for Lily that keeping secrets is a natural behaviour; even bees do it. August also explains to Lily that the black Mary is really just the "figurehead off an old ship" but that her spirit, a spirit of "comfort and rescue," is ubiquitous (114). Lily finally touches black Mary's heart one evening and prays for her to "Fix me, please fix me" (132). She concludes her prayer to black Mary that "(she lives) in a hive of darkness, and you are my mother" in an attempt to come to terms with her dark past and fill the motherless void (132).

Lily to finally be ready to speak with August about her mother. She is surrounded by people who love her and respect her, so she feels that sense of belongingness. And with August's help, she starts to believe herself quite valuable; her self-esteem is quite high. As Lily tells August about accidentally killing her mother, she is so relieved to hear August list all the people who love her, including June. August finishes with, "I love you. Just like I loved your mother" (196). Despite Lily's relief about being loved by so many people after her confession of such a horrible act, Lily does not discover the idealized Deborah Owens she had so long embraced. She finds out that her mother had left both her and her father because she was unable to cope with T. Ray anymore. This knowledge angers Lily to the point that she quite literally has a meltdown in the honey house later, smashing jars of honey against the walls and injuring her arm.

Though Lily has made so much progression in her development, this one detail that her mother had abandoned her, levels her. The knowledge means that T. Ray was right. This means both of her parents ultimately rejected her. This means Lily can no longer entertain the smug delusion that her life would have been much better if her mother were still alive. This means that she will have to forgive her mother if she wants to continue moving forward. After talking with Rosaleen about her mother's leaving, Lily feels a little release when she realizes that Rosaleen knew this but never told Lily in order to protect her. When August discovers a hat box filled with Lily's mother's things, she heads to the honey house and goes through the contents with a very hesitant Lily. When August takes out Deborah's hairbrush, Lily sees a piece of her mother's hair, "a genuine part of her body" (221). Despite her former disappointment with her mother, Lily realizes that "no matter how many jars of honey you threw, no matter how much you thought you could leave your mother behind, she would never disappear from the tender places in you" (221).

The hair is a good reminder that her mother was human and thus fallible; this is the

first step towards Lily's forgiveness of her mother. August then retrieves a book of English poetry she had given Deborah during her final stay. As Lily goes through the book, she finds doodling and pencil marks in the margins, her "mother's private miseries," when she comes to the William Blake poem "O Rose, thou art sick!" (222). After reading the poem, Lily realizes that she was one of the reasons her mother had not been well. Her mother had not planned to marry

T. Ray, but when she became pregnant with Lily, she decided to marry him. Lily desperately wants to apologize to her mother for being one of the "invisible worms that flew in the night," making her mother ill (222). The final item from the hat box eases Lily's feeling of abandonment; her mother had framed a picture of herself feeding Lily in a high chair. Lily explains that now she "didn't care about anything on this earth except the way her face was tipped toward mine, our noses just touching, how wide and gorgeous her smile was, like sparklers going off" (222). The picture is actual proof that Deborah Owens had loved her daughter, and finally, Lily feels loved by her mother.

Now that she had all the facts, Lily has only to forgive her mother for leaving her. That is all. But at the start of the final chapter of the novel, Lily, under the scorching August sun, feels her heart "like an ice sculpture" in the centre of her chest (224). Lily realizes she is being stubborn by not forgiving her mother, but thinks that, in general, most people would "rather die than forgive. It's that hard" (224). While she tucks her mother's things away back into the hat box and pushes it under her cot, she finds a "tiny pile of mouse bones" under it and begins carrying them with her every day, associating them with Deborah (224). This physical representation of her mother in her pocket seems to protract the amount of emotional energy Lily spends replaying all the details of her mother's life in her head.

Lily is grateful that everyone lets her grieve, but even she is starting to get frustrated with her inability to forgive her mother. In a cleaning frenzy one day, Lily is able to tie up the mouse bones with a red ribbon and put them with the rest of her mother's things, symbolically letting her go. Drifting off to sleep that afternoon, she kept thinking how "nobody is perfect" and that you just have to "let the puzzle of the human heart be what it is" (230). So, when she completely understands her mother's decision to leave, she is ready to forgive her.

One day while tending to the bees, August and Lily find a queenless colony. This parallel to Lily's motherless life reminds August to tell Lily of her real intention when she told the story of Beatrix the Nun. August tells Lily that black Mary was serving as a stand-

in mom during the three months that Deborah ran away from her and T. Ray. August explains that black Mary is not “some magical being out there,” but she is “something inside of you” (233). Black Mary is divine feminine wisdom and strength that already enables Lily to deal with her father’s abusive treatment and guilt over her mother’s death. August tells Lily that “you have to find a mother inside yourself” whether you have a mother or not (233). Ultimately, August wants Lily to understand that she does not have to physically touch black Mary’s heart to get “strength and consolation and rescue” because Lily possesses these qualities within her own heart (233). August tells Lily that when she starts to feel small and doubtful, she must listen to black Mary’s voice commanding her to “get up from there and live like the glorious girl (she) is” (233). Finally, August reminds Lily that black Mary “sits in (her) heart all day” and that Lily never needs to feel afraid or alone because she is enough to satisfy any of her fears, saying “I am enough. We are enough” (234). Lily finally realizes that Mary’s spirit within her is enough to help her overcome any fear or dread, especially the seemingly insurmountable task of forgiving her mother’s abandonment.

August’s discussion of black Mary living within is quickly put to the test as Lily opens the door to a triumphant-looking T. Ray in the final dramatic scene of the novel. T. Ray, who had searched for his daughter all summer long, is none too pleased to pretend all is well and accept Lily’s invitation to come into the pink house and have a civil discussion. Despite the raging emotions charging through her chest, Lily quietly asks T. Ray how he finally located her and is surprised when she realizes that her collect phone call home to him was the missing piece. As T. Ray’s chin quivers when he sees Deborah’s whale pin on Lily’s shirt, Lily sees for the first time how much her father must have loved her mother, “how it had split him open when she left” (237). Lily had spent so much time considering the devastating effects of her own motherlessness that she had never considered “what he’d lost or how it might’ve changed him” (237). The months of nurturing at the pink house allows her to see beyond her own suffering.

But seeing the pin confuses T. Ray. He thinks his daughter is Deborah, his wife, so he slaps Lily’s face hard and calls her a “goddamn bitch” (239). As T. Ray waves a knife in front of her face, Lily remembers August’s advice about Mary’s spirit within; “I am enough. We are enough” (234). The encouragement strengthens her to yell “Daddy!” and T. Ray snaps out of his fog. And the damn breaks; T. Ray’s weakness is exposed. He is no longer the bitter, abusive father who makes Lily kneel on grits. He is a broken man trying to face the fact that he had caused both his wife and his daughter to run away from him.

By the time the fight finishes between T. Ray and Lily, over half the daughters of

Mary have joined August and Rosaleen in the parlour with T. Ray and Lily. With an army of loving black women behind her, August promises Mr. Owens that he would be doing them a favour by leaving Lily at the pink house. August tells him that Lily is her “apprentice beekeeper,” and she has learned the business quite well (241). Furthermore, August says that “we love Lily,” promising that “we’ll take care of her,” enrolling her in school the very next term (241). Once

T. Ray relinquishes custody and walks out, Lily turns back to the porch to see Rosaleen, August, and the daughters waiting. “All these women, all this love, waiting” makes her feel like she has ten thousand mothers (243). These powerful, talented, nurturing, protective, intelligent, entertaining black women have brought Lily from a point of running away from her problems to dealing with them directly.

The secret life of bees is multifaceted and nuanced. It is portrayed as both a biological connection and an emotional, spiritual bond that transcends familial ties. Though Lily’s journey, the novel explores the importance of relationship between father and daughter, the concept of motherhood and the Boatwright sisters’ love.

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Patriarchy and Gender relations in Ben Okri's *The Famished Road*

Sakthi Priya K.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

The paper examines the representation of patriarchal structures in Ben Okri's seminal novel, *The Famished Road*. Through a critical lens, this research analyzes how Okri portrays the oppressive nature of patriarchal societies, particularly in post-colonial Nigeria. The paper explored through the narrative of Azaro, the protagonist, and his interactions with the women around him, including his mother and the various female spirits he encounters. The paper explores the sufferings of women and the plight of women in Nigerian society. It examines discourse of womanhood in areas such as motherhood, marriage, the portrayal of the woman in her private domain of life, in relation to her public image, relations with patriarchy, and the contradictions in the collective experience of women and the self. The paper aims to shatter the age-old shackles bound by patriarchy. **Keywords:** Patriarchy, Domination, Sufferings of Women, Postcolonialism.

Sir Ben Golden Emuobowho Okri is a Nigerian novelist, short-story writer, and poet who used magic realism to convey the social and political chaos in Africa. Ben Okri was born on 15 March 1959 Minna, Nigeria. His first novels, *Flowers and Shadows* (1980) and *The Landscapes Within* (1981), employ surrealistic images to depict the corruption and lunacy of a politically scarred country. Okri won the Booker Prize for his novel *The Famished Road* (1991), the story of Azaro, an abiku (spirit child) and his quest for identity. The novels *Songs of Enchantment* (1993) and *Infinite Riches* (1998) continue the themes of *The Famished Road*, relating stories of dangerous quests and the struggle for equanimity in an unstable land. Okri's works focus on post civil war and life in modern Nigeria. His works explore the patriarchy, gender equality, myths, political violence, power in dreaming, poverty, religious beliefs, military excesses, nationalism, family ties and cultural identity. Okri writings discuss many political and social problems in Africa and the effects of post-colonialism.

Ben Okri's primary aim in *The Famished Road* (1991) is to redefine womanhood and patriarchy. Okri's acclaimed trilogy *The Famished Road* is a representative work of

African magical realism. It is a Bildungsroman novel. The novel has its setting in Nigeria, which obviously evokes Okri's own days in a similar place in Lagos. The roots of success of this novel lie in the central theme, which is connected to the age old culture and traditional practices of African society. One main focus of this study is to examine how Ben Okri mirrors women in their existential reality. Okri proposes a subversion of gender positions intending to advocate equality and social justice.

Patriarchy is a social system in which positions of authority are primarily held by men. The Patriarchy is used both in anthropology to describe a family or clan controlled by the father or eldest male or group of males, and in feminist theory to describe a broader social structure in which men as a group dominate society. The powerful patriarchy represents women as 'other'. African women bound by the chains of gender inequality began to struggle gently in an effort to free the bond. Many women started scrutinising the representation of women in male-authored works. So, women started writing about their experiences so that society could get hold of the first-hand experiences of a woman's life and as time went on, women writers gained an upper hand in displaying their emotions which were so far portrayed from a male perspective. Women writers like Simon De Beauvoir, Virginia Woolf, and many others battled to carve out a place for themselves in a society that fostered the idea that a woman is constructed. Gender is a construct that is largely self-created and it is that which one tries to invent for himself or herself. It focuses on patriarchal relations, sisterhood movements, women's roles in domestic and public life, marriage, motherhood, etc. Women were always presented as dependent, gullible, and voiceless.

Azaro is the protagonist, his mother and father are the two strong characters in *The Famished Road*. To have an understanding of gender equations, one must concentrate on these characters. To become a renowned revolutionary figure, Azaro's mother never gives up her family life. Though she earns through trading, she never leaves behind her household duties. The same thing happens in the case of his father. He is very considerate and ready to welcome his partner's growth and victory. He becomes proud of her over her appearance in the newspaper and shows reverence towards her by cutting out the page of the paper and pasting it to the wall (185). But also, he exposes his dislike which symbolizes the male domination society "What market? What trade? This is how you women behave when you get into the newspapers" (201).

Azaro's mother in the novel as one of the central characters, Okri objectifies the stereotypical role of a mother and offers a redemptive role for his woman character. He

does not give any specific name of the mother character as she can be any Nigerian woman, who is not ready to confine herself to a stifling atmosphere. He presents the main character Mum by assigning her equality with managing private as well as public affairs. Through Mum, Okri unravels the different aspects of womanhood. Simultaneously, she plays the role of a wife, mother, and one who works hard for social upliftment. Through this character, Okri asserts that women are capable of multitasking. In other words, Okri moulds her well fit her into marital, maternal, occupational, and political roles.

Okri's writings are rooted in Yoruba mythology, he makes use of the abiku myth to explore the different facets of womanhood. Yoruba mythology says that the myth of abiku emanates from their belief in reincarnation. Analysing the abiku phenomenon clarifies that abiku is a spirit child who maintains a cycle of dying and being reborn. Abiku children are not interested in remaining in the physical realm and go back to the spirit world by leaving their mothers into an abyss of grief. The line "we caused much pain to mothers. Their pain grew heavier with each return . . . we remained indifferent to the long joyless parturition of mothers" (5). Okri clearly explains their apathetic attitude towards mothers. Through Mum, Okri brings out the pain and stigma experienced by an African woman who is the mother of an abiku child. She is a representative of a mother who suffers the pain and agony of losing her child many times. Azaro himself declares that it is his mother's unending suffering that made him free her from the dilemma of motherhood, It is the reason which makes him stay in the earthly world. He says "But I sometimes think it was a face that made me want to stay. I wanted to make happy the bruised face of the woman who would become my mother." (6)

Okri explains that in Nigeria, a woman's social visibility is determined by her ability to give birth to children, in this novel, portrays the plight of motherhood through Azaro's Mum. Making Mum, a prototype to paint the pathetic plight of African women Okri hints at the truth that in African society a woman is assessed in terms of her ability to give birth to children. Her acceptability is determined in terms of her reproductive ability. American author Bell Hooks statement on motherhood is very much relevant here,

"Motherhood was proposed as the central lever with which women would bridge the world and in practice, it offered the best opportunity to women to heighten their domestic power"

(71). Women are presented as people who are good at trade and support their families

financially.

Ben Okri unravels the intensity of the pain of the motherhood through the words of Azaro who says, “I passed a house where a woman was screaming ... I thought thugs were beating her up and I went there and learned that she was giving birth and she had been in labour for three days and three nights” (189). Mum handles the role of mother and as a wife with the same ease. One can label her under the category of a womanist rather than a feminist. She never wants to dominate the male figure, Dad. She acknowledges her husband and accepts his value as a supporter. One never feels this character as a woman who is an embodiment of tolerance and silence. Sometimes she too expresses his dissatisfaction over the pathetic situation through which she goes. Her lamentation “I was the most beautiful girl in my village and I married this madman and I feel as if I have given birth to this same child five times. I must have done someone a great wrong to suffer like this” (508) substantiates her resistance. Raising a voice is not considered a feminine quality.

As a woman, Azaro’s Mum never wants to limit herself within the four walls of life. She tries her best to be an independent figure by becoming the breadwinner of the family. When her husband gets imprisoned, it is Mum who finds a room for them to occupy by paying a month’s rent in advance. Every time she proves her ability as a calculative wife. Here again, she becomes the symbol of Nigerian ghetto women who work hard to run their families along with their husbands. The physical sufferings she has gone through is highlighted when Okri writes, “She looked much leaner and her blouse hung from her and the straps fell over her shoulders as if she had shrunk in her clothes” (96). By supporting the family her identity becomes more visible to the society that tries to suppress her by putting her into the cage of patriarchal forces. Azaro’s Mum is a representative of every other Nigerian woman whose fate is similar to hers. He also, portrays the plight of Nigerian women as:

The women wore faded wrappers and dirty blouses; their faces were like Mum’s In her suffering . . . Mum’s, many faces that could have been hers, and I saw that her tiredness and sacrifice were not hers alone but were suffered by all women, all women of the marketplace. (190)

The patriarchal mentality of Dad makes him believe that women who are engaged in matters other than their family will neglect their familial roles. But Mum sees this as the uttering of an envious husband. She realizes the importance of education in refining a person’s character and this is revealed when she tells Azaro, “You must like

school. If your father had gone to school, we wouldn't be suffering so much. Learn all you can learn. This is a new age. Independence is coming. Only those who go to school can eat good food. Otherwise, you will end up carrying loads like your father" (109). Okri is very authentic and successful in providing a platform for Mum the representative of Black women, from where she can speak of her individuality and history. Here, she becomes a staunch advocate of African tradition and heritage.

Madame Koto, the second significant woman character, is portrayed as a multi-dimensional and complex character. Many critics viewed her as a metaphor for colonial domination. Madame Koto is portrayed as a character unable to belong neither to her own old culture nor to the colonial culture which resulted in creating a hybrid identity which is less native and more western. This resulted in creating in her a sense of hollowness. It was men who constantly tried to rule upon their woman counterparts. But here Madame Koto has inverted the scheme of exploitation by misusing Azaro and other ghetto dwellers. Okri presents Madame Koto as a neo-colonial thug and capitalist. How she establishes her power is well caught up in the following lines:

Madame Koto sucked in the powers of our area. Her dreams gave the children nightmares. Her colossal form took wings at night and ... corruption and disintegration, of innocent women and weak men. Her snoring altered the Geography of our destinies. Slowly, while the people of the area grew weaker, more accepting, more afraid, she grew stronger. (568)

Madame Koto subverts the perception that a woman must possess a tender body, while a man should have a rigid, tough one. In her one can see a complex female character, feminine in make-up but the conduct of whom is essentially masculine-feminine. This is to say that she possessed certain masculine-like traits, which was her exclusive character trait. Madame Koto is introduced at the beginning of the novel as an ambitious local bar owner. She starts her journey as a downtrodden in society. From the beginning to the end, she remains a mysterious figure so no one is sure about her origin or her growth. Others know about her through gossip, "They said of Madame Koto that she had buried three husbands and seven children and that she was a witch who ate her babies when they were still in her womb. They said she was a bewitcher of husbands and a seducer of young boys and a poisoner of children." (118)

Madame Koto explains well how a self-made independent woman is looked upon by her female counterparts in a male-dominated chauvinistic society these are the

opinion of the people. Among the black community, to get the privilege over others, women prefer to label themselves as matriarch. Here, Madame Koto who addresses herself as a matriarch exerts her power over others in different ways. It is quite common that in a matriarchal society, women will be economically safe and secure. As a matriarchal figure, she succeeds in bringing revolutionary changes to the society to which she belongs. She is successful in displacing patriarchy and the new social status that dawned upon her helped her to have a dominant voice in her relationships with both men and women. As a woman, she tries her best to uplift the lives of women socially and economically and thereby make them self-sufficient and secure. Her material affluence changed her physical appearance.

In a country like Africa, a woman's status is often read under the profile of motherhood rather than anything else. Motherhood often acts as a source of power and the same power is denied to Madame Koto. Her lack of motherhood makes her ashamed in front of society. Her desire to keep Azaro close to him shows her love and sincere longing for a child. And every time she incarnates in the form of a great mother who protects every Nigerian woman whenever they are under siege by oppressive forces, she shows her matriarchal prowess and authority. She turns herself into a guide and mentor for her peer groups.

Madame Koto dependents treat her as their mother and they mourn her death in the way people lose their mothers. Each woman, who comes to pay homage to Madame Koto, is extremely settled by themselves and enjoys a good financial status only because of Madame Koto. Okri draws the women characters by giving them a perfect shape and a worthy position in society. Madame Koto transcends her material profile through her hard work and thus changes her subjugated femininity into an authoritative one. She affirms her existence by forcefully eliminating masculine dominance over her in various forms.

Madame Koto exerts her authority over both men and women. She displays women's possibilities in deconstructing the patriarchal myth. Through many circumstances, she substantiates that a woman too can be powerful and be voiced. At the beginning of the novel, she shows the courage to throw down a customer who refuses to do the payment. The entire crowd around her gets stuck at the performance made by Madame Koto. She establishes her strength and supremacy through her massive figure. She becomes a symbol of evil or wicked figures who spread evilness over others. "People came to believe that Madame Koto had exceeded herself in witchcraft. They said she

wore the hair of animals and human beings on her head.” (428)

Though Madame Koto is portrayed as a negative character here, positive aspects of Koto dominate her negative traits. She acts as the harbinger who brings modernity to the Nigerian ghetto by introducing electricity, a fully furnished bar, and even a car too. For the people of Nigeria, the sight of a car is a wonder. Thus, she becomes a pioneer in bringing innovations to the so far undeveloped African society. Okri selects Madame Koto as the antagonist. She appears as a negation of Patriarchal power. Madame Koto has developed through her assertive style.

The two prominent female characters Mum and Madame Koto well explains the truth, that life is not easy for women in a male-dominated society. But through enduring many difficulties these two women emerge as empowered and they are suggestive of societal and cultural improvements that are slowly happening in Nigeria. In *The Famished Road*, Ben Okri leads women from the margins to the center, which helps to remove the negative stereotypes about women. Both female characters are effective in discovering their own personal spaces as well as assisting other women to do the same. They convey the truth that women have a unique role to play in the patterns of social development.

The paper thus highlights the female characters in *The Famished Road*. One can easily comprehend the different ways in which they gained an independent status of their own by shattering the age-old shackles bound by patriarchy. Madame Koto and Mum can be seen as examples of women from all over the world who rebelled against authority by voicing their rage and fear. Ben Okri empowers his women characters by assigning them certain responsibilities, which they extensively fulfil and thereby present themselves as opposing the stereotypical representations accorded to many a female character.

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Role of Silence In Anita Nair's *Lessons In Forgetting*

Serina K.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Anita Nair's novel *Lessons in Forgetting*, highlighting the struggles of women in a patriarchal society. Nair, a bold postmodern writer, delves into the complexities of female identity through her protagonist, Meera, who grapples with her husband's abandonment and societal expectations. The narrative intertwines Meera's journey with that of Jak, a father searching for his daughter, Smriti, who becomes a victim of gender violence. The novel address themes of female infanticide, societal norms, and the quest for self-identity amidst oppression. Nair's characters embody the fragility of modern Indian marriages and the challenges women face in asserting their independence. Through vivid storytelling, the chapter emphasizes the need for awareness of women's issues in contemporary India, ultimately advocating for empowerment and resilience in the face of adversity.

Key Words: Female Infanticides, Struggles, Silence.

Unlike the novelists of thirties, Anita Nair exhibits confidence in tackling new themes and experiments with new techniques. Her novels depict the real life of her characters without hiding anything from the readers and she reveals the effect of social conditioning on women and how they survive in the patriarchal society and find solution to come out from their suffering especially, in her novel *Lessons in Forgetting*. This novel has a strong feminine flavour where the author portrays her female protagonist as strong, determined in the same hand. She has stressed about marriage being an integral part of a woman's life or no one cares about it. She is concerned with the studies, family, love and striving for fame and fortunes. She has portrayed such a life in this novel. In India, it is the traditional norms that keep a woman tied to. The fear of society and of being a misfit is a great impediment for a woman. In India women are always considered to be as inferior beings, women are denied of their rights. So, naturally this contradiction needs to be reflected in her characters as well. Anita Nair portrays about the fragility of the modern Indian marriage and the overwhelming challenges of raising their children in a milieu. This is an ambitious layered novel.

The protagonist of the novel is Meera, who is happily submerged in the role of a

corporate wife. She is forty-four-years old and has been showed as a sacrificial lamb. She is cool, poised, and urban writer of cook books. She is educated and erudite, and mother of two teenagers. She is a successful corporate honcho for her husband Giri. Nayantara is her daughter and she is in the IIT. Nikhil is her son. She and her family live with her mother, Saro and her grandmother, Lily in a lovely old house in Bangalore. In the beginning of the novel, Meera, Giri, and their son participate in the party. In these, she always wants to be with Giri, but he suggests to her to mingle with others. It seems that she is more possessive, but he does not like that. When Meera partakes in the party, she mingles with other people as advised by Giri. In the meantime, Meera searches for him, but she cannot find out anywhere. Later she comes to know that he has escaped from the party without telling anything and that shocks her. In these circumstances, Meera compares Giri with Zeus, the husband of Hera as follows “My Giri is not Zeus. He does not frolic with nymphets or even goddesses. He is prone to fits of rage; he is ambitious. But he is eminently trustworthy. Meera hears again the censorious voice in her head: That’s exactly what Hera must have thought each time Zeus disappeared from her horizon.” (10)

After the disappearance of Giri, she manages to stand on her own feet. She finds a job and manages to fulfil her responsibilities as a mother, a daughter, and she slowly accepts that life has more to offer, even though she does not know exactly what is in store for her. In the meantime, Meera faces so many difficulties to run the family without having money for her own. Looking for a job, she lands on one as a research assistant to a professor of cyclones from the University of Florida, Jak or Kitcha, who is here on his own mission. Meera gets acquainted with other men after Giri has walked out, including the philanderer cine star, Soman Rishi and Jak, the storm predictor. Anita Nair depicts Meera as one leading a meaningless life. She suffers a lot without male guidance for her family, because she has no father and grandfather as they are also passed away. When she enters in her marriage life, she feels very happy, but it does not last long. Even though he lives, he leaves away from her without bothering of his wife and two children. She faces so many difficulties for running her family.

In this novel most of the characters suffer having no life partner although they have been married. The author portrays the character of Meera as an organized person. She does not have any identity of her own, because she is considered as a granddaughter, daughter, wife and mother. She subsumes herself into the identity of her husband and allows her to the other roles to contain but she finds it difficult and would not even know

where to begin. In the absence of Meera's identity is revealed a sad reality of today's women's position. Anita Nair says,

The woman is just doing her job. And it seems to Meera, wife of Giri queen of her world, mother of two, author of cook books, mentor of corporate wives and friend to the rich and celebrated, that she who has everything can afford to be forgiving... Meera can afford to be generous. She gleams at the woman (6)

The realistic portrayal of Nair's character is inducing. For example, Jak's quest to learn about his daughter takes him to a small Tamil Nadu village where large female infanticide racket thrives. It is integral to the plot, yet Nair does not offer any sort of closure to it. There are too many characters such as Meera's mother, grandmother, Jak's aunt each with their own background story. After a long time, Meera gets a mail from Giri that he is settled in Madras. He reveals the reason why he leaves away from her that is after their marriage. He requests her to sell the house for the development of their family. But she refuses to do that and tells him that it is not their home and they have to pay for staying there. For that he gets angry and says "That's what couples argue about. But we are not one, are we? You are the landlady and I am the tenant. It is always you. Your house. Your family. Your friends. Has it occurred to you how I feel?" (108). Later, he asks her to divorce him because he wants to marry another girl. As Meera does accept to sell the house, he wants to punish her. This is childish vengefulness. In the beginning she compares herself as Hera but after the disappearance of Giri, she gets disappointed and says,

I am not Hera, she tells herself. I will not panic. I will not spew venom or make known my rage. I will not lower my dignity or shame myself. I can live with these shadows as long as it is me he comes from to. Besides, Giri is not Zeus. He is not a compulsive philanderer, merely a middle-aged man who has had his head turned (39)

Meera's character is determined by Lily as serious granddaughter. Giri's elegant wife, and Nikhil's and Nayanantara's dependable mother. As for as Jak is concerned about Meera, "A silly cookbook writer. A pathetic and abandoned wife. A desperate and no skills employee." (133) Jak is a weather expert and specially a cyclone specialist. He is working on a book on cyclone. There is a lot of data to wade through, a lot of information to source and collate, and he needs help and for what he appoints Meera as a research assistant. Jak comes to know about the life of Meera and thinks of the life of his

mother, Sarada Ammal who is a perfect wife and mother. But his father wants to go to Ashram leaving his wife and son. His mother feels a lot to allow him to go and Jak discovers his mother who lays as a stone and after his father has gone. His mother asks him,

What do I do now? They tell me I ought to feel blessed to have been married to a man who has taken up sanyas. I am cursed, Kitcha, that's what I am. Neither a wife nor a widow. Who am I Kitcha? You tell me...If he let me for Jak does not know to console his mother as he is in the position, because he also misses his father. (12)

In this novel, Nair shows two kinds of broken marriage relationships. The first, who is abandoned by her husband, and the second one, who is abandoned by his wife. The two protagonists of this novel are abandoned by their partners without having any valuable reasons. That is, Meera is abandoned by her husband Giri and Jak is abandoned by his wife Nina. Both are helplessly living in the same situation. The next character is Kala Chithi who lives with her husband Ambi happily. She has a long hair which attracts her family. Her hair makes her a demure girl and then a demure woman. She is a daughter who pleases her father and later a wife who is pleased by her husband. Her husband is very much impressed by her long hair which makes him marry her. Always he gets promised her not to do anything on her hair without his permission but she disobeys his words and cuts her hair without his knowledge. Then misunderstanding comes into their life and they want to break their relationship just for this reason. Later on, Kala chithi Jak's aunt realizes her mistake and thinks about her sister who is also the responsible for her husband leaving her. This action disappoints her,

You deceived me. Would you have told me if I hadn't found out? You made a fool of me. How can I trust you ever again? You flouted my authority. You betrayed my trust. You broke my heart... His anger is revealed in the following passage: For the first six months Ambi choose to punish me. I had to be thought a lesson, he deemed. For six months he didn't speak to me. Six months of not even a smile. We ate together, slept together, even fornicated when Ambi had the urge, but he wasn't the Ambi I knew or loved. I loved. I was never more lonely or desolate than I was then. (205)

Ambi is not ready to forgive her, so he wants to marry another girl by giving the reason that she also finds the reason to leave him. She herself thinks that she is unfit as

wife and so, she wants to go away from him. Before she leaves him, she cuts her hair at the nape of her neck and gives it to Ambi and declares, “This is all you ever wanted of me. And let me go” (206). After departure, she returns to her father’s home. Her father is worried about his daughter and confesses as, “What sins am I paying for? He hit his head several times. I have two daughters and they are both destitute. One abandoned by her husband. The other abandons her husband. What am I to do?” (206). Finally, Jak worries about his daughter and feels that he is responsible for her bad condition and Kala Chithi consoles him telling that “No one is responsible for what happens to someone else. You have to accept that. Whether it is my life or Smiriti’s” (207). Each and every character in this book is beautifully described. Be it Meera, Jak, her mother, her daughter, or even Jak’s aunt, and Kala Chithi, who has a own story to tell. Like any other Anita Nair’s book, this one is unputdownable.

Anita Nair portrays the condition and status of women and how they suffer in the patriarchal society without having any identity on their own. Her novel reveals the effect of social conditioning of women. She has portrayed her protagonists who are economically independent but still they do not have control over their own life and even major decisions of their life are taken by others. In this novel, she tells how women suffer after getting married and without marriage. Whatever situation a woman is, she has to suffer a lot in the patriarchal society.

Meera and Jak are the two desperate people who cling to each other. Meera will be there for him. But she is not able to give him the reassurance of what he wants from her. She thinks of her favourite fruit, “the pomegranate. Of how she savors it best when she eats it seed by rather than as a handful thrown into her mouth. She will take a cue from that. Of how resurrection is to be fashioned one day at time” (325). Nair’s novel talks about forgetting and coming to terms with second life. The novel has been open ended. But then, the intimacy between Jak and Meera will perhaps draw them closer. As the day passes, fresh beginnings appear where seemed to be only endings.

Lessons in Forgetting is a story of real people in a real world but far from perfect country, where female infanticide still happens with impunity. It is also a story of forgiveness, redemption, and second chances. It is ultimately a story about individuals in deep crises together to offer succour to each other. It is ultimately a story told by an accomplished storyteller who may oftentimes touch upon stodgy topics and ultimately a story that deserves a chance. Forgetting is as much a blessing as the ability to memorise. Conclusively, her female characters have no identity. But they are bold

enough to fulfill their desires by negating family bond to go to the extent of establishing physical gratifications with other men. Women are kept in silence in the male-dominated society as they have no rights to do anything and this is portrayed in this novel. The story is about how women open with personal crises such as loneliness, ill-treatment, rape, abortion, madness and betrayal at different stages of their lives.

J.A. Krishnamurthy, also known as Jak, a single father who is skillfully portrayed is at the centre of the narrative. Jak ruthlessly follows a trail left by subtle clues to discover what transpired to his daughter, Smriti, in a small coastal village in rural Tamil Nadu. Smriti, the daughter of Jak and Nina reside with her father after the legal separation of her parents. Inspired by her father's Indian stories, she comes to India in pursuit of her higher studies. She represents the mistaken identity. She meets her fatal end as she tends to bring change by pointing out the prevailing social evils.

A single mother named Meera who struggles to understand her husband's callousness and abandonment of their marriage, forcing her to raise their two adolescent children and take care of her ailing mother and grandmother alone, joins Jak in his pursuit. Jak's frantic search for answers regarding a horrific occurrence involving his daughter and his yearning for redemption lead Meera and him down a treacherous path that completely upends his life. The story addresses some extremely delicate themes with gender, such as masculine gaze, skewed sex selection, and gender violence. Jak and Meera are two souls on a journey brought together by fate.

Anita Nair expresses the need to make readers aware of the dark side of the developing nation and also the plight of anyone who questions it. She discusses how women suffer in the social system, which has driven them in various ways to repress, degrade, and abuse, in *Lessons in Forgetting*. In her book, she poses several issues and prompts readers to consider the theoretical underpinnings of sociology's place in conventional society. She writes for women to give them a voice in society even though she does not intend to label herself as a feminist author. She is among the best examples of an author who strives to highlight the violence that women experience, how to combat it, and how to set an example for themselves and patriarchal society. She encourages women to have independent lives in each of her novel.

In India, a woman is bound by the ancient customs. For women, one of the biggest obstacles is their fear of societal structure and of fitting in. Women are also denied their rights in India since they are often viewed as lesser humans. Hence, it follows that her characters also need to represent contradiction. Anita Nair depicts the

frailty of the contemporary Indian wedding and the enormous difficulties associated with parenting the kids in a certain environment.

Jak's thoughts over life and its uncertainty inspires his daughter, Smriti. Jak tells Smriti that it is impossible to predict exactly the phenomena of nature and life as well. Everything in nature and life carry uncertainty. No one knows what will happen at the next moment. Jak remarks: "You can study nature as much as you want, but you can't ever predict it. Actually, there is nothing in life you can predict" (44). This seems as a warning sign to Smriti for her awaiting danger. She goes to India to get her degree since the story her father, Jak, told her about India captivated her. She desires a personal encounter with the customs and culture. She joins the campaign at college, "Save the girl child". She embarks on a journey with her companions to raise awareness about the existing societal structures, such as the dowry system and female feticide. They are developing the play "Dying Daughters". She visits the village of Minjikapuram during this campaign since she has heard her father refer to it frequently. Her foot is hurt while wandering close to the sea beach by a piece of shattered glass. She goes to the neighbouring hospital to receive first aid.

There is a sizable crowd of people gathered for various types of check-ups because there is just one hospital in the area. She encounters a number of pregnant women in the hospital who have gone there to learn the sex of unborn children, which is against the law. Women still manage to learn the gender of their unborn children. Smriti makes up her mind to oppose female foeticide. She develops a strategy to combat this category of social ills.

Meera collects documents against the illegal killing of female fetuses. Elaborating female foeticide and its impacts in India concludes that the intentional killing of newborn female offspring is known as female infanticide. The practise of gender-selective abortion is frequently considered as a closely connected issue in nations with a history of female infanticide. Female infanticide is a serious problem in several countries, including China, India, and Pakistan. It has been stated that bias against women exists because of how poorly patriarchal civilizations see women. In only one other large nation, India, do more girl babies die than boy babies. There is an 11% gender gap in child survival. According to the United Nations, India performs an estimated 2,000 unlawful abortions per day of unborn girls.

India has a long history of killing female infants. The causes of the phenomenon of female infanticide in India have included impoverishment, the dowry system, births to

unmarried women, malformed infants, starvation, a lack of support services, and maternal disorders such postpartum depression. Although being made a crime in India, infanticide continues to go unreported due to the scarcity of accurate statistics.

Anita Nair remarks, “Despite the laws and regulations, women still find a way of discovering the sex of their unborn babies. If not the women, their families. They abort the foetus if it’s a girl. Soon there may come a day when there are no women left”(285). She sacrifices everything for the good cause. She feels that knowledge is essential for resolving problems of this nature. to make mothers aware of the importance of giving the girl foetus a chance. that they can enjoy their daughters as well. Smriti investigates the circumstances at the hospital.

Through Smriti, the novelist depicts a modern woman who is intelligent, brave, and capable of forging her own path in a patriarchal society. In addition, her plight warns the young mind against confinement and exploitation. Her views on Western culture makes her think that anything against the law could be stopped lawfully without any interruption. But very well she forgot about the loop holes that could accept any unlawful activities with a bribe.

It’s illegal! Smriti’s Voice rose. They do it here. Why do you think we came here? The Scan Doctor is not from this town. They bring him from somewhere else, and he tells us if we ask him. The woman whispered. Look around you, she added. All these Pregnant women, they come from various Parts of the district. Do you think there are no hospitals Where they live?

It’s because of the scan doctor. And then, if you want it, they’ll do the abortion here as well. (292)

In order to make a report, she tries to gather evidence to refute everything. She meets Chinnathayi, a mother whose daughter had an abortion and later passed away in a nursing facility. Due to Smriti’s interference in their business, Dr. Srinivasan and his men were furious with her. Using Chinnathayi’s name, they call Smriti at the seashore and deliver a false message. That was a ruse, but Smriti was ignorant of such heinous conduct. The three strong men attack Smriti as she approaches the location and assaulted her.

Chinnathai is the only person who witnessed and she remarks, “They were animals, these men. They tore at the girl and it seemed the more she screamed. The

more excited they became. It was the smell of blood” (317). Chinnathai opens up as she knew Smriti tried hard to help her regarding her dead daughter. She transforms into a lifeless, pitiful, and frozen figure. Smriti, an American-born girl who identifies as an Indian woman, encounters difficulties when doing so. She feels it is her responsibility to address social injustice. In the words of Maya Vinay.

Smriti in *Lessons in forgetting* is a victim of such a mistaken identity. Men in India are still unequipped to face such a kind of modernity, which is an off shoot of progressive western education and upbringing. Smriti with all her frivolousness is also a girl who wants to bring about a reform in the society by her social activism. She is cruelly punished by the male society for her interference in local matters... She appears freak in the eyes of her community since she demonstrates the possibilities of her society to a group of people who are not yet ready to either grasp these possibilities or acknowledge them. (119)

When Smriti’s father Jak learns that her life has brought her suffering, he feels it is only his duty to fight against discrimination in India, especially in his hometown of Minjakapuram. Jak remarks “It is true that tattered cliché about time being a healer. My daughter lies there in her tomb of silence. And I can sit here and gaze at the horizon with what seems to be pleasure. Should I feel guilty? Or should I think that this is wisdom, this acceptance of circumstances.” (145). The plight of Jak over his daughter’s state is expressed through the emotional sayings. The outset of his thoughts over his daughter is very emotionally portrayed through Jak, also the novel does a great job of conveying the aspirations, struggles, and salvation of women. In the contemporary male-dominated world, the narrator promotes the equality, liberty, and self- independence of women.

The author of the novel illustrates how familial upbringing and cultural differences contribute to women’s oppression and subordination in society. Smriti was raised in the United States, where gender issues are treated with more candour and freedom. Yet she encounters numerous issues in India, from her home to the hospital and from her college to her campaign. A government doctor that Jak visits to discuss the incident makes a comment,

You see, that’s the problem with you people. You NRIs you don’t understand that grown-up girls need to be with their mothers. You think this is America. You send your daughter back filled with all the Permissive ideas you teach them in the west and then when something

goes wrong, you blame India for it. She was here with a man. I hear. By herself. (54)

The word “tradition” is all-inclusive and refers to all social customs, cultural activities, religious beliefs, and interpersonal ties. A rebellion against the institutionalized powers of oppression and injustice against women has been sparked by the ongoing burden of traditional authority. The traditional way of life and the contemporary perspective are in constant confrontation for Indian women. Women typically spend their entire life safely entrenched in their homes, managing housekeeping and family concerns. A woman is promised individualism, mobility, and permissiveness by modernity. Indian society still adheres to a number of traditional values that women must uphold. Standing and religion are not as important today as they once were rigid as it was for hundreds of years before. Through *Smriti*, the author presents the picture of another woman who is taught, striking, able and fearless and realizes very well how to make her own way in this quick changing world and next to each other the writer cautions that gone are the times of their concealment and abuse.

The narrative of real individuals in a genuine, if not quite perfect, society, where female infanticide still takes place in impurity, is told in *Lessons in Forgetting*. Also, it is a tale about repentance, forgiveness, and second chances. In the end, the story is about people coming together in times of great need to support one another. The story is ultimately one that deserves a chance because it is delivered by a skilled storyteller who occasionally touches on heavy subjects. Both the ability to remember and the ability to forget are blessings.

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Significance of Mandala in Patrick White's *The Solid Mandala*

Snow Amilda Fernando A.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Patrick White, as a novelist has not received sufficiently acknowledged. His material Australianness and his attitude toward it have posed obstacles for reviewers and critics both domestically and internationally. The themes highlighted in Patrick White's writings include isolation, loneliness, the search for purpose in a materialistic society, and the examination of Australian identity through myth, symbolism, and frequently with the Australian landscape as a backdrop. The contradictions between life and art are revealed by a close reading of White's *The Solid Mandala*. The twins have served as a structural element that includes the brothers conflict. On one level, White tries to illustrate the inability to integrate two perspectives. First, from Waldo's point of view, and then Arthur's. Both these perspectives are further sandwiched between the outer framing perspectives of society. The Marbles refers to the little glass spheres that Arthur carries, which are to him 'Solid Mandalas,' symbols of wholeness and the luminous mystery he senses at the heart of things. The final outburst between the two brothers that led to one's death marks the novel's conclusion. White's book challenges us to think about the duality of everything and how our viewpoint distorts how we see the world.

Keywords: Patrick White, Mandala, Totality, Dualities, Conflict.

The Solid Mandala revolves around the contrast and conflict between the twin brothers, Arthur and Waldo Brown. They are twin conscious, separate yet closely linked by birth and long association. The twins are distinct, yet complementary parts of a single person. Waldo Brown is the intellectual, accepted by the tight world of tidiness and quick answers of punctuality and unbreakable rules, but he is arid, nervous, introverted and sterile in his aristocratic and literary pretensions.

The Solid Mandala is divided into four parts. The "Waldo" and "Arthur" sections which are different from one another, are enclosed within shorter sections. The brothers' constricted world, stands as a contrast to a larger world which they ignore. The 'Brown Brothers' are no ordinary twin brothers. They are the means by which White takes a constructive step further on the quest for wholeness. This quest now takes White in the direction of the Jungian Mandala which serves as an organizing factor for the four-part

structure of the novel. As Carl Jung says, “The ‘sacred circle’ has the function of protecting the center of the personality from being drawn out and from breaking up” (341).

Mandala drawing, first practiced by Tibetan Buddhists and then developed by Carl Jung, is a form of integrative body–mind training and currently one of the main forms of drawing psychotherapy. Jung believed that mandala drawing has the function of integrating psychological division, enhancing psychological harmony, and preserving personality integrity. Jung viewed the Mandala as a pattern generated by the psyche in an attempt to integrate itself and to find wholeness. This pattern was used by Jung to show how an imaginative order can be imposed upon chaos. A mandala is a four-part structure made up of opposites that are juxtaposed and maintained in dialectic tension without being destroyed.

Arthur reads out from an encyclopedia, the definition of a Mandala, “*The Mandala is a symbol of totality. It is believed to be the ‘dwelling of the god’. Its protective circle is a pattern of order super-imposed on-psychic-chaos. Sometimes its geometric form is seen as a vision-*” (238). The concept of divinity as filling all things agrees with White’s choice of the adjective solid to accompany the mandala image. As Carl Jung says, “The mandala serves a conservative purpose-namely, to restore a previously existing order. But it can also serve the creative purpose of giving expression and form to something that does not yet exist, something new and unique” (102).

Waldo’s sense of failure is acute and it attacks him in a rather fatal way. Waldo is incomplete. He begins to hate himself and it is very obviously self-hatred that leads Waldo to put on an old dressing gown which had belonged to his mother and then stand before the mirror, preening himself. He is very clearly denying his own identity when he assumes a false one of a woman.

When he was finally and fully arranged, bony, palpitating, plucked, it was no longer Waldo Brown, in spite of the birthmark above his left collar bone. Slowly the salt-cellars filled with icy sweat, his ribs shivery as satin, a tinkle of glass beads silenced the silence. Then Memory herself seated herself in her chair, tilting it as far back as it would go, and tilted and tilted, in front of the glass. (193)

This is clearly a kind of self-punishment Waldo is imposing upon himself for being the failure that he is.

The solution to this problem is contained in the image of the mandala. Waldo can

deal with this failure only if and when he acknowledges to the interdependence of himself and Arthur. Arthur is everything that Waldo is not. He is strong, alive, buoyant and spontaneous and most important of all, Arthur knows how to love. “Who and where were the gods?” (217). Arthur does not know the answer to this question but he knows that he cannot understand cruelty. Perhaps it is because Arthur does not understand cruelty that he is able to perceive the tragedy of life. He is concerned with the truth and what his mother considers to be dishonesty is not so in his opinion. And so he does not consider it a sacrilege to look into people’s houses. He feels that it is the best way to know them better.

The “Arthur” section of the novel changes the prevailing tone because it will now be Arthur’s perceptions which will be presented to the reader. Arthur seems to recognize that it is he who can counter-balance and amend Waldo’s deficiencies. “Nothing could have hurt Arthur. Arthur only feared for Waldo” (228). He knows that he is the stronger of the two and that it is his task to impose order, on the chaotic anarchy of Waldo’s world. At the very beginning of this section presents the image of “the red gold disc of the sun” (215). The orange disc is burning brightly over the iceberg, emblematic of the living mind of Arthur working over the icebergs which bring Waldo to mind. The red gold disc of the sun, like all other circles and spheres, becomes a talisman for Arthur to prove to him that mandalas exist on all levels, from his tiny marbles to the great world and what lies beyond it.

The experiences related in the Waldo’s section which appear twisted and chaotic, viewed from Waldo’s morbid thinking, now take on a totally different dimension when White brings them to the reader from Arthur’s healthier point of view. Arthur changes Waldo’s morbid relationships into something loving and responsive. The cow Waldo’s point of view is now explained by Arthur as an occasion which had called for a sharing of suffering and agony. The tragedy is ridiculous and frightening but it forces its audience to share the agony, “but that, surely, was what tragedy is for” (230).

Waldo when he met with an accident, Arthur weeps for him not because he is afraid to be left on his own but because he feels the compelling need to impress upon his brother his abiding need for him. It is because he can love that Arthur’s artistic creations represent the tragic aspect of life. Arthur shares all Waldo’s frustrations and he writes a poem to celebrate their common pain. But Waldo is never able to emotionally respond to any of these situations which is why Arthur fears for Waldo. He knows that Waldo is dry and arid. White says, “Much as he admired his brother, for his scholastic

brilliance, his knowledge of the world, his self-sufficiency, he had begun to fear for Waldo, for some lack of suppleness in his relationships with other people” (243- 44). Arthur is convinced that he is the only one who can protect Waldo from complete self-destruction.

What Arthur sees in Waldo’s world is mere chaos, conflict and sickness. Waldo is deficient because he is sterile and cold. So it is Arthur who now asks the question – What “is the meaning of ‘totality’?” (240). George Brown’s answer to this question does not satisfy Arthur because of its superficiality. Totality, George Brown admits, is a word so simple in itself that it defies explanation. The dictionary supplies a sketchy definition “Totality is ‘the quality of being total’” (240). Then Arthur realized Dad would never know, any more than Waldo. It was himself who was, and would remain, the keeper of mandalas, who must guess their final secret through touch and light.

The mandala is the pre-dominating image in the novel. Since the mandala is a symbol of totality and since Arthur feels that it is he who must work at achieving totality, it is he and not Waldo who becomes the keeper of mandalas. He displays an intuitive fascination with religious and mystical symbolism, an interest which White displays. In none of his previous novels has White accorded such minute attention to the structuring of the novel as he has in *The Solid Mandala*.

The quaternary is a predominant image as there are four parts in the novel, four epigraphs, four corners to Arthur’s dance and four marbles which Arthur keeps on his body. The geometric shapes–the triangle and the square which emerge through the structure of the novel are White’s apocalyptic images for man and God. In all these shapes, man remains at the centre, but knotted in all the conflicts and problems facing humanity, subject to time, pain and death.

Patrick White is now exploring deep into the psychological and spiritual depths in order to discover the way to man’s wholeness. Arthur and his twin brother together make one man, potentially capable of achieving perfection. Both of them are very real individuals and there is nothing vague or uncanny about White’s presentation of the two brothers. As Patricia A. Morley writes,

... Arthur’s love for his brother is an apocalyptic image of man’s love for the archetypal brother, every other human being. Man’s divided state, which is identified with the number two or with the first two corners of a square, is squared through love. The wholeness achieved through love is identified with the quaternary and the square which, in turn, is closely

associated with or contained within the mandala. (8)

Arthur must play the role of the redeeming benefactor because it is he who has the capacity to love. He holds the mandala as a symbolism because it is he who can impose some kind of an order on the dualities prevalent in the novel. First, Arthur has his four marbles, the microcosmic spheres which are his solid mandalas. He hands one to Dulcie and the next to Mrs. Poulter and they graciously accept his gift. The third marble, Arthur keeps for himself. The pattern inside the marble seems to reflect Arthur's own relationship with his brother. But their interaction is never so uncomplicated. Waldo, however, refuses the gift of his mandala, the one with the knot at its heart. So far, Arthur fails too because he is not able to actually relieve Waldo's agony.

The only occasion when Arthur comes closest to realizing the fullness of his own being is when he performs the mandala dance before Mrs. Poulter. The tragic corner in Arthur's dance is the one belonging to Waldo, to spite to winter and death. In the other three corners, Arthur has known fulfilment. First he danced the dance of himself. "Even in the absence of Gods, his life, or dance, was always prayerful" (265). The man who had once asked, who and where the gods? now keeps his faith for he is not afraid to worship.

In the second corner, he declared his love for Dulcie Feinstein, and for her husband, by whom, through their love for Dulcie, he was, equally, possessed, so they were all three united, and their children still to be conceived. Into their corner of his mandala he wove their Star, on which their three-corner relationship was partly based. (266)

This "three-cornered relationship" is suggestive of the existence of a triangle within the quaternary. Yet it is not subversive because Arthur imposes a pattern over the existing chaos. He next dances for Mrs. Poulter and fulfils both her and himself by becoming for her the child she has never conceived. To everyone, Arthur brings completeness without even making a concerted effort at doing so. And yet, he fails his brother. As he dances the fourth and final corner of his dance Arthur realises that he cannot save his brother. He now experiences a living death but brings himself out of this condition by forcing himself to realize that at the centre lies a force which will ultimately save Christ's passion, which can be the passion of "all their lives." Christ's suffering and love were redemptive. That is for Arthur the most revealing aspect of Christianity and he tries to offer the quaternary the opportunity to show willingness to suffer and to love.

Man does appear to be at the centre of White's mandala image. If man is present

then the divine has to be present too. In Arthur's four cornered mandala dance man and God come together and coalesce. "Till in the centre of their mandala he danced the passion of all their lives, the blood running out of the backs of his hands, water out of the hole in his ribs. His mouth was a silent hole, because no sound was needed to explain" (267).

The conclusion to the mandala dance does put man at the centre, but a man whom image and archetype identify with divinity. Arthur's dance is equated with life itself. In the first three corners of his dance, Arthur is at perfect harmony with himself, Dulcie and Mrs. Feinstein and lastly with Mrs. Poulter when he becomes for her the child she has never had. Yet in the fourth corner of his dance which belongs to his brother, Arthur recaptures images which recall deadness, withering and discontinuity-aspects which typify not - just Waldo's writings but his life as well. When Arthur is unable to dance his brother out of himself, he is equally unable to save Waldo.

Using the mandala as a symbolic structure, Patrick White's *The Solid Mandala* examines issues of loneliness, duality, and the pursuit of wholeness. Arthur and Waldo Brown, twin brothers who symbolize opposing viewpoints, are the main characters of the book. Arthur is impulsive, affectionate, and perceptive, whereas Waldo is sterile, introverted, and intelligent. The endeavour to bring conflicting forces together is highlighted by their conflict and complementarity. A Tibetan Buddhist symbol that Carl Jung later studied, the mandala stands for spiritual harmony and psychological wholeness. This search for completeness is symbolized throughout the book by Arthur's marbles, which he refers to as "solid mandalas." While Waldo, ensnared in his dogmatic worldview, is unable to find emotional or spiritual fulfillment, Arthur recognizes the importance of connection and balance.

Therefore, this research paper examines the mandala significance in Patrick White's *The Solid Mandala*, emphasizing how the characters spiritual and psychological development can be understood through the complex mandala formations. The protagonists of the book, Waldo and Arthur, are dualistic; their opposing dispositions represent the conflict between disorder and order. This study examines how, in the larger framework of Australian society, mandala imagery represents their need for identity and wholeness through a close reading of the text. The mandala emphasizes concepts of balance, cyclical existence, and the pursuit of meaning, serving as a symbol of integration. This study provides deeper insights into White's narrative strategies and the philosophical foundations of his work by placing *The Solid Mandala* inside a



mandala framework.

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Cormac McCarthy's *The Road*: A Narrative of the Resilience of Humanity in the Post-Apocalyptic World

Steena B.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Cormac McCarthy's *The Road* serves as a poignant monument to the resilience of the human spirit in the face of the desolation that characterises a post-apocalyptic society. McCarthy's narrative skilfully delves into the depths of human despair while simultaneously celebrating the enduring spirit of survival. The novel addresses themes of violence, love, morality, trust and the innate human drive to persevere. The research article analyses the characters' struggle for survival in a post-apocalyptic world. It also explores the complex coping strategies adapted by the father and the son, shedding light on their capacity to discover resilience in the face of adversity and optimism in times of tragedy. It also examines the profound impact of resilience, highlighting the characters' ability to withstand and adapt as a means of ensuring their survival in an environment devoid of any recognisable reference points.

Keywords: Post-apocalypse, survival, resilience, love, morality.

An apocalyptic event is a massive catastrophe that kills most life, levelling cities and buildings, and turning the world into a lifeless wasteland void of humans and animals. The post-apocalyptic literature is a sub-genre of speculative fiction characterized by taking place in a world after some catastrophic disaster or devastation. The main characters scrape a living in a world decimated either socially, politically, or environmentally, most often a combination of all three. (Stanton 1)
Post-apocalyptic fiction focuses on the aftermath of the world when it has been destroyed by a major catastrophe. It deals with survivors of the apocalypse, depicting how they cope with living in the new wasteland.

The Road by Cormac McCarthy follows the convention of the post-apocalyptic genre, which chronicles the end of the world. However, the cause of the apocalypse remains obscured, and the only information given in the text is: "The clocks stopped at 1:17. A long shear of light and then a series of low concussions" (54). The novel depicts the world a few years after the event when the collapse of the biosphere is starting to become apparent. It is set in a bleak, post-apocalyptic world where the sun is obscured, and the environment is cold, gray and lifeless. Everything is covered in ash, and nearly

all forms of life, including plants, animals, and humans have vanished. The world is in a constant state of decay. Cities have either been burned down or abandoned, leaving few people alive. All the trees are dead and colourless, and the wind moves ash across the road's surface. The novel centers on an unnamed father and his young son who are journeying through this desolate landscape. The man and the boy travel through the rough terrain of the southeastern United States in search of warmth after some unspecified catastrophe.

They passed through the city at noon of the day following. He kept the pistol to hand on the folded tarp on top of the cart. He kept the boy close to his side. The city was mostly burned. No sign of life. Cars in the street caked with ash, everything covered with ash and dust. Fossil tracks in the dried sludge. A corpse in a doorway dried to leather. (10- 11)

These lines capture the physical and symbolic decay of the world. This portrays the destruction of nature and civilization. The father and son's journey through this desolation underscores the futility of their struggle, as everything around them crumbles. Wherever they go, the father and the son can see chaos, death, fear, and destruction. The conditions they face are unforgiving: rotted corpses, landscapes devastated by fire, abandoned towns and houses.

In this harsh, lonely world, the man and the boy live with a constant alertness, keeping the pistol on them at all times. They are travelling south down the road to escape the coming winter. The whole landscape is dead and empty, and the man and the boy have only each other. The earth lacks an ecosystem and is in a state of entropy, with the winters getting deeper, the sun obscured, and hardly any living plants or animals left: "The land was gullied and eroded and barren. The bones of dead creatures sprawled in the washes. Middens of anonymous trash. Farmhouses in the fields scoured of their paint and the clapboards spooned and sprung from the wallstuds" (189).

The man's primary goal is to keep his son safe and guide him towards survival, while the boy represents innocence and hope. They are constantly on the move, pushing a shopping cart filled with their meager belongings, searching for food and shelter. Along the journey, the father and the son face numerous challenges including starvation, harsh weather and encounters with other survivors who have turned to violence, cannibalism and brutality. Trust is almost non-existent, and the few people they meet pose significant danger. The father is often worried, trying to protect the boy from these threats.

The father and the son travel southwards, hiding from other people, as violence is

rampant and cannibalism is widespread. The society is reduced to bands of marauding survivors, road agents, or single travellers who hide from one another for fear of being captured, murdered, and then devoured. Despite the sense of impending doom, the father and the son continue to trudge on, starving and bedraggled, hoping for warmth in the south. Their possessions (a toy truck, an incomplete pack of cards, a butane lighter, a pistol, a tarp, binoculars, and some canned food) were pushed down deserted highways in a grocery trolley with a motorcycle mirror attached to the handle. They encounter numerous horrors including mummified corpses everywhere, dead bodies stuck in the molten asphalt of the road, a dried human head under a cake bell, a half-eaten newborn infant, and a cellar full of naked people who are used as food for those who captured them.

In Joseph Carroll's classification, survival arouses avoiding predators, obtaining food, seeking shelter, and defeating enemies (Gottschall et al. 89). The father and the son in *The Road* are trying to achieve all of these goals. In this instance, the predators are groups of cannibals, to whom they may fall as prey and be consumed. The two of them are constantly hiding from others. They seek loneliness and isolate themselves from others. The apocalypse has transformed the survivors into desperate bandits who eat people, and the father frequently emphasizes that they are different from the others because they are the good guys and the other survivors are terrible, therefore they avoid them. They use binoculars to look around for smoke or movement, and they flee and hide at the first sign of human presence. The man carries a pistol with only two bullets, which he uses to defend his son against the marauders' band. Due to a lack of plant growth, sustenance is obtained by scavenging canned food from abandoned houses or stores. Starvation is prevalent, and food and shoes become the most wanted resources: "Mostly he worried about their shoes. That and food. Always food" (16).

In terms of shelter, they spend most of their days outside, either walking or resting by the fire, covered with a tarp, despite the increasing cold and frequent rain. They sleep with campfires burning all night and wrap their feet to walk through the snow. The only respite comes when they discover a bunker stocked by preppers who had anticipated a disaster. They get the opportunity to sleep in beds, eat a lot of canned food, and take a decent bath there.

McCarthy has shed light on survival tactics employed by the characters in different scenarios. The post-apocalyptic accounts tell the saga of survival in a world that fits the description of a wasteland. These ends of the world narratives depict a world where the instinct of self-preservation drives the actions of the characters. The instinct

for survival can be defined as the inherent capability to act in a manner that ensures one's survival. This instinct fosters adaptation among the living organisms so that the continuation of existence can be ensured. Saving one's life in difficult times is commonly referred to as survival. However, surviving in a post-apocalyptic world is not limited to the physical wellbeing of an individual, it extends to the optimum functioning of mental and psychological aspects of one's mind. As the survival instinct is an innate ability, it is just human nature to go to any lengths to ensure their continued sustenance.

The characters of a post-apocalyptic novel have to undergo countless physical as well as mental struggles to merely survive the harsh surroundings. In *The Road*, the father and his son undergo such experiences that take a toll on their mental well-being. In order to keep themselves sane, the man and the boy engage in various activities that provide them an escape from the grim reality and also aid in preserving their sense of identity. One way in which they managed to escape reality is through play. On his excursions to find food and other necessities, the man tried to find toys for his son. On one such excursion, he found a toy truck, which the boy loved to play with; the boy made roads over the ashes with a stick on which "the truck tooled along slowly. He made truck noises" (62). His play also distracts the man from reality. Thus, the characters indulge themselves in leisurely activities despite the grim circumstances, implying the necessity of mental rejuvenation in order to keep their spirit alive.

In a post-apocalyptic world, there is a rampant scarcity of resources. With the collapse of large-scale agriculture and the destruction of other means of production, the survivors have a limited supply of the things essential to their survival. During such times, an important strategy of survival employed by the inhabitants of the post-apocalyptic world is scavenging. In *The Road*, McCarthy depicts the survivors visiting the ruins of grocery stores, houses, farmhouses, gas stations, and other similar buildings in search of essential items such as clothes, blankets, canned foods, tarps etc. On one such scavenging hunt, the father and son find "some utensils and a few pieces of clothing. A sweatshirt. Some plastic they could use for a tarp" (87). They store whatever they find in their cart to ensure their sustenance.

In a post-apocalyptic society, after the collapse of all the social and economic arrangements, it is impossible to find appropriate and required sources to fulfill human needs for survival, humans are forced to live on the leftovers of the preceding era. Not only do these remains act as the reminders of the preapocalyptic life, they are also the storehouses of the important resources for the survivors. The characters of *The Road* understand the value of items in the broken world such as warm clothing and canned

food, therefore they do not hesitate to collect them while scavenging the ruins.

Fire is very important for the survival of humans. It serves many significant purposes for humans, including making food digestible, providing warmth in cold weather, and keeping predators away. The importance of fire for human existence is highlighted in *The Road*, where the surroundings are dark and cold. The inhabitants rely on fire for providing them warmth, being a source of light during the blinding nights, and making food safe to consume. The phrase “no smoke, no movement of life” (82) stands true as the presence of fire is the proof of somebody’s existence in the context of the post-apocalyptic world presented in the novel. Fire also holds a symbolic importance in the novel. It is used as a symbol for hope, endurance and adhering to morality in challenging times. The man is seen repeatedly telling his son that they are “carrying the fire” (87) to encourage him to go on during the challenging times. Apart from ensuring the physical safety of the survivors by enabling them to stay warm, cook their food and be used as a source of light, fire also serves as a symbol of hope and regeneration.

Weapons played a huge role in the evolution of humans and excelling in the art of using weapons improves the chances of one’s survival in the post-apocalyptic world as well. In *The Road*, having a lethal weapon like a gun, ensures that a person has a better chance at defending oneself from others. Beholding a weapon also gives a sense of power over others, as it may easily be used to rob essential supplies like food and clothing from them. The gun serves as a crucial tool for self-defense for the protagonists, a father and his young son. The gun symbolises their constant need to protect themselves from the dangers lurking around them, including other survivors who may pose a threat. In *The Road*, weapons not only serve the purpose of enabling a person to defend themselves, but also of taking their own life to escape a cruel death at the hands of cannibals.

The Road itself is both a literal and symbolic journey. It represents both despair and hope because it leads them through a dying world, but hope because it keeps them moving forward in search of something better. Throughout the story, the father wrangles with moral dilemmas. His goal is to carry the fire—a symbol of maintaining humanity, decency and hope—yet the harshness of their reality often pushes him towards ruthlessness. The boy, on the other hand, remains compassionate and frequently urges his father to help others they encounter.

In fact, this dangerous world manifests itself in yet another horrible scene in which human beings are trapped in their selfish attitudes. The people of this post-apocalyptic world are divided into two classes; “good guys” (81) or the hunted and “bad

guys” (80) or the hunters. The father and his son come face to face with the forbidden activities of the bad guys when they search for food in a grand house. Entering into the dark cellar of the house, the man finds “naked people, male and female, all trying to hide, shielding their faces with their hands. On the mattress lay a man with his legs gone to the hip and the stumps of them blackened and burnt. The smell was hideous” (116). Indeed, it does not take the father long to be fearful and highly suspicious of everyone because they have become killers, and he is unable to distinguish friend from foe. The various cannibalistic practices show the man and the boy that human connections are severed in such a post-apocalyptic world.

The father, as has been pointed out, wrestles with the aftermath of the violent destruction of his old world. He is always in danger, and there is a growing sense of death all around him. Indeed, the father awaits his turn to be swept up by the darkness and the silence of this new world. As the title of the novel suggests, much of the action takes place on the road, demonstrating most clearly how the road can never be taken as a permanent refuge; rather, it is only a means of survival. Indeed, on the road, the boy is only preoccupied with survival more than with imagining a different better future. Apparently, this post-apocalyptic vision is not driven by a utopian impulse. Rather, it is a bleak vision that never helps the man or the boy see things anew, a bleakness that is faintly mixed with hope that may turn out to be illusory. In a significantly titled article “The Road Through Hell, Paved With Desperation,” Maslin writes:

The Road would be pure misery if not for its stunning, savage beauty.

This is an exquisitely bleak incantation—pure poetic

brimstone. Mr. McCarthy has summoned his fiercest visions to invoke the devastation.... *The Road* offers nothing in the way of escape or comfort.

But its fearless wisdom is more indelible than reassurance could ever be. (E1)

Obviously, struggle for survival is a necessary aspect of predatory world. However, in McCarthy's post-apocalyptic world, survival is no longer a possibility.

In the end of their harrowing journey, the father's health gets worse due to illness, starvation, and continual exhaustion. Despite his worsening condition, he pushes forward for the sake of his son, determined to take him as far as he can. The novel culminates in the father's death. Knowing his time is near; he prepares his son to continue on alone. He tells the boy to keep “carrying the fire,” urging him to hold onto their shared values and hope. After the father's death, the boy is found by a group of survivors who appear more benevolent than others encountered earlier. The novel ends

with the ambiguous hope that the boy may find a chance at a better future with these people. Despite the overwhelming bleakness, the bond between the father and the son and the concept of ‘carrying the fire’ symbolise the persistence of hope, goodness and humanity even in the darkest times.

Through the novel *The Road*, McCarthy emphasises the importance of not only bodily survival but also the survival of human generosity and kindness. The journey of the father and the son serves as a powerful exploration of human resilience, love, and the struggle to maintain humanity in the face of overwhelming adversity. Their love for each other becomes a driving force that keeps them moving forward in the desolate world. Their constant search for food, water, and shelter, coupled with the threat of danger and the father’s illness, creates a relentless fight for survival. This ongoing search is a matter of life and death, highlighting the harsh reality of survival in a post-apocalyptic world.

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The Innocence of Youth in Ian McEwan's *Atonement*

Suganya T.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Ian McEwan is widely recognized for his exploration of trauma, memory, guilt, and atonement in contemporary literature. His critically acclaimed novel *Atonement* examines the complexities of innocence, betrayal, and redemption. Set across three significant time periods 1935 England, World War II England and France, and present-day England the novel moves around Briony Tallis, a young girl whose false accusation irreversibly alters the lives of those around her. The narrative explores the enduring consequences of guilt, the fragility of truth, and the power of storytelling as she struggles to atone for her mistake.

Keywords: childhood, innocence, loss of innocence, false accusation, love, war, guilt, atonement.

Ian McEwan is one of the leading contemporary novelists whose works are well received by readers as well as critics. He has been controversial sometimes but his works always put forward something new which attracts, often shocks, the readers, critics and scholars. *Atonement* (2001), along with *Saturday* (2005), is considered a seminal work of the first decade of twenty first century. The novel was shortlisted for the Booker Prize in 2001 and the film made on the novel, with the same title, won the Academy Awards.

The novel beautifully blends the traditional as well as contemporary tendencies, techniques and themes and thus fosters hybridity in its nature. Through love and the search for redemption. Ian McEwan shows how innocence is inevitably lost. This loss deeply impacts the characters, shaping how they see themselves and the world around them. It is written in the form of Metafiction and employs narrative techniques such as stream of consciousness, flashback, foreshadowing, unreliable narratology and multiple points of view.

Generally the theme of loss of innocence is a profound and often poignant exploration of the transition from naivety to awareness, a journey that lies at the heart of the human experience. It captures the moment when individuals confront the harsh

realities of life, leading to a fundamental shift in their perception of the world and their place within it. But in *Atonement*, McEwan masterfully weaves the theme of innocence together with the themes of guilt, redemption, and the power of storytelling, creating a rich and emotionally charged narrative that has captivated readers worldwide.

Atonement explores the strict social rules that controlled people's lives in early 20th-century England. Society seemed perfect and respectable on the outside, but beneath the surface, people were trapped by rigid expectations. One mistake could ruin a person's life, especially for women. The main character, Briony Tallis, is a young girl who makes a mistake that sets off a chain of events, changing the lives of those around her forever. Although Ian McEwan is the real author of *Atonement*, he frames the novel so that it is told by one of its characters, Briony Tallis. She is an author suffering from vascular dementia, who is desperately trying to make up for a far-reaching mistake she made as a much younger woman. To achieve this goal, she writes about her past, but she changes some of the events so that the novel will have a more satisfying ending.

The novel also examines the devastating effects of war on individuals, particularly through Robbie's harrowing experiences during combat. *Atonement* is identified as a historical novel with its setting ranging from 1935 through the Second World War to the recent days. The fates of individuals are intermingled with the verisimilitude of history and society. In history, facts and fiction are knitted into the narrative framework with the loss of innocence, capturing its nuances through the characters' personal transformations and the unfolding of events that irrevocably alter their lives. This theme is intricately examined through the lens of childhood misunderstandings, the brutal realities of war, and the enduring quest for redemption. McEwan uses Briony's character to challenge the oppressive social norms of his time and how individuals coped with the limitations placed upon them. Briony Tallis' misunderstanding and false accusations due to her innocence of youth shatter the lives of her sister and her sister's lover, leading to a lifelong journey of guilt and regret. The story is narrated through Briony Tallis the youngest of Tallis sibling when she becomes a famous novelist. She is thirteen when the novel begins and seventy seven in the story's later part. The mistake she makes as a child in accusing Robbie of rape plagues Briony for the rest of her life. She spends it trying to atone for it. Despite her writing talents, Briony becomes a nurse during the Second World War and atones herself for her wrong doing.

Atonement opens in the English countryside during a steamy and idle 1935 summer that allows a privileged adolescent girl's fantasies to get the best of her after she witnesses events beyond her experience. It culminates against the backdrop of World War II with an epigraph, quoting from Jane Austen's *Northanger Abbey*. Like Catherine in *Northanger Abbey*, Briony Tallis is a young girl with an overactive imagination. Then consequences are a lot more serious in *Atonement* though Briony's imagination leads her to create her own narrative, which has life-changing consequences for her sister Cecilia and Robbie, the gardener's son.

The novel travels around Briony Tallis' naive interpretations of events and the devastating consequences of her actions, ultimately leading to a loss of innocence and a profound sense of guilt. It begins with Briony, a 13-year-old girl, whose innocence rooted in her limited understanding of adult relationships and the complexities of human emotions sees her sister Cecilia strip off her clothes and plunge into the fountain in the garden of their country house. In reality Cecilia and Robbie bicker over a vase, which breaks and falls into a pond to retrieve the pieces, surprising Robbie. Briony watching from a window is confused and intrigued by Cecilia and Robbie's actions. At the end of that day, the lives of all the three had changed forever. Her naivety and black-and-white perception of right and wrong are evident in her misinterpretation of events between her sister Cecilia and Robbie Turner, leading to her false accusation of Robbie.

Briony's false testimony against Robbie, born out of her youthful misunderstanding, has devastating consequences, forever altering the lives of everyone involved. This act, though seemingly innocent in its origins, highlights the potential for harm that can arise from unchecked youthful judgment. As the story unfolds, Briony and other characters, including Lola, experience a loss of innocence as they are exposed to the harsh realities of the adult world, including war and violence. Briony's false accusation places a heavy burden of guilt on her, as she grapples with the consequences of her actions and the damage she has caused. This guilt, coupled with her loss of innocence, shapes her journey throughout the novel. As the novel's characters develop over the course of the novel and are inured to the sufferings of the adult world, they grow progressively less innocent. This universal loss of innocence is largely catalyzed by Lola's rape and Briony's false testimony.

Briony has matured enough to realise her grave mistake. This cements *Atonement* as a bildungsroman. She then wants to atone for the suffering she has

inflicted on Cecilia and Robbie through her novel. “I like to think that it isn't weakness or evasion, but final act of kindness, a stand against oblivion and despair, to let my lovers live and to unite them at the end” (371-372). This is Briony's validation for the fictional ending she gives Cecilia and Robbie. It is also part of her atonement for the guilt she has made, so she sees it as a kind to give them a happy ending in the play, the only way she is able to.

The characters in the *Atonement* develop over the course of the novel and are inured to the sufferings of the adult world, they grow progressively less innocent. This universal loss of innocence is largely catalyzed by Lola's rape and Briony's false testimony. As a 13-year-old, Briony naively believes that she understands love and virtue and can flawlessly interpret her surroundings and her incorrect interpretations have disastrous consequences.

Robbie and Cecilia, the two people most directly harmed by Briony's lie, also lose a great deal of innocence as a result. Once a promising medical student, Robbie is forced to jail by Briony and he has to focus his attention on his own survival during wartime. Paul a close friend of the Tallis' eldest son, Leon rapes Lola, a fifteen year old child. He then allows Robbie to take the blame for it. Paul is protected by his class. He is not considered a suspect because he is from a rich upper class. He then goes on to marry Lola. Paul faces no consequences for his actions whereas Robbie was accused for no fault of his.

Cecilia is fiercely loyal to Robbie and cuts ties with her family after Robbie's arrest. When he is taken away by the police Cecilia claims her promise again and again in all her letters to Robbie. “I'll wait for you. Come back” (202-203). She works as a nurse during the Second World War and is killed during the Blitz.

Robbie instead of cultivating his intellect learnt to treat suffering; he overlooks others' suffering to ensure that he escapes France alive. Briony's false testimony against Robbie 's innocence due to his class background contributes to the fact that many of those around him believe he has raped Lola. Robbie is passionate and remains loyal to Cecilia until he loses his life in the war. Cecilia Tallis who is in love with Robbie Turner, the Tallis family's housekeeper had a stunted progress by the loss of Robbie and then of her own life.

Lola also loses innocence when Paul rapes her. Not only is she traumatically introduced to a violent, unsafe world, in the aftermath she allows herself to become complicit in Briony's lie. This complicity compounds itself further when Lola marries

her rapist, Paul. From then on, she must consider her victimization from a coldly pragmatic perspective not to allow the truth to surface for it would undermine her husband, and her own high social status which she gained through the marriage.

The last section of *Atonement* is set in the year 1999. It is in the form of a diary entry by Briony who is then seventy-seven years old and a famous novelist. However, she also suffers from dementia. The diary entry reveals that Briony has been the author of the previous sections of the novel *Atonement* and that it is written in an attempt to make up for the suffering she unintentionally inflicted on Cecilia and Robbie. It is also revealed that not all of what she wrote was true. The section in which Briony encounters Robbie in Cecilia's apartment, the two reunited, is fictional. In reality, Robbie died of his injuries in Dunkirk and Cecilia died during the bombing in the Blitz. Briony believed the two deserved a happy ending after all they had suffered.

The theme of innocence and its loss extends beyond Briony to encompass the broader context of the novel, particularly through the depiction of war. The onset of World War II serves as a backdrop that strips away the characters' innocence on a grand scale. Robbie's experiences in the war reveal the brutal and dehumanizing aspects of conflict, contrasting sharply with his earlier, more idyllic life.

Through the literary technique of stream of consciousness, fore shadowing, and unreliable narrator Ian McEwan explores the sneak peek into the inner conflicts and wars of the central characters like Briony, Robbie and Cecilia. The three different time periods are told from different point of view. The first part of the novel is told from the point of view of 13 years old Briony, the second part is told largely from Robbie's point of view who is a soldier in the World War Second and the third part is again told from the old Briony's point of view. This structure allows the readers, to grasp the complexities of guilt, atonement and truth.

By using Briony as the narrator of the novel, McEwan makes it clear how easy it is for people and in particular for authors to create their own narrative. He shows it inside the story via the events in Briony's childhood, where her false statement has serious consequences. And he shows it outside the story, by letting Briony reveal, what we just read isn't quite what has happened. She meant to write the truth as some sort of atonement. But in the end she couldn't do it. Briony muses that all of the involved parties will soon be dead. Only her version of the truth will survive through her novel. Briony asks: "How can a novelist achieve atonement when, with her absolute power of deciding outcomes, she is also God?" (371).

In *Atonement*, the loss of innocence is a central theme that affects both the characters and the story itself. Briony's childhood misunderstanding leads to devastating consequences, while war exposes the harsh realities of life. Through love, guilt, and the search for redemption, Ian McEwan shows how innocence is inevitably lost. This loss deeply impacts the characters, shaping how they see themselves and the world around them. The novel *Atonement* is a powerful story about human nature, the flaws in the perceptions of the characters and the ongoing need for forgiveness and understanding.

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Dominance and Defiance: Gendered Power Structures in Toni**Morrison's *Paradise*****Thanga Rathi J.**

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

This paper examines the tensions between male authority and female autonomy in *Paradise* by Toni Morrison. It explores the conflict between the Old and New Fathers in Ruby, revealing how both perpetuate patriarchal control. The Oven symbolizes cultural resilience and male authority. The study draws parallels between *Paradise* and *Beloved*, highlighting how trauma, shame, and masculinity shape the men's actions. Through an analysis of Elder and the Convent women, Morrison critiques the transformation of protection into oppression. The study reveals how Ruby's men, in safeguarding their identity, recreate the dominance they sought to escape. It also considers how the Convent women's resistance challenges patriarchal power, emphasizing the need to redefine identity beyond oppression.

Key words: Masculinity, Patriarchy, Female autonomy, Racial purity, Trauma, Control, Oppression.

African literature, rooted in oral and written traditions, reflects the continent's history, culture, and contemporary experiences. Writers like Chinua Achebe, Ngũgĩ wa Thiong'o, and Toni Morrison use literature to preserve culture, challenge historical narratives, and address social issues. Toni Morrison (1931–2019), the first Black woman to win the Nobel Prize in Literature, redefined Black representation through works like *Beloved*, *Song of Solomon*, and *Paradise*. Blending history, folklore, and myth, her novels explore race, memory, and power.

In Toni Morrison's, *Paradise*, intricately explores the tensions between male authority and the subjugation of women through the conflicting ideologies of the Old and New Fathers in the town of Ruby. The term "Founding Fathers" signifies the patriarchy that governs Ruby, as men establish the rules, oversee the functioning of society, and assume the role of "protectors" within their community. However, despite the attempts by the New Fathers to reform the practices of the Old Fathers, both groups ultimately perpetuate the same oppressive structures. Under the rule of the Old Fathers, women were subjected to hard labour, their lives consumed by constant work. Even with the arrival of the New Fathers, these women faced deeper levels of exploitation and

control, with some even being killed by men who perceived them as a threat to their authority.

The Oven in *Paradise* is a powerful symbol of the Old Fathers' resilience and the way they sought to preserve their cultural identity in the face of adversity. The Old Fathers, descendants of freed Black slaves, endured significant hardships and were displaced from positions of power in white-dominated society. This displacement led them to establish the town of Haven as a place of refuge, where they could rebuild their lives and ensure the protection of their people, especially the women, from the external threats of exploitation and subjugation. The Oven, located at the heart of the town, is more than just a place for preparing food. It represents the communal effort of the Old Fathers to maintain control over their community's identity and uphold a sense of dignity and autonomy. It stands as a symbol of the town's survival through their physical labour and their determination to remain untarnished by the degradation of white society. As Morrison writes, "The Oven was central to everything in Haven... They baked, they prayed, and they kept things secret here" (113).

A key aspect of the Oven's symbolism is its role in protecting women from exploitation. During and after the era of slavery, Black women were often subjected to sexual violence in white households. The Old Fathers took deliberate steps to prevent their women from working in these environments, as they saw it as a form of vulnerability to sexual abuse and the erosion of their dignity. By keeping their women within the safety of Haven and within their own community, the Old Fathers maintained control over their women's labour and their bodies. The communal kitchen served as a safe space where women could contribute to the community in ways that preserved their autonomy and purity. The contrast between the Oven and the white man's kitchen deepens the significance of the symbol. The white man's kitchen is viewed as a site of exploitation, where Black women are vulnerable to sexual assault and the objectification of their labour. In stark opposition, the Oven within the town is a place of racial and cultural autonomy. It symbolizes a rejection of the racial hierarchies imposed by white society and the creation of a safe space for the Black community to flourish, free from the historical exploitation they experienced.

The Oven reflects the Old Fathers' belief in the purity of their heritage. Their dark skin, which had been historically marginalized and oppressed, becomes a symbol of strength and untarnished lineage. The Old Fathers viewed their ability to preserve their cultural and racial identity in the face of external pressures as a mark of honour. The

Oven, thus, is more than just a place of cooking; it is a representation of their commitment to keeping their community's heritage intact and to shielding their women from the types of violence and exploitation that had been all too common in the outside world. This connection between the Oven, racial autonomy, and the safeguarding of women's dignity encapsulates the Old Fathers' vision of a self-sustaining and protected community in Haven.

Cynthia Griffin Wolff's observations in her analysis of the enslaved woman's voice in American literature reveal an important parallel to Morrison's *Beloved* (1987), which explores the moral and emotional turmoil of enslaved mothers. In *Beloved*, Sethe's choice to kill her children rather than let them endure the horrors of enslavement emphasizes the depth of a mother's protective love, a theme that resonates with the eight rock men of Ruby. The character of Halle in *Beloved*, Sethe's husband, embodies the destruction of a man's identity when he fails to protect his wife from assault, leading to his mental breakdown. Similarly, the men of Ruby derive their sense of self from their ability to protect their women. They view their masculinity and pride as inseparable from their role as protectors, but their failure to shield women from harm such as the humiliation of being rejected for shelter in the town of Fairly becomes a defining trauma. This collective shame shapes their identity and fuels their determination to control their women to avoid repeating past failures.

The theme of protection resonates with the eight-rock men of *Paradise*. The character Halle, Sethe's husband, embodies this struggle. His inability to protect his wife from assault when schoolteacher's nephews steal her milk destroys him, leading to his mental breakdown (64-66). Likewise, the men of Ruby derive their identity from their ability to shield their women from harm. Their collective trauma stems from past humiliations, particularly the rejection they faced in Fairly, a town that refused them shelter. This exclusion deeply wounded them:

"It was the shame of seeing one's pregnant wife or sister or daughter refused shelter that had rocked them, and changed them for all time. ... The humiliation did more than rankle; it threatened to crack open their bones. ... They wanted more than control; they wanted absolution, vindication. ... Not only from the men who had turned them away but from the women who had witnessed it. ... They had to prove ... that they were still men" (95).

The men of Ruby's reaction to rejection in Fairly reveals a deep connection between

shame, pride, and protection. According to J. Brooks Bouson's work, the trauma experienced by Black men and women in Toni Morrison's novels leads to internalized emotional damage and a desire for control. In *Paradise*, this trauma triggers shame, linked to racial pride and purity, driving the men's need to protect their identity and masculinity. This response mirrors Paul D's character in *Beloved*, who also asserts control due to past trauma. Bouson's analysis highlights how internalized trauma fuels the men's violent actions toward the Convent women, stemming from a desire to safeguard their racial and masculine identity.

The sense of duty that the men of Ruby feel toward protecting their women is deeply connected to sacrifice. They view their actions such as buying winter coats and blue dresses for their wives from the first harvest of as sacred offerings. These gestures serve to reinforce their perception of women as sacred figures who must be protected at all costs. The construction of the Oven in Haven symbolizes their triumph over the economic dependency that would force women into servitude in white kitchens. It serves as a sign of their autonomy and a means of providing for their families, preserving a sense of community and racial dignity.

After Haven deteriorates, Ruby is founded as a refuge to protect women from external threats. The men of Ruby see the outside world as a danger zone, where their families are vulnerable. As one resident describes it: "Where your children were prey, your women quarry, and where your very person could be annulled" (16). This quote highlights the men's perception of the outside world as a place where their loved ones are constantly at risk. This mindset shapes their ideal of masculinity, which emphasizes protecting women and maintaining domestic order. The Morgan twins, Steward, and Deek, exemplify this mindset, believing that women's roles are tied to purity, order, and domestic stability.

The New Fathers see their identity as rooted in their duty to provide and protect like the old fathers. They aggressively repel any external influence that could disrupt their carefully maintained order. When a group of outsiders arrives in Ruby and harasses local women with lewd gestures, the townsmen immediately take action, confronting the intruders with their weapons. This fierce protectiveness eventually culminates in their attack on the Convent. As Tally argues, their obsession with maintaining Ruby's purity drives them to view the women of the Convent as a corrupting force that must be eliminated.

In *Paradise*, Toni Morrison contrasts the men of Ruby with the women of the

Convent, particularly in terms of protection, control, and freedom. This contrast underscores the complexities of gender roles, power dynamics, and identity in the novel. The men of Ruby, led by figures like the Morgan twins (Steward and Deek), define masculinity through their role as protectors. They believe their duty is to shield women, uphold racial purity, and preserve the town's idealized order. However, this protection is inseparable from control. By dictating the roles of women expecting them to be obedient, domestic, and aligned with Ruby's values the men reinforce rigid structures that limit women's autonomy. Their obsession with protection is driven by a deep-seated fear of vulnerability, particularly stemming from the humiliation of being rejected by Fairly. This trauma fuels their need to assert dominance over Ruby's women as a means of restoring their own sense of power and masculinity.

The women of the Convent Mavis, Gigi, and Seneca reject these imposed roles, each shaped by personal histories of trauma and marginalization. Mavis, a mother who lost her children in a tragic accident, flees societal judgment and her oppressive family life, seeking refuge in the Convent. Gigi, having endured abandonment and an abusive relationship, chooses independence over conformity. Seneca, scarred by sexual abuse and emotional neglect, distrusts traditional family structures and seeks healing and autonomy away from patriarchal control. Their choice to live at the Convent represents a form of resistance against Ruby's rigid gender norms. In contrast to the men's belief in control through protection, the women assert independence through defiance, highlighting the novel's exploration of gender, power, and identity.

This tension between protection and autonomy culminates in violence. The men, perceiving the Convent as a threat, launch an attack, believing their actions are justified in the name of order. Their obsession with purity and control ultimately leads to destruction, while the women's self-determination challenges these structures without resorting to violence. The novel suggests that rigid patriarchal control is self-destructive, whereas autonomy offers the possibility of liberation.

Elder, the older brother of Steward and Deek, embodies the psychological consequences of the men's fixation on protection. His experience illustrates how this impulse, rather than stemming from genuine care, evolves into domination and oppression. Elder's failure to protect a Black woman from a violent assault haunts him, revealing the fragile foundation of the masculine identity constructed around protection. Unlike his brothers, who dismiss the assaulted woman as insignificant, elder refuses to ignore her suffering. Morrison writes, "He saw himself, always, as her defender" (213),

highlighting his deeply ingrained belief that protection defines his masculinity. However, his inability to prevent the assault leaves him feeling emasculated. His failure is symbolized by his refusal to mend his stained uniform a metaphor for his damaged self-perception. Morrison describes, “He couldn’t mend the uniform. He couldn’t repair it... it had to stay that way, stained” (214). The uniform represents his identity as a protector, and his refusal to fix it reflects his unresolved guilt. His masculinity, tied to his ability to safeguard women, is now tainted by perceived failure.

Elder’s experience mirrors the broader pattern in *Paradise*, where the men of Ruby’s need for control escalates in response to perceived failures. Their obsession with protecting women is not rooted in respect for female autonomy but in a desperate attempt to maintain power. When this power is challenged whether by an external rejection (as with Fairly) or by independent women (as with the Convent) the men react with violence and repression.

The men of Ruby replicate the very systems of dominance they sought to escape. Originally fleeing racial violence and subjugation, they recreate hierarchical control within their own community. Their insistence on purity and order becomes a means of oppression, as Morrison states, “Their women were for purity, for order. They were a part of the structure” (96). Protection becomes a tool for maintaining patriarchal dominance, stifling women’s freedom rather than ensuring their safety.

Elder's failure to protect the woman exposes the fragility of the men's constructed identity. By defining masculinity through control, they reinforce oppressive systems that ultimately lead to their downfall. As Morrison states, "It was not just the defeat of the woman they wanted to control, but the complete structure that they had built around themselves" (104). This highlights how their rigid adherence to power and protection proves self-destructive. In their quest for dominance, the men of Ruby create an unsustainable power structure. Their narrow definition of masculinity fuels a cycle of control and oppression that consumes them. Morrison underscores how rigid power inevitably collapses, as their refusal to acknowledge women's autonomy leads to the destruction of both their community and their own identity.

This research paper examines *Paradise* through the themes of patriarchal power, protection, and gender dynamics in Ruby. The novel critiques masculinity as a form of dominance rather than mutual respect, reinforcing systems of control. The Oven symbolizes cultural heritage but also represents ideological conflict. Haunted by historical rejection, Ruby’s men strive for racial purity and social order, yet their

obsession with control leads to repression and violence. In contrast, the Convent women reject traditional roles, challenging these rigid structures. Their conflict culminates in a violent climax, underscoring Morrison's critique of patriarchy. *Paradise* reveals how rigid power structures lead to destruction, while autonomy and self-definition offer paths to liberation.

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Trapped in Time: The Psychological Toll of Captivity in Emma Donoghue's *Room*

Tharani P.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Captivity refers to the state of being confined or imprisoned, where individuals are restricted in their freedom of movement. This includes situations such as incarceration in prisons, detention during war time, human trafficking and other forms of involuntary confinement. Human captivity can be enforced by legal systems or through coercive means. The most apparent feature is physical confinement within a limited space, which can vary significantly in size and quality depending on the context. Individuals in captivity often experience a lack of control over their environment and daily activities. This loss of autonomy can lead to psychological stress and behavioural changes. This paper explores the trauma of the character of Ma in Emma Donoghue's *Room*. The objective of this paper is to analyse Ma's journey of traumatic recovery, considering the various factors that cause her trauma and hinder her recovery as well as the factors that help her cope with trauma and contribute to her recovery.

Keywords: Confinement, Trauma, Sexual abuse, Incarceration.

Literature has been defined as a body of writings that possesses aesthetic excellence and conveys ideas of permanent or universal interest. Literature can be categorised into several forms, Poetry, Prose, Drama and Essays. It serves multiple functions in society: it can entertain, inform, preserve culture and critique social norms. It also includes oral traditions that have been transcribed over time. It often explores universal themes and ideas, such as love, loss, identity, morality and human condition.

It provides insights into the culture, history and values of a particular time and place. English literature encompasses a vast body of written works produced in the English language, originating from the British Isles and extending to various parts of the world influenced by English culture.

Captivity is unique compared to other traumatic experiences because it involves prolonged exposure to distressing conditions without an end in sight. Victims are often entirely dependent on their captors for basic needs such as food, water and safety. This dependency creates a sense of helplessness and despair, which can severely impact

mental health. Research indicates that the psychological consequences of captivity can manifest as post-traumatic stress disorder (PTSD), anxiety disorders, depression and other emotional disturbances. Studies have shown that the effects of captivity can persist for decades after release. Survivors may experience flashbacks, nightmare and severe anxiety when reminded of their traumatic experiences. Additionally, they may struggle with trust issues and difficulties in forming relationships due to the betrayal experienced during captivity. The chronic nature of these psychological effects underscores the importance of recognising them as serious public health concerns.

Emma Donoghue is an Irish-Canadian author, literary historian and screenwriter. Her novel *Room* was published in 2010 and became an international bestseller. It won the Hughes & Hughes Irish Novel of the Year, the Rogers Writers' Trust Fiction Prize (for best Canadian novel), the Commonwealth Prize (Canada & Caribbean Region), the Canadian Booksellers' Association Libris Awards (Fiction Book and Author of the Year), the Forest of Reading Evergreen Award, the W. H. Smith Paperback of the Year Award and the University of Canberra Book of the Year. It was shortlisted for the 2011 Orange Prize, was shortlisted for Man Booker Prize and won the Commonwealth Writers' Prize, the regional prize (Caribbean and Canada) in 2011.

Donoghue's portrayal of Ma's experience highlights not only the physical aspects of captivity but also the profound psychological impact it has on both her and Jack. The isolation they endure creates a unique dynamic where Ma must create a nurturing environment within an oppressive space, showcasing her strength as a mother despite overwhelming circumstances. The effects of isolation are vividly depicted through Jack's perspective, which serves as both a lens for understanding trauma and a means to convey innocence amidst horror. His limited worldview shaped entirely by his life in the room reflects how trauma can distort reality for victims. According to Herman, "Traumatic events are extraordinary, not because they occur rarely, but rather because they overwhelm the ordinary human adaptations to life" (24). The narrative emphasises how Jack's development is influenced by his mother's efforts to provide him with love and education despite their dire situation.

The novel starts with Ma preparing for Jack's fifth birthday. Therefore, at the age of five, he is very susceptible to internalising any traumatic experience. The timing of place detachment is potentially suitable to cause trauma in Jack. The children are much more vulnerable to traumatic experiences since trauma does not change the child's personality (as for adults); rather, it forms his personality. This is due to brain

development in early childhood. Jack could not develop the sense of privacy since his self was merged with that of Ma and the room. Jack, Ma and the room were three components of Jack's self, so he could not distinguish between self and the other. On the other hand, spatial properties of his birthplace did not allow him to distinguish between boundaries. A traumatising experience is usually magnified in its effect for a child victim and leaves him helpless and vulnerable. A child who has experienced trauma may create a magical guardian to communicate and ask for protection. Once Jack is cut off from the room and from Ma, he holds her tooth in his mouth as a magical defender. "I suck on Tooth that's Ma, a bit of her" (320). Jack sucks on Ma's tooth even when Ma isn't around to breastfeed him.

Psychological violence includes mental, emotional and verbal abuse. It is said in Emma Donoghue's *Room* that Ma confronted new conditions that she had never imagined before. Ma was nineteen when she was kidnapped and like any innocent girl oblivious to a stranger's main intention, Ma easily believes what Old Nick says and rushes to examine the dog's status. The man used the dog as an object to capture Ma's attention and feelings:

"Anyway—this man ran up asking for help, his dog was having a fit and he thought it might be dying."

"What's he called?" "The man?"

I shake my head. "The dog."

"No, the dog was just a trick to get me into his pickup truck. Old Nick's truck." (116-117)

The conversation shows Ma explaining to her son why she was trapped in the room. It is clear that Ma wants to help the dog, but trusting a man whom she has never met makes her life miserable. Ma believes anyone, whether they are telling the truth or not. Unfortunately, Ma falls into a trap and is locked in a room for nearly two years with no one to care for her. The man comes to give her food, vitamins and clothes.

Ma cannot reject the man in this state since despair and tension cloud her thoughts. She tries not to whine about what has happened to her. A year has passed and Ma still refuses to see the man's face or communicate with him. In her heart, her only desire is to get out of the room. Nightmares and anxiety torture Ma for a few months until she can accept her new condition, even though she desperately wants to escape it deep down. Staying in the room denies her the freedom other people enjoy, which

diminishes her wonderful days: “Old Nick--I didn’t even know him, I was nineteen. He stole me” (116). Ma is nineteen years old when an unknown person takes her. She tries to flee before the stranger drags her away to an unknown location, but nothing she does helps. The room is fortified with a security system code and only the man who knows the password may supply Ma with food and vitamins. Even though Ma has all her daily needs met, she is nonetheless depressed because she has no one to talk to and this is the first time she has been kidnapped.

Jack has only ever seen one other person besides his mom and that is Old Nick. Old Nick visits the room at night time while young Jack sleeps in a wardrobe, hidden as much as he can be. Old Nick brings food and necessities to the room, but poor young Jack is unaware that Old Nick kidnapped Ma when she was nineteen years old and he has kept her imprisoned for the past seven years. Old Nick regularly rapes Ma each night and Jack is the product of one such sexual assault. Before Jack was born, she suffered a miscarriage. She attempts to escape twice by smashing a toilet lid over Old Nick’s head, but he catches her and breaks her wrist. During a visit, Old Nick calls out for Jack in front of the wardrobe and asks Ma: “You’ve never let me get a good look since the day he was born. Poor little freak’s got two heads or something?” (90). Then Ma diverts him by inviting him to the bed. Ma deliberately acts with an emotional bond with the captor for survival.

Ma experiences sleep disturbance. The statement, “I couldn’t sleep without pills” (235), strengthens that Ma has to take sleeping pills before sleep so that she can sleep. Difficulty in to sleep is a signal of stress and worry. On the other hand, there are some depressive conditions in which sleep is increased. It can be seen in the quotation, “I used to be scared to go to sleep, in case he came back,” states Ma, “but when I was asleep was the only time I wasn’t crying, so I slept about sixteen hours a day” (118). The quotation authenticates that it is not only difficult for the victims of depression to sleep, but it can also increase their sleep duration.

Ma suffered from emotional and mental anguish for a long time after being abducted for seven years. She must handle the circumstance and observe Old Nick’s behaviour to figure out how to leave the room. She swears to keep Jack safe from Old Nick since the day he was born. Ma had to have sex with Old Nick practically every day when he got into the room at 9.00 p.m. She cannot fight the man until she has a son. Despite having one, she is still forced to do it. Jack observes: “I don’t think he came last night after nine, the air’s always different if he came. I don’t ask because she doesn’t

like saying about him” (4). Ma is in a completely different scenario. Despite having a partner to converse with, Ma’s psychological health did not improve. She cannot defend herself while also complying with the man’s demands. Ma is unable to refuse Old Nick’s request for sex since it has been ingrained in her. This proves that instead of putting herself in danger, Ma always obeys and submits to the man. Foucault asserts that “normalisation is one of the great instruments of power” (184). Old Nick normalizes his food timetable by conditioning Ma and Jack to expect food at specific times. Moreover, by consistently employing the same punishment of depriving them of food and electricity, he problematically normalizes his punitive methods.

Ma tries hard to force her son to run away from the place where they are treated like prisoners. Jack, a boy who has just turned five, is strongly encouraged by his mother to learn to run away. All of this is done by Ma for their own good. Jack attempts to keep in his mind what Ma has said so that he can get out of the room. Eric D. Lister notes that “When one is physically vulnerable, fearing further violence or death, this forced silence necessarily shapes subsequent reaction to the trauma” (872). However, because their effort to escape does not go smoothly as Ma predicted, it causes huge trauma for Jack. Even though it does not go smoothly, in the end, Jack manages to bring himself and Ma free from the room they have been living in. He says:

....Oh, I have to Wiggle Out, I was forgetting. I start to do like a snake, But Rug’s got tighter I don’t know how, I’m stuck I’m stuck. Ma Ma Ma... I can’t get out like we practiced even though we practiced and Practiced, it’s all gone wrong, sorry. Old Nick’s going to take me to a Place and bury me and the worms crawl in the worms crawl out... I’m Crying again, my nose is running, my arms are knotted under my chest, I’m fighting Rug because she’s not my friend anymore. I’m kicking like Karate but she’s got me, she’s the shroud for the corpses to fall in the Sea.... (172-73)

With the above point in mind, the process of escaping is not as smooth as Ma and Jack had imagined. The process makes Jack very depressed and scared. He is afraid that Old Nick will bury him and he is also scared that Ma will be disappointed with him. Although in the end he succeeds, still the course of incident seems terrible for his mind. He finds it hard to forget the way he managed to escape.

Jack and Ma lived together for an unpredictable time and Ma tried as hard as possible to educate Jack until Jack was five years old. As long as they become captives in

the narrow room, it makes them unknown to the world outside of the room. However, there are a lot of things he can find. Therefore, when he manages to get out of that narrow room that has already become the centre of his life, he is confused, afraid of the crowd and traumatised wondering if one day he will return to that cramped place again.

Ma and Jack acclimate and adapt to their changing contexts. Theirs is a mutually dependent and nourishing relationship that provides strength to each other. Andrea O'Reilly in her article entitled "All Those Years I Kept Him Safe: Maternal practice as Redemption and Resistance in Emma Donoghue's *Room*" states: "the birth of Jack gives purpose to Ma's life in room and enables her to endure captivity through his love and their companionship" (95). Early on, Ma gives Jack the mantra of "Mind over Matter". She tells him, "If we don't mind, it doesn't matter" (11). Over the years, it has been suggested that mind over matter is an essential part of healthy living. Jack and Ma are on the outside; they need to really define who they are and what they hope to become. They will have to change to reinvent or reincarnate themselves; day by day, event by event.

Posttraumatic stress disorder is a mental disorder that can develop after a person is exposed to a traumatic event, such as sexual assault, warfare, traffic collisions, or other threats on a person's life. According to Cathy Caruth, "the precise definition of post-traumatic stress disorder is contested, most descriptions generally agree that there is a response, sometimes delayed, to an overwhelming event or events, which takes the form of repeated, intrusive hallucinations, dreams, thoughts or behaviours stemming from the event, along with numbing that may have begun during or after the experience" (4). Jack's success in escaping from Old Nick, causes enormous trauma. Nevertheless, the escape process he experiences does not run smoothly. Even after knowing the outside world, Jack still feels comfortable in that room, but, he does not want to go back there. However, there is fear for Jack if one day he and his mother would return to that small room again.

Post-escape, inside the hospital, after his first night, when he wakes up in a room full of natural sunlight, he notices that he has wet the bed and apologises to Ma. For a child who has suffered trauma or is scared or has had nightmares, bedwetting is a sign of their mental anguish. This nocturnal enuresis clearly indicates the anxiety and immense stress felt by him in the outside world. He not only had to get accustomed to the idea that the outside world is a lot bigger than he had been told about, but also that, they would never return to the room again. From a child's perspective, he feels that it is a temporary displacement and longs to go back to familiar surroundings. Similarly, Ma feels

disconnected from her surroundings because her childhood home and the relations within that space have changed so much in the seven years that she had been gone. This feeling of dissociation is often reported by survivors of sexual violence, wherein the person experiences detachment from their surroundings, depersonalisation and lessened reactivity. She views her incarceration in a different light than before, as she feels that life has moved on for everybody in a positive direction apart from hers. She grapples with post-traumatic stress disorder (PTSD), a negative sense of identity with reduced self-esteem and efficacy, in her former safe haven. She also lashes out at her mother Nancy and blames her for teaching her to be good to strangers, which resulted in her incarceration by Old Nick.

Ma's traumatic experiences also affect her relationship with her parents. Her parents thought that she had died and had even organised a funeral service for her. She also comes to find that her mother and father have moved on in their lives – they have separated and her mother has found a new partner. Ma is not happy about this, as she acts cold towards Leo, her mother's new partner. Furthermore, when Ma's father flies in from Australia to visit her, he is unable to accept Jack as his grandson, because, in his eyes, Jack is a product of her daughter's repeated rape. When Ma first tries to introduce her father and Jack to each other, Ma's father does not want to talk to Jack or even be in the same room, saying, "But all I can think of is that beast and what he" (282). Ma is extremely frustrated by his inability to accept his grandson and it creates tension between them.

Unfortunately, Ma can't run away from her past the way she wants to. She tries to take a bunch of pills to kill herself, but she survives. While recuperating, she's absent for a whole part of the novel. Jack proves to her that she can't move on without seeing the room again one more time. He suggests to see it and she agrees to go with him because she feels she needs to see it and accept it before she can move on. And just as Jack always relied on her, she has to learn to rely on him a bit, too. *Room* powerfully illustrates that trauma is not merely an individual experience but a multifaced phenomenon that affects relationships, societal perceptions and personal identities. Through its vivid portrayal of Ma's struggles alongside Jack's innocent perspective, the novel suggests that while trauma leaves indelible marks on individuals, there exists hope for healing through connection, love and understanding.

This research paper attempts to examine the multifaced influence that confinement can exert on individuals. It is also observed that, isolation from human

connection transforms the individual's identity, perception of freedom and society, as well as some fundamental concepts, such as reality and normalcy. The individual experiences a kind of psychological and social paralysis as soon as he moved to live once again in the free community.

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Confinement and Resistance: Gender Roles and Marriage in Edith Wharton's *The Age of Innocence*

Vesta Serapha F.

PG And Research Department of English, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

Edith Wharton's *The Age of Innocence*, which won the Pulitzer Prize, paints a vivid picture of 19th-century New York's rigid social codes, showing how women like May Welland and Ellen Olenska navigate expectations of innocence, marriage, and duty—one by following the rules, the other by daring to break them. This paper explores the intricate gender dynamics in Edith Wharton's *The Age of Innocence*, focusing on the rigid societal expectations placed on men and women in 19th-century New York. Wharton illustrates how women are trapped within narrow roles defined by sexual innocence, marriage, and social duty. Wharton exposes the silent struggles and calculated power plays required for women to survive through the contrasting characters of May Welland and Ellen Olenska. May embodies the obedient wife and she subtly manipulates circumstances to preserve her marriage. Ellen, on the other hand, dares to defy these suffocating norms. Ellen's departure from New York reflects both personal liberation and the price society demands for nonconformity. Wharton critiques the deeply ingrained gender codes of her era by paralleling Ellen's experiences with aspects of her own life.

Keywords: gender, marriage, patriarchy, divorce, autonomy, freedom, independence.

Edith Wharton's *The Age of Innocence* offers a piercing examination of the strict social codes that governed 19th-century New York, particularly the roles and expectations imposed on women. Beneath the polished surface of upper-class society lies a world where appearances are meticulously maintained, and individuals who dare to challenge tradition face subtle but severe consequences. At the heart of this world are two contrasting female figures: May Welland, the picture of compliance and societal perfection, and Ellen Olenska, a woman who dares to seek autonomy and self-fulfillment despite society's disapproval. Through these characters, Wharton explores the tension between personal freedom and social obligation, exposing the hidden sacrifices and quiet forms of resistance practiced by women constrained by rigid gender norms.

This study aims to analyze how Wharton uses the characters of May and Ellen to

critique the oppressive gender expectations of her time, with a particular focus on how women navigate power within the limitations placed upon them. By examining the complex ways both women assert control—whether through subtle manipulation or open defiance—this paper seeks to highlight Wharton’s commentary on the silent struggles for identity, agency, and survival within an unforgiving social structure.

Gender plays an important role in Edith Wharton’s *The Age of Innocence* as each gender has been assigned its own respective freedoms and restrictions. Female subordination seems to be the most severe. Just to protect their dignity, women must be submissive to their societal ties or suffer the possibility of being ostracized. They are expected to maintain total sexual innocence at all times. They must seem to appear overly dutiful and loyal. It seems the only restriction men have is their jobs, which they toil at un- feverously. Both sides of the gender spectrum also had powers granted to them solely due to their gender. Although it may not appear that women have any powers, it’s merely because they are overshadowed by the cons of being a woman in this society. Women, most importantly, have the power to get pregnant. Although this may seem like a menial power or even a burden, pregnancy can be tactical.

Wharton describes the transformation of a single girl into a married woman. She showed how uneducated the girls were with love and marriage matters. Although the proper education can bring success, as could be seen in example of May, who was closed in her cage. She did not have any unimportant questions about marriage and she accepted her role at all circumstances.

Although powerful in social terms in the society, women were dependent on men to provide for them. If a woman came from a wealthy family, she might be fortunate enough to have a sum of money to contribute to the marriage, but women expected their husband to take care of all of their material needs. Women were expected to behave in certain ways, especially in the upper class. They were to master domestic skills, such as needlework, and they were never to challenge men or be unpleasant. A virtuous woman was one who was pretty, elegant, and compliant. In *The Age of Innocence*, May represents the New York society ideal, while Ellen hints at the strides being made for female independence outside the tightly knit New York community.

May’s marriage was happier and she was not childless. Wharton states that “a girl is only a sketch; a married woman is the finished picture” (New Frenchwoman 294), so Ellen comes to New York as a whole woman, however she was not accepted in society, although, it is only the married woman who counts as a social factor. She was

married but seeking divorce, by which she again lost on the social ladder. May and Newland's marriage was the same according to the general pattern that is the wife's efforts concentrated on home-making and child rearing. Newland outweighed this concept with the idea of being "the husband of one of the handsomest and most popular young married women in New York...one of the sweetest and most reasonable wives" (176). While looking at her appearance he had pleasant feeling of proprietorship, unfortunately, he could not forget about Ellen, he could not get her appearance out of his mind.

May wanted Newland to be happy, however, individual happiness was not the primary aim for the 19th century society. Newland did not realize that behind his back May had a plan. Cooperating together with all her family, she wanted to send Ellen away. The whole family wanted her to go back to her husband, where her rightful place was. On the contrary, Ellen and Newland were sort of manipulated, by May and her family. Edmund Wilson in *Justice to Edith Wharton* generalizes men in Wharton's novel "men are usually captured and dominated by women of conventional morals and middle class ideals" (352). Ellen was always positive about May, who was her nice cousin, who helped her to assimilate in New York. Ellen did not see the intrigues behind her back.

Ellen did not want to steal May's husband from her, she could have had him, however not as a husband as he was already married, but as a lover, which she refused. She had the instinct of self-preservation and she was also moral. To run from her husband did not mean that she was immoral. Ellen accepts the rules of the sexual and social game as determined by the society. The basic laws of this game are that a mistress has no rights and that a wife may use means as she has the rights necessary to preserve her marriage and the honour of her family. Ellen in that case would not like to be a mistress because a mistress does not have any right and she wanted to be free and have her rights. May in the same case has the right to fight for saving her marriage and she later uses all possible means. Ellen understands that the protection that society provides must not be relinquished. The code of behaviour prevents her from becoming a mistress and Newland from spiraling into professional and personal ruin.

May, according to Newland, did not have imagination and their life would be monotonous, of which Newland was afraid. He later lacked excitement, which he experienced with Ellen. She was always herself and she was a huge personality. May, on the other hand echoed what he told her at the time of their engagement, but later in the marriage she developed her own opinion. However, she was still doing what was

expected from the society, she did not like needlework, she was not good at it, but because other wives did it, she was knitting as well.

May wants to hide her willingness for Ellen to go far away, she would like to hide it in front of Newland, for him to think that she likes Ellen. “I’m afraid I haven’t been fair to her [Ellen] lately” (266). She plays the role of a wife who wants to keep her husband for herself and rather wants his mistress to go away. She does it with the help of her family without his knowledge, she uses all the tools she can and she has the right to do it, to save her marriage. Wharton made her to do it by intrigues rather than to persuade her husband or at least talk to him about it. It was a period when people apparently did not talk about such topics, and naturally May and Newland did not talk about their relationship at all.

May uses the most powerful lie to get back Ellen from New York. At one point in the story, Newland thinks that May hates Ellen. She would like not to hate her and she would like to help him to overcome his feelings towards Ellen. May found a perfect reason for Ellen to go away for the rest of their lives. While having a long talk with her she did not forget to mention to Ellen that she is expecting a baby with Newland. It was the last straw for Ellen and nothing could keep her from going back to Europe.

May made her triumph complete by organizing a farewell dinner for Ellen, to show how nice she is to her own cousin. May works unscrupulously to defend her position - that of married woman whose husband has no other duties but those of providing for, loving, her and their children. Newland fulfills his role. May uses a lie, because she was not sure about being pregnant while talking to Ellen about it. She uses the information as a weapon against Ellen and it becomes unethical, although she was fighting to save her marriage.

Wharton mentions May’s great satisfaction several times, apparently to show the amount of May’s feeling about her own action, “he [Newland] met May’s triumphant eyes” (286), “glitter of victory in his wife’s eyes” (287) and “her blue eyes wet with victory” (290). May did not tell anyone as to how she feels about her victory, not even to her husband, but she let him to perceive it through senses, through her eyes as she didn’t want to expose her other side.

Traditionally, marriage is the destination that all women are supposed to reach and the only way to be happy. Ellen was not single; she was married but not living with her husband in one household. For Ellen, however, an unhappy marriage is nothing more

than a restriction. She values her own freedom and she will ask for a divorce when her marriage is not working in the right way, though divorce is not favored by social customs. She was Europeanized, experienced, and therefore corrupted. She has fallen in love, however does not have an affair with the other man; she just enjoys life and a kind of freedom which does not really allow her to find mother man. Finally, she seeks divorce, and with the label divorced woman she leaves for Paris.

Ellen had possibility to go back to her husband. He also promised her to give her back her money, which was an attractive offer, however she refused it. She did not want to go back and experience the same cruelty as she did before, only for the sake of money. Ellen's life might seem strange to the readers. She ran from her husband and she could not have her beloved man, because he was already engaged. Ellen must have been a great woman and friend because she did not grab her chance to be with Newland but rather told him to marry May, even though, she loved him. The reader does not get the glimpse of how society in Paris perceived a young lady who was divorced from her husband.

Aristocratic privilege enabled some English ladies to flaunt middle-class standards: women intellectuals in Paris were not absolutely constrained by bourgeois codes. In the United States, however, increasing number of well- educated women seemed to be trapped by domesticity (Cuncliffe 286-7).

The society by Cuncliffe was not so bewildered by codes in Paris and it might be one of the reasons why Wharton left America for Paris. Wharton preferred France to England, because she did not stay in England, where she had many friends. She also sent Ellen to Paris, Ellen was apparently accepted by society more easily than anywhere else.

Ellen moved to Washington, because she could not stand, that in New York people did not have their own opinion but they all relied on the opinion of someone who was superordinate to them. It was not Ellen's habit, she was free in her opinions and she was willing to meet variety of people with free ideas, which was impossible in New York, where everyone was narrow-minded. She felt different from all those people and that might be the main reason why she did not try harder to participate in the life of the upper class New York society. They seem to be not worthy for her, she needed to communicate and she prizes good conversation even more than the heirloom jewels and priceless antiques that she married into. Ellen had this opinion because she knows of no country in which

there is so little independence of mind and real freedom of discussion as in America. Ellen needed to be livelier and freer, not to be tied with so many rules. Her later decision to move to France might have similar basis of free mind as France being more free spirited. But in New York was the man whom she loved and could not have, and therefore she did not want to be close to him.

Ellen's desire to leave New York might also have come from Wharton's impression about New York, she apparently did not like it much: "intolerable ugliness of New York" (Little Girl 256). On the contrary Ammons says that Wharton did not hate her country or feel aggrieved; she simply needed an older, richer environment in which to live and work. Having spent large portion of her youth in Europe, she settled abroad. Ammons seems to be apologizing for Wharton of her leaving America, but it seems that Wharton did not have any liking towards New York and she was deeply disappointed with her native country.

Some of the rules and principles of the 19th century New York society seem comparatively very strange. The "divorce was considered sociably unacceptable. This does not mean...that families were living happily and in harmony. A high rate of desertion and separation of couples took the place of legal divorce" (Haveren 255), which was partially Ellen's case. As it is mentioned in *Hastings History*, woman could not escape from cruel marriage, and until 1891 woman running from husband could be captured by police and returned to husband. The church, law and also the society approved of the situation. Ellen was lucky that her family saved her and did not return her to her husband. Primarily, Ellen longed for divorce, but the circumstances were unfavourable against her getting divorced so, unfortunately she was persuaded to remain in marriage. However, after she did not find any luck in America, she persisted on the divorce and reached it at the end.

Ammons explains Wharton's clear point that in America would Ellen never be independent, as well as Wharton. It seems that neither Newland's and May's marriage was as happy as others might have awaited. Newland never fully devoted himself to May which she knew, but apparently never complained about. What Newland has lost is not Ellen, but May, whom he never took pains to know or to love. May who knew all along the extent and the fullness of her husband's sacrifice, they both tried to remain in their marriage. It might be proof that people cared enough about the content and quality of family life and marriage to be willing to dissolve an unsatisfactory marriage. The problem with May and Newland might not have been deep to the extent of divorce,

because May loved Newland and he did not dislike her. May lived a proper life without scandals, being a perfect wife respected by husband and society. Newland proved to be loyal and faithful to her even after her death.

Newland was free to go to find Ellen, and his son Dallas wanted to help him to be happy after all, after spending the whole life longing for something unreachable. Now, when he had it in front of him, he did not go for it. He decides not to see Ellen. It might have been because of his loyalty to May, but it seems that he was more afraid of the meeting, than being loyal. Although, he has lived according to Old New York society's codes, he was missing something all of his life, he led "life without passion, without expression, without satisfaction" (Doren 386). He apparently did not know how he could apologize to Ellen, and therefore he sees only one possible way, to leave all as it is and not to see her. It was too late that he realized what the members of New York's elite think of one another is more important than individual effort, honour, or happiness.

Finally, Wharton made Newland realize such a problem, through his own son; however, Newland could not do much about his situation at the moment. It was too late and he was unable to act, he could only be dreaming of action. Wharton announced that the sealed society of Old New York, which could not admit of the marriage of Newland and the Countess, must inevitably open to modernity and to the wider world, and must thereby pass out existence and therefore Wharton puts Newland's family await the chance "Newland family... feels keenly the changes in New York society, vigilantly tracing 'each new crack in its surface'" (Bentley 454).

In the novel, different behaviors and manners are expected from both men and women. Professions such as banking or law, or politics were seen as more distinguished and acceptable for men. Women are expected to act according to society's conventions as innocent wives, mothers, and daughters. In *The Age of Innocence* Edith Wharton puts opposite options for both men and women, one is to follow the orders of the mainstream society and the other is to revolt from the forbiddance. From this the reader can see that her attitude towards the old gender roles and her understanding of human life are ambivalent.

In *The Age of Innocence* Wharton contemplates on marriage types in her time in America. In some occasions, a man owns a female and a female needs a man to ensure her what she wants in life. There are several qualities that the female is supposed to have in order to guarantee herself a male, which also leave her with no other power or ability at all. Women of innocence like May are trapped in their limited roles. Newland Archer

perceives May as a light under ice she embodies “the steadying sense of an unescapable duty” (176). Except for May, Mrs. Welland is also an example of socially required woman (she trains her daughter to be one as well). She believes in the prescribed gender relationship, which tells people the right and wrong. Her relationship with her husband serves for May as a model in her marriage. While women like Ellen, although they are mostly alien to the old society, they are still fearless in fighting for what they want. In that patriarchic society women must follow the rules that are determined by men. For example, in the novel, Lawrence Lefferts is an example of hypocrisy. He himself has numerous illegal love affairs but he severely criticizes Ellen for divorcing her husband. However, the New York society treated him with tolerance only because he is a male.

The society in which Wharton was reared and which she wrote was the feudal remainder of the traditional New York aristocracy. Edith Wharton’s *The Age of Innocence* beautifully echoes the pain of being a woman in a patriarchal social setting.

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Exploring the Power of Voice and Writing in Sandra Cisneros' *The House on Mango Street*

Vijaya Bala Priyaa S.

PG and Research Department of English, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract

The power of voice and writing is a key concept in Sandra Cisneros's novel *The House on Mango Street*. The novel moves around Esperanza a young Latina girl as she navigates the complexities of growing up in a poor urban neighbourhood. Despite the hardships her story unfolds through poetically crafted vignettes often incorporated in Spanglish language. Esperanza uses her writing to carve out her ideas and resist the limitations imposed on her by her socio-economic background and gender. Through her writing Esperanza imagines a life beyond the confines of Mango Street. The novel explores how Esperanza's self-expression and storytelling empower her to confront and transcend cultural and gender constraints.

Keywords: cultural heritage, complexities of life, resistance, gender constraints, selfexpression, freedom, personal identity

Sandra Cisneros is a poet, short story writer, novelist, and essayist, whose work explores the lives of the working class. *The House on Mango Street*, first published in 1984. The novel intricately weaves elements of Mexican-American culture with themes of social class, race, sexuality, identity, and gender. Cisneros is a dual citizen of the United States and Mexico, and currently lives in central Mexico. Cisneros' works often employ an episodic structure, as seen in *The House on Mango Street*, where each vignette stands alone but also contributes to a larger narrative.

In *The House on Mango Street*, Cisneros displays how powerful the words are. The vignettes, "Rafaela Who Drinks Coconut and Papaya Juice on Tuesdays" and "Mango Says Goodbye Sometimes" are the main sections out of the book that show the power of writing. Furthermore, the voice of the writings gives a clearer perception of the subject it teaches. Being able to write is extremely valuable because the writer can inform numerous people, they can also express their feelings through words and can describe objects without others experiencing them. Lastly, writing is extremely powerful and when used right, can inspire others.

The novel *The House on Mango Street* draws heavily from Cisneros own life,

making Esperanza's journey a reflection of her own struggles and aspirations. Sandra Cisneros and her character Esperanza share many similarities, particularly in their thoughts and experiences. Both Cisneros and Esperanza grapple with their cultural identity and the sense of belonging. Growing up in a predominantly Latino community, they experience the tension between their Mexican heritage and the broader American culture. They both challenge the societal norms that dictate how women should behave and what they can achieve. At the end of the novel, Esperanza's voice and writing serve as powerful forms of resistance, enabling her to assert her identity and challenge the constraints placed upon her. Her journey reflects the transformative power of storytelling and the importance of giving voice to marginalized experiences.

The patriarchal society enforces strict gender roles that confine women to domestic spaces and responsibilities. Esperanza observes how women in her neighbourhood are expected to marry young, bear children, and remain subservient to their husbands. This expectation stifles their dreams and ambitions. Through her writing, Esperanza articulates her desire to break free from these traditional roles and pursue her own path. She witnesses the oppression and subjugation of women around her, including her own family members and neighbours. Women like Minerva and Sally experience physical and emotional abuse at the hands of men. These harsh realities fuel Esperanza's determination to resist such a fate. Her writing becomes a powerful tool to voice her resistance against oppression and to imagine a life where women can live freely and autonomously. The limited access to education for women and girls in Esperanza's neighbourhood reflects broader cultural and socioeconomic norms.

Esperanza is seen as a first-generation learner in the novel by Sandra Cisneros. She grows up in a working-class Mexican-American community where educational opportunities are limited, and many of her family members and neighbours do not pursue higher education. Esperanza's aspirations to become a writer and to escape the constraints of her environment mark her as someone who is breaking new ground for herself and her family.

Traditional gender norms frequently constrain women in *The House on Mango Street*, where they confront serious issues like economic reliance, domestic violence, and limited opportunities. Mango Street's social and cultural norms restrict women's independence and opportunity by upholding patriarchal ideals. Writing empowers women by allowing them to express their thoughts, feelings, and experiences. It empowers them by reclaiming their narratives and asserting their identities. Writing also provides a space for reflection,

connecting with others who share similar experiences, and fostering solidarity. It also serves as a means of resistance against oppressive structures, allowing women to envision alternative futures and challenge the existing condition.

Cisneros faced significant challenges in her journey as a writer, many of which stemmed from her unique background. She was indeed a first-generation learner in the sense that she pursued a path in higher education that was uncommon in her family. Born to a Mexican father and Mexican-American mother, Cisneros grew up in a household where education and creativity were not traditional focuses, especially for women. Her struggles were deeply intertwined with navigating her cultural heritage, financial constraints and societal expectations. She often felt that her experiences as a Latina woman were not reflected in the literature she encountered during her formal education. It took time and perseverance for her to realize that her unique perspective was precisely what gave her writing its power.

Cisneros encountered several difficulties as a child growing up in a low-income, working- class Mexican-American household, such as financial difficulties, cultural exclusion, and gender norms. Her desire to use writing to communicate her own and her community's struggles was encouraged by these encounters. She was motivated to give voice to the Chicana experience by her strong sense of cultural identity and pride in her Mexican- American ancestry. Through her stories, she aimed to clarify assumptions and promote the diversity and depth of her culture. Writing became a means of empowerment, allowing them to envision and work towards a better future for themselves and their communities. Their commitment to advocating for marginalized voices and challenging societal norms motivated them to use storytelling as a powerful tool for change.

Sandra Cisneros uses poetic language to capture the beauty, pain, and complexity of life on Mango Street, highlighting the emotional and psychological depths of the characters. The poetic language in the novel heightens the emotional impact of the narrative. Cisneros through his character Esperanza brings out how writing is deeply intertwined with her quest for personal identity and freedom in a society that seeks to define and limit women's freedom.

The House on Mango Street contains many small poems and references to emphasize the importance of language not only to Esperanza but also to her neighbours. These references include jump-roping chants, and simple, internal rhymes within paragraphs of the text. The abundance of poetry suggests that the women and girls on

Mango Street try to make their lives better by describing the world with beautiful language. The novel itself, with its many internal rhymes, is in some ways Esperanza's attempt to make some of the unpoetic aspects of her life less hard and more ordered through poetry.

Cultural and social pressures reinforce the patriarchal norms. Esperanza experiences these pressures, but she uses her writing to challenge and critique the cultural norms that seek to restrict her freedom. Esperanza is acutely aware of the limited choices available to her and other girls in her community due to the patriarchy. She writes about her dreams of becoming a writer and owning a house, aspirations that defy the expectations placed upon her. Her writing serves as a means to envision and work towards a future where she can achieve these dreams. Through her stories and poems, she creates a narrative of empowerment and resistance.

For Esperanza, writing poetry becomes an act of empowerment. It gives her agency to confront her circumstances and imagine a life beyond Mango Street. The poetic language used in the novel often invites readers to read between the lines. It encourages Esperanza's journey of self-discovery and enables her to reflect on her experiences, her desires, and envision a better future. Through poetry, Esperanza not only finds her voice but also crafts her identity “. . . she writes poems on little pieces of paper that she folds over and over and holds in her hands a long time, little pieces of paper that smell like a dime” (84).

Cultural background often shapes an author's perspective, experiences, and worldview. Esperanza's mixed cultural identity is seen in her use of both Spanish and English languages. The novel's multilingual language represents her capacity to balance her Mexican roots with her American environment. By embracing both languages she acknowledges and celebrates the richness of her cultural background while also asserting her place in American society. She is linguistically flexible and adaptable as seen by her multilingual expression. The blending of languages also mirrors her internal journey of self-discovery as she learns to reconcile and integrate different aspects of her identity.

Esperanza's poetic style is deeply reflective. Her poetry frequently incorporates cultural references and bilingual elements, reflecting her Mexican-American heritage. She blends Spanish and English seamlessly, creating a unique linguistic texture that adds depth to her work. Her poems often tell a story or capture a moment in her life, providing insight into her thoughts and feelings. Esperanza's spiritual freedom may eventually give her the power to be literally free as well. She uses her words to express her desire for

personal agency, a sense of self, and a future beyond the constraints of her current reality.

Esperanza despised living on Mango Street, but little by little she discovers fragments of herself wanting to become a better person. Writing poems and speaking her mind is what sets her free. Poetry is Esperanza's home in the heart:

I want to be
like the waves on the sea me.like the clouds in the wind, but I'm
One day I'll jump out of my skin (60)

In the chapter “Born Bad”, Esperanza recited a poem that she wrote to her sick aunt, Guadalupe. She metaphorically spoke about in her words that one day she'll grow up and take control over her life to change for the better. The poem is rich with metaphorical imagery, such as being “the waves on the sea,” “jumping out of her own skin,” and “shaking the sky like a hundred violins.” These images convey a sense of fluidity, freedom, and the transformative power of poetry. The act of reciting the poem not only comforts Aunt Guadalupe but also brings Esperanza a sense of hope and serenity. Through her words, Esperanza envisions a future where she can take control of her life and effect positive change. This moment underscores the therapeutic and aspirational qualities of poetry.

Furthermore, it was in “Mango Says Goodbye Sometimes”, Esperanza came to the realization that she does belong to the Mango Street and was not put there by mistake, at least for now. She imagines a life outside of Mango Street and explores the constraints society imposed. She is able to express herself, her desires and her uniqueness through her writing. It becomes a powerful tool for self-expression and a way to assert her voice in a world that often tries to silence her.

Poetry not only applies to Esperanza but the women living on Mango Street as well. Ruthie one of the characters who has poetic talent similar to Esperanza observes the world and describes it in a different perspective. Both Esperanza and Ruthie face the challenge of finding their true identities. Despite these challenges, poetry plays a crucial role in their journey towards self-discovery. It provides a means for them to reflect on their experiences, dreams, and aspirations, ultimately helping them to shape their identities. Ruthie's poetic sense and childlike wonder set her apart from the other characters in the novel. Ruthie lives in a world of her own, finding joy and beauty in the simplest things. Ruthie express herself with her poetic lines like, “The moon is beautiful like a balloon.”(68) showcasing her ability to see beauty and wonder in everyday objects and

phenomena.

Ruthie uses her imagination to escape from the harsh realities of her life. She creates a fantastical image that offers her a sense of joy and escape from her surroundings. She appears to have missed opportunities in life, leading her to seek solace in her poetic imagination. She appreciates the beauty of everyday life, which is something that resonates deeply with Esperanza, who is also a dreamer and aspiring writer.

Minerva's poetry reflects her dreams and desires for a better life. Her situation reminds Esperanza that she must work hard to achieve her goals and not let herself be confined by her environment. Minerva's poetic sense and struggles are explicitly highlighted in the chapter titled "Minerva Writes Poems" in *The House on Mango Street*. Minerva's plight, Esperanza realizes the importance of self-empowerment and independence. Minerva's struggle to break free from her abusive husband and her reliance on poetry for solace underscore the necessity of taking control of one's destiny. Esperanza is inspired to use her writing as a means of empowering herself and creating a better future. Minerva's poetry shows Esperanza how powerful and therapeutic writing can be. Despite her difficult circumstances, Minerva continues to write, using her poems to articulate her emotions and experiences.

Minerva's ability to create poetry in the midst of her struggles teaches Esperanza about resilience and inner strength. Even when faced with abuse and despair, Minerva does not give up her poetry, showing Esperanza that creativity and self-expression can provide strength and hope in difficult times. It reveals the harsh realities of her life, including her struggles with an abusive relationship and the burdens of motherhood. Minerva's art has been recognized for its powerful commentary on domestic oppression. It serves as a catalyst for conversations about gender roles, feminism, and societal expectations.

Sandra Cisneros and her character, Esperanza, embrace the English language as a means to thrive as writers and assert their independence as women. Embracing both English and Spanish language allows Cisneros to navigate multiple cultural languages. This linguistic flexibility enables her to connect with broader audience and articulate her experiences more fully. Stepping away from a purely Spanish-speaking environment might provide her with the freedom to experience and innovate with her use of language.

A psychoanalytical-linguistic approach to the novel reveals various reasons why the narrator distances herself from her native Spanish-speaking community. Like Esperanza

Cisneros may attempt to define her own distinct identity by resolving the conflict between her cultural background and her own goals by taking a step back might discover her individualism and make her voice heard. Cisneros frequently criticises her community and traditional gender norms. She draws attention to the limitations placed on women and their restricted opportunities in her writings. She might oppose these limits and promote greater gender equality and individual freedom by separating herself.

To conclude *The House on Mango Street* displays the circumstances that led Esperanza, Ruthie and Minerva to become independent through their love of writing and proved that the voice of writing can make a different effect on the reader if the writer uses the right voice for their passage. Writing keeps the characters spiritually free, because putting their experiences into words gives power over them. If they use beautiful language to write about a terrible experience, then the experience seems less awful. Their spiritual freedom eventually gives them power to be literally free as well. Thus it is proved that the power of writing is excessively useful and can give voices to those who cannot find theirs. By creating this book, Cisneros was able to touch many people's hearts and thoughts. The power of writing is countless and influences everyone.

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ENSEMBLES OF SATAVAHANA (200 – 250 C.E)**U. Mala**

Department of History, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

An ancient Indian costume could focus on key elements like intricate patterns, vibrant colours and symbolic motifs. The design could be characterized by flowing fabrics with a mix of rich textures, such as silks or velvets, in deep reds, gold and blues. Often reflecting the grandeur of royal attire. accessories like ornate jewellery, including necklaces, earrings and headpieces would be represented as abstract forms of shimmering lines and shapes. The silhouette might evoke a sense of grace and elegance, with traditional draping techniques like the sari or dhoti being suggested through curving, sweeping lines. The overall feel would blend heritage, spirituality, and artistry, combining geometric patterns with organic flow to symbolize the beauty and cultural richness of ancient India.

KEYWORDS:

Satavahana, Saka, Costumes, Hair Styles, Andhra, Jewellery.

INTRODUCTION

The Satavahana dynasty, which ruled large parts of Central and Southern India from around 230 to 220 B.C.E, the ancient Indian costume during the Satavahana period was a blend of indigenous styles and influences from various cultures, including those of the Mauriyas, Kushanas and Greek-Bactrian regions, due to the dynasty's interactions with trade routes and foreign kingdoms. For both men and women, clothing was often made from fine fabrics like cotton, linen and wool with the weakly using silk. The attire generally involved draped garments that allowed ease of movement, reflecting the regional climate and lifestyle. Men typically wore simple linencloths or langotis with long tunics or chitons fastened at the waist, sometimes complemented by a shawl or scarf-like piece. Women wore draped garments with the sari or a variation of it possibly being worn, although it evolved over time. The garments were often decorated with intricate embroidery or patterns that reflected the social status of the wearer. In terms of accessories both men and women adorned themselves with jewellery made of gold, silver and precious stones. The Satavahana kings were often depicted wearing ornate crowns, armlets and earrings signalling their royal status. The clothing and accessories from this period were not only a form of personal adornment but also a reflection of the socio-political and cultural dynamics of the time.

The Satavahana or Andhra empire was the next great empire after the Mauryan, and was established in the Deccan just as the Mauryan empire was came to an end. It endured for 460 years in unbroken continuity and ran parallel, for a while, to the Kushan empire with which it struggled for almost a century. On the whole, it was a peaceful and economically prosperous period and trade and industry increased tremendously, especially with Rome.

In the 3rd century B.C.E. the Satavahanas were ousted by the Ikshvakus, who were themselves from the Deccan.

EARLY SATAVAHANA PERIOD (200-100 B.C.E)

Costume

The people of the Deccan were a hybrid race, a mixture of the aboriginally Dravidians and foreign invaders. In the first century B.C.E. their costumes too were an interesting mixture of foreign and indigenous garments. In the 1st century B.C.E. find tunics, Kancuka in the strips or beehives design worn by a king in hunting dress has no discernible opening at the neck, so it is probably at the back. Necklines too differed in that some were V- shaped and others were round in shape. With the tunic a thick Kayabandh was wound once or twice around the waist. An elaborate turban Ushnisa, intertwined with the long black hair of the aborigine wearers was also worn. In addition to these, hunters wore two- bar type sandals with a strap for buckling, which is still seen in the Deccan. As influences from the north and from foreign invaders percolated, the Dravidians aboriginal village women too changed their costume using short Antariyas, large Uttariyas with elaborate broad borders covering the head and back, Tikkas on the forehead and a series of conch or ivory bangles on the arms except for the skrit, they looked very much like the Lambadis who are a gypsy tribe of the Deccan today.

In the royal court dress of the Mauryan-Sunga people the female attendants wore transparent long Antariyas with loose Kayabandhs tied in a knot at the centre having beautiful ornamental tips. Their many-stringed girdles or Mekhala were made of beads. Shoulder-length hair held by fillets or top knots tied at the centre of the head seems to denote that these attendants were foreigners, although nothing in the garments worn seems foreign. The king and most of his countries wore the indigenous Antariya, short and informal at home, with the longer style worn in a variety of ways on ceremonial occasions. With this the decorative Kayabandh was tied in different styles and knots. The Kayabandh could be tied like a thick cord or be worn looped in a semi-circle at the front with conspicuous side tassels or be made

of thick twisted silk. The Ushnisa was always worn and a crown or tiara was used when necessary.

Soldiers wore short-sleeved tunics or jackets, with elaborate headgear consisting of either a turban with a top knot, chin band and ear flaps or two top knots with a turban. They were equipped with axes, bows and arrows or carried sickles. Palace however wore the Antariya with a heavy cloak draped over the left shoulder.

Headgear and Hairstyles

The aboriginal jungle women wore rolls and headbands with peacock feathers attached. Village women and commoners wore their hair in a simple knot at the nape covered by a large Uttariya which, at times, had elaborate broad borders. Court attendants and women of the richer classes wore their hair more fashionably, either in a top knot on the right side with a loop of flowers suspended or in a plait. A Fillet, simple or gold embroidered could be worn to hold it in place.

Most often, the long hair of men was worn intertwined with lengths of cloth to form an Ushnisa in a variety of ways. Frequently it had a knot the original top knot of the aboriginals covered with the cloth of the turban. This knot could be at centre front or protrude over the forehead in a 'conch-shell' shape or the tuft of hair could be visible on top of the turban.

Jewellery

Jewellery in this period had a massive primitive character in strong contrast to that worn in the later Satavahana period. When indigenous garments are shown on men, whether at court or in villages all wear some form of jewellery. But when the foreign dress, the Kancuka or tunic, is worn by hunders, attendants and soldiers, very little or no jewellery is seen. Most often it consists of just earrings of the wheel pattern type.

Indigenous jewellery however, consisted of Lambanam, earrings, and a pair of Kangan and B¹aju band for the males. Women did not wear the Baju band but wore a large number of bangles made of conch or ivory, disc-type earrings, the Lambanam, and Tikka on the forehead. Women attendants at court wore, in addition, the Mekhala.

LATE SATAVAHANA (100 -A.D.250 C.E.)

Costume

Clothing was generally sparse and made of thin cotton. The three articles of clothing, the Antariya, Uttariya, and Kayabandh were widely used, but interesting mixtures of foreign and indigenous garments were fairly prevalent. The Uttariya for both men and women was usually white and of cotton or silk. It was however, at times, of beautiful colours and embroidered. Men could wear it across the back and over both shoulders or merely thrown over the chest and they seldom wore it as a head covering. The Antariya was still worn by both sexes in the Kachcha fashion which meant that one end was passed between the legs and tucked in behind, but this way of draping had its own fanciful fashions. For men it was normally to the knees or even shorter. Generally, the Antariya appears to have been made of almost transparent cloth and was worn very tight and clinging in the case of women. It is almost invisible in the early Andhra sculpture with only double incised lines to show the drape. The Nivi Bandha or preliminary knot to tie the Antariya at the waist is often alluded to in the literature of ancient India.

The Kayabandh tied in a bow- shaped knot was worn by both sexes to give further support to the Antariya at the waist. This item was worn in a variety of ways. The Kayabandh in the form of a simple sash was called the Vethaka. The women also wore the Pattika which was made of flat ribbon shaped pieces of cloth, usually silk. A heavy looking thick jewelled roll with hanging tassels Kakshyabandha was worn by men. The Kalabuka was a girdle made of many strips plaited together and the Muraja had drum headed knots at the ends instead of tassels.

It is in the distinctive ways of wearing these three simple garments the Antariya, Uttariya and Kayabandh and in the headgear and jewellery that trace the evolution of the costumes and the fashion of the times in areas of India where they were in use. The true Yajnopavita or sacred thread is found on the sculptures of this period. Before this, it existed more in the form of the Uttariya worn draped over the left shoulder and under the right arm in the Upavita fashion from which the term Yajnopavita seems to have been derived. The Yajnopavita consisted of three cotton threads each of nine twisted strands but of hemp for the Kshatriya and of wool for the Vaisya. At a later stage this sacred thread continued to be used in a limited way by other castes but was retained most strongly by the Brahmins.

A stitched shirt like foreign garment called the Kancuka was frequently used by attendants, grooms, guards and so on in the king's court, and an indigenous long tunic was worn by eunuchs and other attendants in the women's apartments in the palace. Women too wore the short Kancuka with an indigenous Antariya, or when calf-length it was worn with Kayabandh and Uttariya, and in many other ways.

Headgear and Hairstyles

The Ushnisa of the Turban was generally wrapped around three or four times after first covering the top knot of hair with one end. It was normally white but could also be of dyed cloth and simple turbans were held in position by ornamental gold strips or Pattabandha. Gold turbans were worn on special occasions. Kirita or crowns were also in use, of which one type was a short cylindrical cap studded with gems and ornamented with designs. The Maulibandha was an elaborate turban wound with the hair which itself was decorated with strings of pearls or flower wreaths. The turban normally covered the hair which was arranged in a large top knot at centre front and could have a jewelled clasp or Maulimani at the centre to hold in place the folds of the turban. This top knot could also be pear shaped or elliptical to give it variety. Without the turban, the hair could be worn in one or two top knots or one loop and one top knot. Short hair parted in the middle and reaching the neck was fairly prevalent, especially among the common people.

Women wore their hair in several ways. One was in the form of a plait, Praveni at the back, decorated with jewelled strips and tassels as Bharat Natyam dancers do today. Another common style was the coil with five delicate plaits dangling from it, a favourite with all classes of women. In the Kesapasa style the hair was looped close to the head in an elongated knot at the back of the head or lower down at the nape. This could have a Veni, a small fillet of flowers, around it or a short garland of flowers dangling from it. If the hair was made in a simple knot it was known as Kabaribandha. The Dhammilia was elaborate dressing of the hair with flowers, pearls and jewels that often completely covered the hair like a close cap or turban. This style was greatly admired in the Satavahana kingdom. Women no longer wore the turban of earlier periods. Special ornaments were designed to be worn in the hair. The Chudamani was lotus-shaped, its petals composed of pearls and precious stones. It was worn normally in the centre of the knotted hair. The Makarika was shaped like a fish-crocodile and worn at the front parting of the hair, very like the gold ornament worn by the Uriya women in

the northern Circars. There were also small crown like fillets through which the hair was drawn and then plaited or hung loose.

Jewellery

Strands of pearls were the main motif in all forms of jewellery particularly in the late period of the Satavahana Empire. Both men and women wore earrings, bracelets, armlets and necklaces as in previous periods, particularly the indigenous people. The more common design in earrings was the Kundala shaped like coil, which could be simple or decorative. The Talapatra originated from a small strip of palm leaf rolled and inserted into the lobe. This shape was later made from ivory or gold and could be gem studded. A full-blown lotus design the Kanaka-Kamala set in rubies is still popular in south India, and a couple of generations ago the Karnika or Jimiki continued to be in use. This was in the shape of a lotus seed-pod fixed upside down like a tassel. Necklaces or Hara were mainly strung with pearls, sometimes consisting of only a single string called Ekavali. A necklace of gems and gold beads was called Yashti, the central bead being often larger than the others. Several of these necklaces could be worn together. Sometimes three or five slab like gems, Phalaka, were inserted at regular intervals. These held together the several strings of which a necklace was composed and the whole was called a Phalakahara.

A simple perfumed cotton- thread necklace was known to have been in use and tiger claws were strung around the necks of children probably to ward off the evil eye. The Yasnopavita or a sacred thread made of pearls called the Muktayajnopavita, were prevalent. Kantha, the shorter form of necklace, continued to be in use and was often of gold set with rubies and emeralds. Also, the gold coin necklace Nishka strung on silk thread or plaited gold cord was worn in almost the same design as the modern Putalya of Maharashtra and the Malai of Tamil Nadu. These gold coins were sometimes replaced by mango-shaped pieces of gold or gold set with gems, like the contemporary Mangamalai of South India. Men and women wore bracelets Valaya of solid gold set with precious stones. The more delicate ones were made of filigree and elegant rope-shape done of fine gold wire were worn generally by women. They also used bangles of ivory and rhinoceros horn. Slab-like gems when set into bracelets, like the Phalakahara necklace, were called Phalakavalaya.

Armlets or Keyura for both sexes were close-fitting and could be engraved or set with jewels, or be in the shape of a snake; also, they could be straight-edged or have an angular top edge. Jewelled girdles of one or many strings, Mekhala, were worn only by women. These

were made in several varieties from the tinkling Kanci with bells to the Rasana style made of a linked chain or strung with pearls, beads or precious stones. These girdles, besides being very attractive, held up the lower garment or Antariya. In addition, cloth girdles or Kayabandh like those of the men described earlier in this study were also used for the same purpose.

Anklets, worn again only by women, had an astonishing variety. The Manjira was hollow and light, coiling several times around the ankles loosely and tinkling when in motion as it had gems inserted in the hollow. This type is still worn in Marwar. The Nupura was plain while the Kinkini had small bells suspended. A heavier looking one was the Tulakoti whose two ends were enlarged at their meeting points. This form is still worn in Andhra. Tinkling anklets of any kind were not worn by the wife in the absence of her husband. The finger ring or Anguliyaka is visible on some of the Satavahana sculptures but only after C.E. 150. The Hemavaikaksha was an ornament worn by women seen more frequently in the Kushan period. It consisted of two long wreaths of flowers or pearls crossed at the breasts.

Military Costume

Andhra soldiers wore an Antariya which was shortened by lifting it at the hemline and tucking it into the waist to facilitate marching and the style is still used in Tamil Nadu. A cloth Sash or Kayabandh was wound tightly many times around the waist for support and was sometimes crossed at the chest for protection. This developed in later times into the Channavira which was similar in function to the early Babylonian and Assyrian sword belts crossed at the chest with a metal buckle in the centre. In addition, the military personnel of this period occasionally wore earrings and simple jewellery.

Saka foreign soldiers were employed by some of the Andhra kings in the royal bodyguard. They wore a heavy tunic with ruched sleeves which reached to the knees or mid-thigh. With it was worn a form of Churidar or ruched trousers and their helmet or Sirastra had ear flaps. A wide sash was worn at the waist. Sometimes a short quilted tunic was worn with a heavy drape over the left shoulder along with a turban a mixture of the foreign and indigenous garments. Footwear was not incumbent for soldiers and was probably worn by foreign rather than indigenous troops.

The equipment of a trained fighter was mainly his sword, shield, bow, axe and spear sometimes the mace, club and javelin were used. Swords were either curved or straight and

could have a sharp edge on one or both sides. They were 30 inches long and beautifully crafted. Handles of ivory or horn and hilts of precious metals encrusted with jewels were carried by those in command and simpler ones of bamboo or wood were used by the common soldier. These swords in their sheaths, Kosha, of fine-tooled leather were normally fastened on the left side of the waist. Smaller and more ornamental swords and daggers were fastened by gold chains.

Shields, mainly rectangular in shape were purely functional and large enough to protect the body. The club or Gada could be short or long but was immensely heavy and was used for striking the enemy forcefully. The bow or Dhanush made of wood or horn was painted red and gaily decorated, but the bamboo bow was more common. The bow string was made of sinew or hemp. The heads of the arrows were of iron, bone, wood and were carved into animal and other shapes and had shafts of feathers affixed with sinews. Sometimes the arrow tips were dipped in poison. The Buddhist monks were now in a very powerful position and had more or less abjured their vow of poverty. Their clothes now retained a semblance of patchwork but were composed of rich pieces of cloth of the same colour, symmetrically arranged together in checks and most probably presented to the Buddhist order by rich donors, as referred to in the Jatakas.

Hindu ascetics continued to wear their bark strip garments Valkala with a deer skin over the left shoulder in the style known as Ajinayajnopavita. Their hair was tied in a heavy bundled top-knot of matted locks called the Jata-Bhara and sometimes the hair was worn in small plaits. The priests were Brahmins who wore white garments but added a red turban when officiating at ceremonial functions. Jain monks and nuns have retained their white robes to this day and all their beliefs and customs have remained unchanged because of their strong conservatism.

Textiles and Dyes

From Mauryan times and even earlier, the manufacture of textiles in India had flourished and there are constant references to its variety in the Brahmanical, Buddhist, and Jain works. Coarse and fine varieties of cotton were in great demand. Silk formed an important part of the rich person's wardrobe. A very cheap material made of Hemb was worn by the weavers and by labourers of all kinds. Wool was not needed much in the part of India ruled by the Satavahanas which had a warm climate, but it was used in the form of Chaddars or Blankets in winter. There was a variety of dyes available from Vedic times, indigo, yellow,

crimson, magenta, black and turmeric. Since washermen were also dyers, these colours were well-known to them and the knowledge of the dyeing processes was probably handed down to each successive generation. Varieties and mixtures of colours known to those countries with which the Satavahanas did a great deal of trade, like China, Persia and Rome must also have been incorporated to extend their range of coloured textiles.

Printed and woven designs on textiles were plentiful and embroidery in gold was also common among the richer classes. The Uttariya, in particular, was very often of silk and embroidered with flowers all over or had a pattern of birds along with flowers. Precious stones were often used in the borders of these Uttariyas or they were dyed blue or red, but a spotless white remained the favourite with men.

CONCLUSION

Ancient Indian Costumes, evolving from draped fabrics to stitched garments, reflect a rich history and cultural heritage, with materials like cotton and silk playing a crucial role, and styles like the sari and dhoti emerging as iconic garments. During the Satavahana period, (2nd century to 3rd century C.E.), clothing consisted of garments like Antariya and Uttariya (Upper and Lower garments), Kanchuka (Tunic), Kayabhandh (Waistbelt), and Ushnisha (Turban). Textile manufacturing and trade flourished, with brides wearing borders with swans and colours used in stories for cultural interaction.

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TRIBONACCI r -GRACEFUL LABELING OF PATH RELATED GRAPHS

S. Steffi Cross

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract: A Tribonacci r -graceful labeling is a specific type of graph labeling where the vertex labels are derived from the Tribonacci sequence. Let r be any real natural number. An injective function $\phi : V(G) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$, where T_{q+r-1} is the $(q + r - 1)^{th}$ Tribonacci number in the Tribonacci sequence is said to be Tribonacci r -graceful if the induced edge labeling $\phi^* : E(G) \rightarrow \{T_r, T_{r+1}, \dots, T_{q+r-1}\}$ such that $\phi^*(uv) = |\phi(u) - \phi(v)|$ is bijective. If a graph G admits Tribonacci r -graceful labeling, then G is called a Tribonacci r -graceful graph. A graph G is said to be Tribonacci arbitrarily graceful if it is Tribonacci r -graceful for all r .

Keywords: Tribonacci r -graceful labeling, Path graph, Comb graph, Coconut Tree graph, Star graph, Fork graph

I INTRODUCTION

Graph labeling is an important area of research in graph theory, involving the assignment of labels, usually represented by integers, to the vertices and edges of a graph while satisfying specific conditions. One such labeling is Tribonacci r -graceful labeling, which extends the concept of graceful labeling by incorporating the Tribonacci sequence. Labeling of graph is the assignment of values to vertices and edges or both subject to certain conditions. In 1967, Rosa [2] introduced the concept of graceful labeling. In 1982, Slater [3] introduced the concept of k graceful labeling of graphs. Let G be a simple graph with p vertices and q edges. Let k be any natural number. Define an injective mapping $\phi : V(G) \rightarrow \{0, 1, 2, \dots, T_{q+k-1}\}$, where T_{q+k-1} is the $(q + k - 1)^{th}$ Tribonacci number in the Tribonacci sequence is said to be Tribonacci k -graceful if the induced edge labeling $\phi^* : E(G) \rightarrow \{T_k, T_{k+1}, \dots, T_{q+k-1}\}$ such that $\phi^*(uv) = |\phi(u) - \phi(v)|$ is bijective. If a graph G admits Tribonacci k -graceful labeling, then G is called a Tribonacci k -graceful graph. A graph G is said to be Tribonacci arbitrarily graceful if it is Tribonacci k -graceful for all k . In this sequel, we give a new concept Tribonacci r -graceful labeling of graphs.

II PRELIMINARIES

In this section, we recall some basic definitions related to this paper.

Definition 2.1: A **Graph** G consists of a pair $(V(G), X(G))$ where $V(G)$ is non empty finite set whose elements are called points or vertices and $X(G)$ is a set of unordered pairs of distinct elements of $V(G)$. The elements of $X(G)$ are called lines or edges of the graph G .

Definition 2.2: A **Path** is a sequence of vertices where each consecutive pair of vertices is connected by an edge in the Graph.

Definition 2.3: A **Tree** is an undirected Graph in which any two vertices are connected by exactly one path, or equivalently a connected acyclic undirected Graph.

Definition 2.4: A **Complete graph** is a graph in which each vertex is connected to every other vertex.

Definition 2.5: The **Comb graph** $P_n \odot K_1$ is obtained by joining a single pendant edge to each vertex of the path P_n .

Definition 2.6: A **Coconut Tree graph** $CT(m, n)$ is obtained from the path P_n by appending n new pendent edges at an end vertex of P_n .

Definition 2.7: A **Star graph** S_n is a tree where one vertex is connected to all other vertices.

Definition 2.8: A **Fork graph** is a tree graph with 5 vertices and 4 edges. It is also called as chair graph

Definition 2.9: The **Tribonacci sequence** is a sequence of integers T_n defined by

$$T_0 = 0, T_1 = T_2 = 1, T_n = T_{n-1} + T_{n-2} + T_{n-3} \quad (n \geq 3).$$

Definition 2.10: A **Graceful labeling** of a graph $G = (V, E)$ with $m = |V|$ vertices and $n = |E|$ edges is a one to one mapping $\phi: V(G) \rightarrow \{0, 1, 2, \dots, n\}$ of the vertex set into the set $\{0, 1, 2, \dots, n\}$ with the following property for any edge $e\{u, v\} \in E(G)$, the value $\phi^*(e) = |\phi(u) - \phi(v)|$ then $\phi^*: E(G) \rightarrow \{1, 2, \dots, n\}$ is a one to one mapping of the set $E(G)$ onto the set $\{1, 2, \dots, n\}$.

Definition 2.11: Let r be any natural number. Let r be any real natural number. An injective function $\phi: V(G) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$, where T_{q+r-1} is the $(q+r-1)^{th}$ Tribonacci number in the Tribonacci sequence is said to be Tribonacci r -graceful if the induced edge labeling $\phi^*: E(G) \rightarrow \{T_r, T_{r+1}, \dots, T_{q+r-1}\}$ such that $\phi^*(uv) = |\phi(u) - \phi(v)|$ is bijective. If a graph G admits Tribonacci r -graceful labeling, then G is called a **Tribonacci r -graceful graph**.

Definition 2.12: A graph G is said to be **Tribonacci arbitrarily graceful** if it is Tribonacci r -graceful for all r .

III TRIBONACCI r -GRACEFUL LABELING

Theorem 3.1: The Path graph P_n is Tribonacci r -graceful for all $n \geq 2$.

Proof: Let P_n be a path graph of length $n - 1$ with vertex set $V(P_n) = \{u_i/1 \leq i \leq n\}$ and edge set $E(P_n) = \{u_i u_{i+1}/1 \leq i \leq n - 1\}$ such that

$$|V(P_n)| = p = n \text{ and } |E(P_n)| = q = n - 1$$

Define a function $\phi : V(P_n) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ for all k by

$$\phi(u_1) = T_0$$

$$\phi(u_i) = \phi(u_{i-1}) + (-1)^i T_{q+r-i+1}, 2 \leq i \leq n, r \geq 1$$

The example of Tribonacci 2-graceful labelling is P_5 is given in Figure 3.1

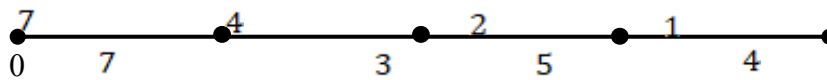


Figure 3.1

Edge label calculation for P_5 is given by the following equations

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

$$\phi^*(u_1 u_2) = |\phi(u_1) - \phi(u_2)| = |0 - 7| = 7$$

$$\phi^*(u_2 u_3) = |\phi(u_2) - \phi(u_3)| = |7 - 3| = 4$$

$$\phi^*(u_3 u_4) = |\phi(u_3) - \phi(u_4)| = |3 - 5| = 2$$

$$\phi^*(u_4 u_5) = |\phi(u_4) - \phi(u_5)| = |5 - 4| = 1$$

Hence the path graph $P_n, n \geq 2$ is Tribonacci r -graceful graph.

Theorem 3.2: The comb graph $P_n \odot K_1$ is Tribonacci r -graceful for all $n \geq 2$.

Proof: Let $u_i, 1 \leq i \leq n$ be the vertices of the path P_n and Let $v_i, 1 \leq i \leq n$ be the vertices which are joined to each vertices of the path P_n .

The resultant graph $P_n \odot K_1$ whose vertex set is

$$V(P_n \odot K_1) = \{u_i, v_i/1 \leq i \leq n\} \text{ and edge set is}$$

$$E(P_n \odot K_1) = \{\{u_i v_i/1 \leq i \leq n\} \cup \{u_i u_{i+1}/1 \leq i \leq n - 1\}\} \text{ such that}$$

$$|V(P_n \odot K_1)| = p = 2n \text{ and } |E(P_n \odot K_1)| = q = 2n - 1$$

Case (i): $n = 2$

Define a function $\phi : V(P_n) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ for all k by

$$\phi(u_1) = T_0,$$

$$\phi(u_2) = T_{r+1}, r \geq 1,$$

$$\phi(v_1) = T_{q+r-1}, r \geq 1,$$

$$\phi(v_2) = \phi(u_2) - T_r, r \geq 1$$

Case (ii): $n \geq 3$

Define a function $\phi : V(P_n) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ for all k by

$$\phi(u_1) = T_0,$$

$$\phi(u_i) = \phi(u_{i-1}) + (-1)^i T_{q+r-i+1}, 2 \leq i \leq n, r \geq 1$$

$$\phi(v_1) = T_r, r \geq 1$$

$$\phi(v_i) = \phi(u_i) - T_{r+i-1}, 2 \leq i \leq n, r \geq 1$$

The example of Tribonacci 3-graceful labelling of comb graph $P_2 \odot K_1$ for Case (i)

and the Tribonacci 2-graceful labeling of comb graph $P_5 \odot K_1$ for Case (ii) is given in Figure 3.2(a) and Figure 3.2(b) respectively.

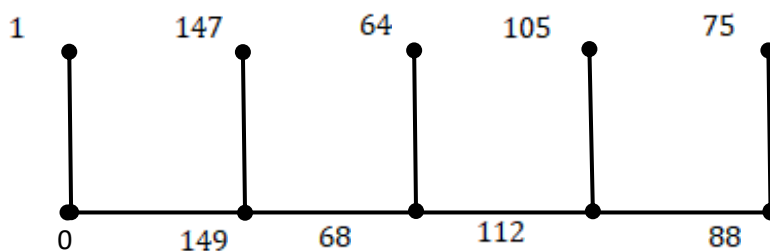


Figure 3.2 (a)

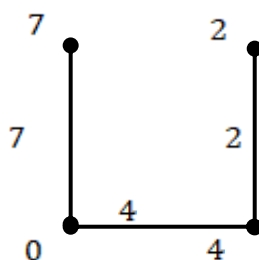


Figure 3.2 (b)

Thus ϕ admits Tribonacci r - graceful labeling for all $n \geq 2$

Hence the Comb graph $P_n \odot K_1$ is Tribonacci r -graceful for all $n \geq 2$.

Theorem 3.3: The Coconut Tree graph $CT(m, n)$ is Tribonacci r -graceful for all $m, n \geq 2$.

Proof: Let $u_i, 1 \leq i \leq m$ be the vertices of the path P_m and let $v_i, 1 \leq i \leq n$ be the new vertices which are attached to the m^{th} vertex of the path P_m .

The resultant graph is $CT(m, n)$ whose vertex set is

$$V[CT(m, n)] = \{u_i / 1 \leq i \leq m\} \cup \{v_i / 1 \leq i \leq n\}$$
 and edge set is

$$E[CT(m, n)] = \{u_i u_{i+1} / 1 \leq i \leq m-1\} \cup \{u_m v_i / 1 \leq i \leq n\}$$
 such that

$$|V[CT(m, n)]| = p = m + n \text{ and } |E[CT(m, n)]| = q = m + n - 1$$

Define a function $\phi : V(P_n) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ for all k by

$$\phi(u_1) = T_0,$$

$$\phi(u_i) = \phi(u_{i-1}) + (-1)^i T_{q+r-i+1}, 2 \leq i \leq m, r \geq 1$$

$$\phi(v_i) = \phi(u_m) - T_{r+i-1}, 1 \leq j \leq n, r \geq 1$$

The example of Tribonacci 1-graceful labeling of Coconut Tree graph $CT(5, 5)$ is given in Figure 3.3

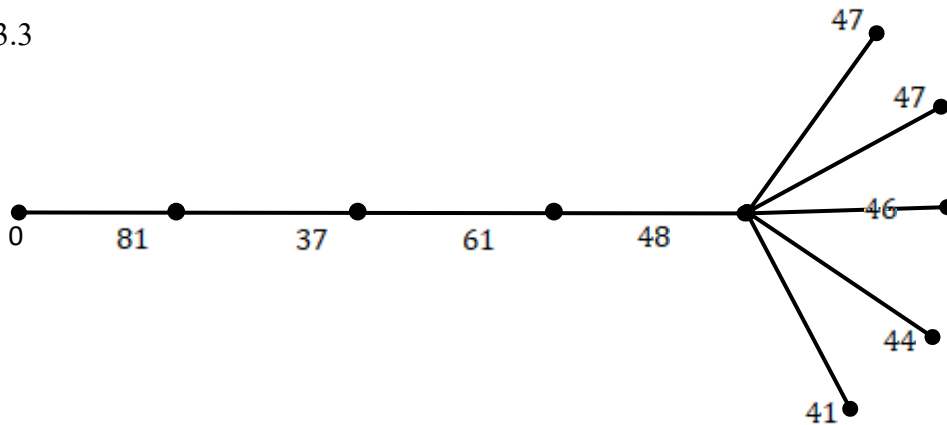


Figure 3.3

Thus ϕ admits Tribonacci graceful labelling for all r .

Hence the Coconut Tree graph $CT(m, n)$ is Tribonacci r -graceful for all $m, n \geq 2$.

Theorem 3.4: The Star graph S_n is Tribonacci r -graceful labeling for all $n \geq 3$.

Proof: A star graph is a tree with one internal node and multiple leaves. Let v be the central vertex. Let $\{v_1, v_2, \dots, v_n\}$ be the pendant vertices adjacent to v .

The resultant graph is S_n with

$$V(S_n) = \{v\} \cup \{v_i / 1 \leq i \leq n-1\}$$
 and

$$E(S_n) = \{vv_i / 1 \leq i \leq n-1\}.$$

Define a function $\phi : V(G) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ by

$$\phi(v) = T_{q+r-1},$$

$$\phi(v_1) = T_0,$$

$$\phi(v_i) = \phi(v) - T_{q+r-1-(i-1)}, 2 \leq i \leq n.$$

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

The example of Tribonacci r -graceful labelling of S_8 is given in Figure 3.4

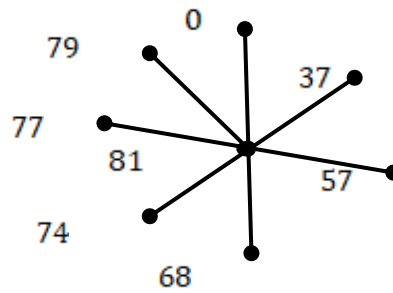


Figure 3.4

Thus ϕ admits Tribonacci graceful labeling for all r . Therefore, Star graph S_n is Tribonacci arbitrarily graceful graph.

Theorem 3.5: The Fork graph is Tribonacci arbitrarily graceful.

Proof: Let $V(G) = \{v_i / 1 \leq i \leq 5\}$

Let $E(G) = \{e_i / 1 \leq i \leq 4\}$.

Define a function $\phi : V(G) \rightarrow \{0, 1, 2, \dots, T_{q+r-1}\}$ by

$$\phi(v_1) = T_0,$$

$$\phi(v_2) = T_{r+1},$$

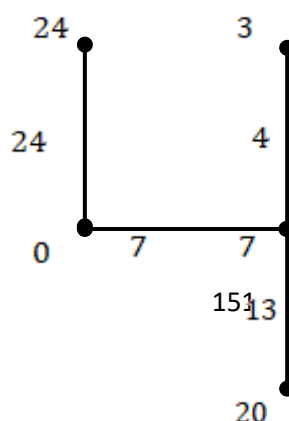
$$\phi(v_3) = T_{q+r-1},$$

$$\phi(v_4) = \phi(v_2) - T_r,$$

$$\phi(v_5) = \phi(v_2) + T_{r+2},$$

$$\phi^*(uv) = |\phi(u) - \phi(v)|$$

Tribonacci 4-graceful labelling of Fork graph is given in the Figure 3.5



Thus ϕ admits Tribonacci graceful labelling for all $r \geq 1$. Therefore Fork graph is Tribonacci arbitrarily graceful graph.

CONCLUSION

In this study, we explored Tribonacci r -graceful labeling for Path graph, Comb graph, Coconut Tree graph, Star graph, Fork graph. The main objective was to determine whether the given graphs admits a Tribonacci r -graceful labeling and analyse their properties in relation to Tribonacci numbers. This type of labeling has applications in coding theory, cryptography, and communication network design, data structuring and storage, circuit design, scheduling problems, combinatorial design and Graph decomposition.

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CONTR CONTINUOUS AND CONTRA IRRESOLUTE FUNCTIONS VIA NANO REGULAR*- OPEN SETS

J. Jeya Surya

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT: The purpose of this paper is to introduce and study a new class of functions called contra nano regular*- continuous and contra nano regular*- irresolute functions in nano topological spaces and investigate some of its properties.

KEY WORDS: Nano regular*- open, Nano regular* - continuous, Contra nano regular* - continuous

I INTRODUCTION

Lellis Thivagar et al. [4] introduced nano topological space with respect to a subset X of an universe which is defined in terms of lower and upper approximations of X . The elements of nano topological spaces are called the nano open sets. He also introduced the weak forms of nano open sets namely nano α -open sets, nano semi-open sets, nano regular-open sets and nano pre-open sets. In 2014, K.Bhuvaneswari and K.Mythili Gnanapriya[1] introduced Nano Generalised Closed Sets in Nano Topological Space. Quite recently the authors C. Reena, B.Santhalakshmi and S.M.Janu Priyadharshini[3] have introduced the concept of nano regular*-open sets and investigated its properties. M. Lellis Thivagar and Carmel Richard [2] introduced the concept of nano continuity in nano topological spaces. In this paper, I have introduced a new concept contra nano regular* - continuous functions and contra nano regular*- irresolute functions and its properties in nano topological spaces.

II PRELIMINARIES

Throughout this paper $(U, \tau_R(X))$, $(V, \sigma_R(Y))$, $(W, \eta_R(Z))$ represent non empty nano topological spaces on which no separation axioms are assumed unless otherwise mentioned.

Definition 2.1[1]: Let $(U, \tau_R(X))$ be a Nano topological space. A subset A of $(U, \tau_R(X))$ is called *Nano generalized-closed set* if $Ncl(A) \subseteq V$ where $A \subseteq V$ and V is Nano-open.

The complement of Nano generalized -closed set is called as *Nano generalized-open set*.

Definition 2.2[1]: For every set $A \subseteq U$,

(i) *Nano generalized closure of A* is defined as the intersection of all Ng- closed sets containing A and is denoted by $Ncl^*(A)$.

(ii) **Nano generalized interior of A** is defined as the union of all Ng- open sets contained in A and is denoted by $Nint^*(A)$.

Definition 2.3[3]: A subset A of a nano topological space $(U, \tau_R(X))$ is called **nano regular*- open** if $A = NInt(NCl^*(A))$. The collection of all nano regular*-open sets is denoted by $NR^*O(U, \tau_R(X))$.

Definition 2.4[3]: The complement of nano regular* -open set is called as **nano regular*-closed**. The collection of all nano regular* - closed sets is denoted by $NR^*C(U, \tau_R(X))$.

Theorem 2.5: [4] (i) Every nano regular- closed set is nano regular*-closed

(ii) Every nano regular*-closed set is nano closed

(iii) Every nano regular* - closed set is nano semi closed

(iv) Every nano regular*- closed set is nano pre closed.

(v) Every nano regular*-closed set is nano α -closed

(vi) Every nano regular*-closed set is nano b-closed

(vii) Every nano regular*-closed set is nano semi*-closed.

Theorem 2.6: [2] (i) Every nano regular*-closed set is nano β -closed

(ii) Every nano regular*-closed set is nano β^* -closed.

Definition 2.7: A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is said to be

(i) contra nano continuous if $f^{-1}(V)$ is nano closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(ii) contra nano regular-continuous if $f^{-1}(V)$ is nano regular-closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(iii) contra nano α -continuous if $f^{-1}(V)$ is nano α -closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

(iv) contra nano semi*-continuous if $f^{-1}(V)$ is nano semi*-closed in $(U, \tau_R(X))$ for every nano open set V in $(Y, \sigma_R(Y))$.

III CONTRA NANO REGULAR* - CONTINUOUS FUNCTIONS

Definition 3.1: Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be two nano topological spaces. A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is said to be **contra nano regular* continuous** if $f^{-1}(V)$ is nano regular* closed set in $(U, \tau_R(X))$ for every nano open set V in $(V, \sigma_R(Y))$.

Example 3.2: Let $U = \{a, b, c\}$, $U/R = \{\{a\}, \{b\}\}$ and $X = \{a, c\}$. Then $\tau_R(X) = \{U, \emptyset, \{a\}\}$ and $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$ $NR^*C(U, \tau_R(X)) = \{\{U, \emptyset, \{b, c\}\}\}$. Let $V = \{a, b, c\}$, $V/R = \{\{a\}, \{c\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a, c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b, f(b) = a, f(c) = c$. since $f^{-1}(\{a, c\}) = \{b, c\}$ is nano regular* closed in $(U, \tau_R(X))$, Hence f is contra Nano regular* continuous.

Theorem 3.3: Every contra nano regular- continuous function is contra nano regular*-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular closed in $(U, \tau_R(X))$. Hence by theorem 2.5(i), $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. Therefore f is contra nano regular*-continuous.

Remark 3.4 :

The converse of the above theorem is not true as shown in the following example.

Example 3.5: Let $U = \{a, b, c\}$, $X = \{a, c\}$ and $U/R = \{\{a\}, \{b\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{a\}\}$, $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset, \{b, c\}\}$ and $NRO(U, \tau_R(X)) = \{U, \emptyset\}$, $NRC(U, \tau_R(X)) = \{U, \emptyset\}$. Let $V = \{a, b, c\}$, $V/R = \{\{a\}, \{c\}\}$ and $Y = \{a, b, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a, c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b; f(b) = a; f(c) = c$. Then f is contra nano regular*-continuous but not nano contra regular-continuous. Since for the nano open set $\{b, c\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a, c) = \{b, c\}$ is nano regular*-closed but not nano regular closed in $(U, \tau_R(X))$.

Theorem 3.6: Every contra nano regular*-continuous function is contra nano continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence by theorem 2.5(ii), $f^{-1}(V)$ is nano-closed in $(U, \tau_R(X))$. Therefore, f is contra nano-continuous.

Remark 3.7: The converse of the above theorem is not true as shown in the following example.

Example 3.8: Let $U = \{a, b, c\}$, $X = \{b, c\}$ and $U/R = \{\{a\}, \{b\}, \{c\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{b, c\}\}$ and $NR^*O((U, \tau_R(X))) = \{U, \emptyset\}$, $NR^*C((U, \tau_R(X))) = \{U, \emptyset\}$. Let $V = \{a, b, c\}$, $Y = \{a, b\}$ and $V/R = \{\{a\}, \{b, c\}\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}, \{b, c\}\}$. Define

$f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = a; f(b) = b; f(c) = c$. Then f is contra nano-continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) =$

$\{a\}$ and $\{b,c\}$ in $(V, \sigma_R(Y))$, $f^{-1}(b,c)=\{b,c\}$ is nano-closed but not nano regular*-closed in $(U, \tau_R(X))$.

Theorem 3.9: Every contra nano regular*-continuous function is contra nano semi-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence by theorem 2.5(iii), $f^{-1}(V)$ is nano semi-closed in $(U, \tau_R(X))$. Therefore, f is contra nano semi-continuous.

Remark 3.10: The converse of the above theorem is not true as shown in the following example.

Example 3.11: Let $U = \{a,b,c\}$, $X = \{a,c\}$ and $U/R = \{\{a\}, \{b\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{a\}\}$, $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset, \{b, c\}\}$ and $NSO(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{a,b\}, \{a,c\}\}$, $NSC(U, \tau_R(X)) = \{U, \emptyset, \{b,c\}, \{c\}, \{b\}\}$. Let $V = \{a,b,c\}$, $V/R = \{\{a\}, \{b\}\}$, $Y = \{a,c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = c$; $f(b) = a$; $f(c) = b$. Then f is contra nano semi-continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) = \{b\}$ is nano semi-closed but not nano regular*-closed in $(U, \tau_R(X))$.

Theorem 3.12: Every contra nano regular*-continuous function is contra nano pre-continuous

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence by theorem 2.5(iv), $f^{-1}(V)$ is nano pre-closed in $(U, \tau_R(X))$. Therefore, f is contra nano pre-continuous.

Remark 3.13: The converse of the above theorem is not true as shown in the following example.

Example 3.14: Let $U = \{a,b,c\}$, $X = \{b,c\}$ and $U/R = \{\{a\}, \{b\}, \{c\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{b,c\}\}$, $NR^*O(U, \tau_R(X)) = \{U, \emptyset\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset\}$ and $NPO(U, \tau_R(X)) = \{U, \emptyset, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}\}$, $NPC(U, \tau_R(X)) = \{U, \emptyset, \{a,c\}, \{a,b\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a,b,c\}$, $Y = \{a,b\}$ and $V/R = \{\{a\}, \{b,c\}\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}, \{b,c\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b$; $f(b) = a$; $f(c) = c$. Then f is contra nano pre-continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) = \{b\}$ and $\{b,c\}$ in $(V, \sigma_R(Y))$, $f^{-1}(b,c) = \{a,c\}$ is contra nano pre-closed but not contra nano regular*-closed in $(U, \tau_R(X))$.

Theorem 3.15: Every contra nano regular*-continuous function is contra nano α -continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence by theorem 2.5(v), $f^{-1}(V)$ is nano α -closed in $(U, \tau_R(X))$. Therefore, f is contra nano α -continuous.

Remark 3.16: The converse of the above theorem is not true as shown in the following example.

Example 3.17: Let $U = \{a, b, c\}$, $X = \{b, c\}$ and $U/R = \{\{a\}, \{b\}, \{c\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{b, c\}\}$, $NR^*O(U, \tau_R(X)) = \{U, \emptyset\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset\}$ and $N\alpha O(U, \tau_R(X)) = \{U, \emptyset, \{b, c\}\}$, $N\alpha C(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$. Let $V = \{a, b, c\}$, $V/R = \{\{a\}, \{b\}\}$, $Y = \{a, c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = a$; $f(b) = b$; $f(c) = c$. Then f is contra nano α -continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) = \{a\}$ is nano α -closed but not nano regular*-closed in $(U, \tau_R(X))$.

Theorem 3.18: Every contra nano regular*-continuous function is contra nano β -continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence by theorem 2.6(i), $f^{-1}(V)$ is nano β -closed in $(U, \tau_R(X))$. Therefore, f is contra nano β -continuous.

Remark 3.19: The converse of the above theorem is not true as shown in the following example.

Example 3.20: Let $U = \{a, b, c\}$, $X = \{a, c\}$ and $U/R = \{\{a\}, \{b\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{a\}\}$, $N\beta O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{a, b\}, \{a, c\}\}$, $N\beta C(U, \tau_R(X)) = \{U, \emptyset, \{b, c\}, \{c\}, \{b\}\}$ and $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset, \{b, c\}\}$. Let $V = \{a, b, c\}$, $Y = \{a, b, c\}$ and $V/R = \{\{a\}, \{b\}\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b$; $f(b) = a$; $f(c) = c$. Then f is contra nano β -continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) = \{b\}$ is nano β -closed but not nano regular*-closed in $(U, \tau_R(X))$.

Theorem 3.21: Every contra nano regular*-continuous function is contra nano b -continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. By theorem 2.5(vi), $f^{-1}(V)$ is nano b -closed in $(U, \tau_R(X))$. Therefore, f is contra nano b -continuous.

Remark 3.22: The converse of the above theorem is not true as shown in the following example.

Example 3.23: Let $U = \{a,b,c,d\}$, $X = \{a,b,c\}$ and $U/R = \{\{b\},\{d\},\{c\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{b,c\}\}$, $NbO(U, \tau_R(X)) = \{U, \emptyset, \{b\}, \{c\}, \{a,b\}, \{a,c\}, \{b,c\}, \{b,d\}, \{c,d\}, \{a,b,c\}, \{a,b,d\}, \{a,c,d\}, \{b,c,d\}\}$, $NbC(U, \tau_R(X)) = \{U, \emptyset, \{a,c,d\}, \{a,b,d\}, \{c,d\}, \{b,d\}, \{a,d\}, \{a,c\}, \{a,b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$ and $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{b,c\}\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset, \{a,d\}\}$. Let $V = \{a,b,c,d\}$, $Y = \{a,c,d\}$ and $V/R = \{\{a\},\{b\}\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = b$; $f(b) = a$; $f(c) = c$; $f(d) = d$. Then f is contra nano b -continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) = \{b\}$ is nano b -closed but not nano regular*-closed in $(U, \tau_R(X))$.

Theorem 3.24: Every contra nano regular*-continuous function is contra nano β^* -continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. By theorem 2.6(ii), $f^{-1}(V)$ is nano β^* -closed in $(U, \tau_R(X))$. Therefore f is contra nano β^* -continuous.

Remark 3.25: The converse of the above theorem is not true as shown in the following example.

Example 3.26: Let $U = \{a,b,c,d\}$, $X = \{a,c,d\}$ and $U/R = \{\{a,b\},\{c,d\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{c,d\}, \{a,b\}\}$, $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{a,b\}, \{c,d\}\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset, \{c,d\}, \{a,b\}\}$ and

$N\beta^*O(U, \tau_R(X)) = \{U, \emptyset, \{a\}, \{b\}, \{c\}, \{d\}, \{a,b\}, \{a,c\}, \{a,d\}, \{b,c\}, \{b,d\}, \{c,d\}, \{a,b,c\}, \{a,b,d\}, \{a,c,d\}, \{b,c,d\}\}$, $N\beta^*C(U, \tau_R(X)) = \{U, \emptyset, \{b,c,d\}, \{a,c,d\}, \{a,b,d\}, \{a,b,c\}, \{c,d\}, \{b,d\}, \{b,c\}, \{a,d\}, \{a,c\}, \{a,b\}, \{d\}, \{c\}, \{b\}, \{a\}\}$. Let $V = \{a,b,c,d\}$, $Y = \{a,c,d\}$ and $V/R = \{\{a\},\{b\}\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = a$; $f(b) = b$; $f(c) = c$. Then f is contra nano β^* -continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(a) = \{a\}$ is nano β^* -closed but not nano regular*-closed in $(U, \tau_R(X))$.

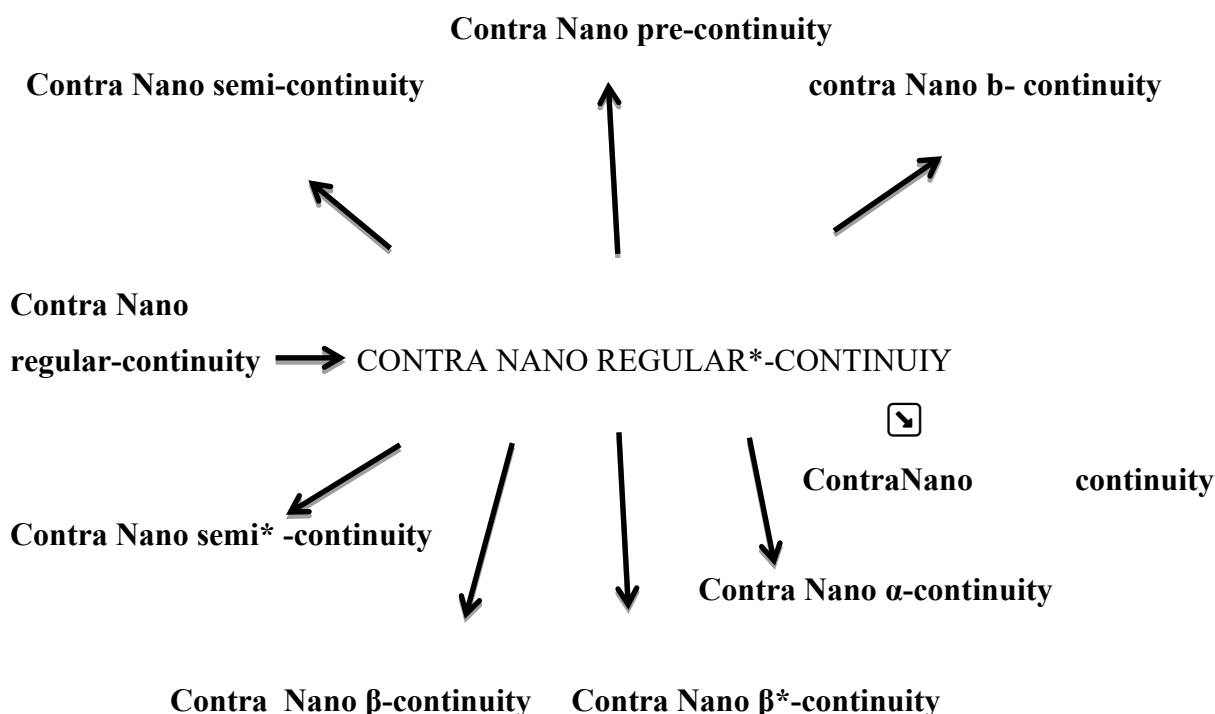
Theorem 3.27: Every contra nano regular*-continuous function is contra nano semi*-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous. Let V be any nano open set in $(V, \sigma_R(Y))$. Then $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$. By theorem 2.5(vii), $f^{-1}(V)$ is nano semi*-closed in $(U, \tau_R(X))$. Therefore f is contra nano semi*-continuous.

Remark 3.28: The converse of the above theorem is not true as shown in the following example.

Example 3.29: Let $U = \{a,b,c\}$, $X = \{b,c\}$ and $U/R = \{\{a\},\{b\},\{c\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{b,c\}\}$, $NR^*O(U, \tau_R(X)) = \{U, \emptyset\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset\}$ and $NS^*O(U, \tau_R(X)) = \{U, \emptyset, \{b,c\}\}$, $NS^*C(U, \tau_R(X)) = \{U, \emptyset, \{a\}\}$. Let $V = \{a,b,c\}$, $V/R = \{\{a\},\{b\}\}$, $Y = \{a,c\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{a\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = a$; $f(b) = b$; $f(c) = c$. Then f is contra nano semi*-continuous but not contra nano regular*-continuous. Since for the nano open set $\{a\}$ in $(V, \sigma_R(Y))$, $f^{-1}(\{a\}) = \{a\}$ is nano semi*-closed but not nano regular*-closed in $(U, \tau_R(X))$.

From the above discussions, we have the following diagram:



Theorem 3.30: A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra nano regular*-continuous if and only if $f^{-1}(F)$ is nano regular*-open in $(U, \tau_R(X))$ for every closed set F in $(V, \sigma_R(Y))$.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-continuous and F be a closed set in $(V, \sigma_R(Y))$. Then $G = V \setminus F$ is nano open in $(V, \sigma_R(Y))$. Then $f^{-1}(G)$ is nano regular*-closed in $(U, \tau_R(X))$. Therefore $f^{-1}(F) = f^{-1}(V \setminus G) = U \setminus f^{-1}(G)$ is nano regular*-open in $(U, \tau_R(X))$.

Converse: Let G be any nano open set in $(V, \sigma_R(Y))$. Then $F = (V \setminus G)$ is nano closed in $(V, \sigma_R(Y))$. By assumption $f^{-1}(F)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence $f^{-1}(G)$

$= f^{-1}(V \setminus F) = U \setminus f^{-1}(F)$ is nano regular*-open in $(U, \tau_R(X))$. Therefore, f is contra nano regular*-continuous.

Theorem 3.31: If a function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is nano regular*-continuous and if $(V, \sigma_R(Y))$ is locally indiscrete, then f is contra nano regular*-continuous.

Proof: Let G be a nano open set in $(V, \sigma_R(Y))$. Since $(V, \sigma_R(Y))$ is locally discrete, G is nano closed in $(V, \sigma_R(Y))$. Since f is nano regular*-continuous, $f^{-1}(G)$ is nano regular*-closed in $(U, \tau_R(X))$. Therefore f is contra nano regular*-continuous.

Theorem 3.32: The composition of two contra nano regular*-continuous functions is nano regular*-continuous.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano regular*-continuous functions. Let V be a nano open set in $(W, \eta_R(Z))$. Since g is contra nano regular*-continuous, $g^{-1}(V)$ is nano regular*-closed in $(V, \sigma_R(Y))$. Since theorem 2.5(ii), $g^{-1}(V)$ is nano closed in $(V, \sigma_R(Y))$. Since f is contra nano regular*-continuous, $f^{-1}(g^{-1}(V))$ is nano regular*-open in $(U, \tau_R(X))$. Thus $g \circ f$ is nano regular*-continuous.

Theorem 3.33: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano regular*-continuous and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano regular*-continuous function. Then $(g \circ f): (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano regular*-continuous.

Proof: Let S be a nano closed set in $(W, \eta_R(Z))$. Since g is contra nano regular*-continuous, $g^{-1}(S)$ is nano regular*-open in $(V, \sigma_R(Y))$. By theorem 2.5(ii) $g^{-1}(S)$ is nano open in $(V, \sigma_R(Y))$. Also f is nano regular*-continuous, $f^{-1}(g^{-1}(S)) = (g \circ f)^{-1}(S)$ is nano regular*-open in $(U, \tau_R(X))$. Hence by theorem 3.30, $g \circ f$ is contra nano regular*-continuous.

Theorem 3.34: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano regular*-irresolute and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano regular*-continuous function. Then $g \circ f: (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano regular*-continuous.

Proof: Let G be a nano open set in $(W, \eta_R(Z))$. Since g is contra nano regular*-continuous, $g^{-1}(G)$ is nano regular*-closed in $(V, \sigma_R(Y))$. Also, since f is nano regular*-irresolute, $f^{-1}(g^{-1}(G)) = (g \circ f)^{-1}(G)$ is nano regular*-closed in $(U, \tau_R(X))$. Hence $g \circ f$ is contra nano regular*-continuous.

IV CONTRA NANO REGULAR*-IRRESOLUTE FUNCTIONS

Definition 4.1: Let $(U, \tau_R(X))$ and $(V, \sigma_R(Y))$ be two nano topological spaces. A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is said to be **contra nano regular*-irresolute** if $f^{-1}(V)$ is nano regular*-closed in $(U, \tau_R(X))$ for every nano regular*-open set V in $(V, \sigma_R(Y))$.

Example 4.2: Let $U = \{a, b, c, d\}$, $X = \{a, c, d\}$ and $U/R = \{\{a, b\}, \{c, d\}\}$. Then $\tau_R(X) = \{U, \emptyset, \{c, d\}, \{a, b\}\}$ and $NR^*O(U, \tau_R(X)) = \{U, \emptyset, \{a, b\}, \{c, d\}\}$, $NR^*C(U, \tau_R(X)) = \{U, \emptyset, \{c, d\}, \{a, b\}\}$. Let $V = \{a, b, c, d\}$, $Y = \{a, b, c\}$ and $V/R = \{\{b\}, \{d\}, \{c\}\}$. Then $\sigma_R(Y) = \{V, \emptyset, \{b, c\}\}$ and $NR^*O(V, \sigma_R(Y)) = \{V, \emptyset, \{b, c\}\}$, $NR^*C(V, \sigma_R(Y)) = \{V, \emptyset, \{a, d\}\}$. Define $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ by $f(a) = a$; $f(b) = d$; $f(c) = b$; $f(d) = c$. Then $f^{-1}\{b, c\} = \{c, d\}$ is nano regular*-closed in $(U, \tau_R(X))$. Hence f is contra nano regular*-irresolute function.

Theorem 4.3: A function $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ is contra nano regular*-irresolute if and only if the inverse image of every nano regular*-closed set in $(V, \sigma_R(Y))$ is nano regular*-open in $(U, \tau_R(X))$.

Proof: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a contra nano regular*-irresolute and S be a nano regular*-closed set in $(V, \sigma_R(Y))$. Since f is contra nano regular*-irresolute function, $f^{-1}(S^c) = (f^{-1}(S))^c$ is nano regular*-closed in $(U, \tau_R(X))$. Hence $f^{-1}(S)$ is nano regular*-open set in $(U, \tau_R(X))$. Conversely, suppose the inverse image of every nano regular*-closed set in $(V, \sigma_R(Y))$ is nano regular*-open in $(U, \tau_R(X))$. Let S be a nano regular*-open set in $(V, \sigma_R(Y))$. Then S^c is nano regular*-closed in $(V, \sigma_R(Y))$. By assumption, $f^{-1}(S^c) = (f^{-1}(S))^c$ is nano regular*-open in $(U, \tau_R(X))$. Hence f is contra nano regular*-irresolute.

Theorem 4.4: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be nano regular*-irresolute and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be contra nano regular*-irresolute. Then

$(g \circ f): (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano regular*-irresolute.

Proof: Let G be a nano regular*-open set in $(W, \eta_R(Z))$. Since g is contra nano regular*-irresolute, $g^{-1}(G)$ is nano regular*-closed in $(V, \sigma_R(Y))$. Since f is nano regular*-irresolute, $(g \circ f)^{-1}(G) = f^{-1}(g^{-1}(G))$ is nano regular*-closed in $(U, \tau_R(X))$. Hence $g \circ f$ is contra nano regular*-irresolute.

Theorem 4.5: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be contra nano regular*-irresolute and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ be nano regular*-irresolute. Then

$(g \circ f): (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is contra nano regular*-irresolute.

Proof: Let G be a nano regular*-open set in $(W, \eta_R(Z))$. Since g is nano regular*-irresolute, $g^{-1}(G)$ is nano regular*-open in $(V, \sigma_R(Y))$. Since f is contra nano regular*-irresolute, $(g \circ f)^{-1}(G) = f^{-1}(g^{-1}(G))$ is nano regular*-closed in $(U, \tau_R(X))$. Hence $g \circ f$ is contra nano regular*-irresolute.

Theorem 4.6: If $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ and $g: (V, \sigma_R(Y)) \rightarrow (W, \eta_R(Z))$ are contra nano regular*-irresolute functions, then $g \circ f: (U, \tau_R(X)) \rightarrow (W, \eta_R(Z))$ is nano regular*-irresolute.

Proof: Let G be nano regular*-open set in Z . Since g is contra nano regular*-irresolute, $g^{-1}(G)$ is nano regular*-closed in $(V, \sigma_R(Y))$. Also, since f is contra nano regular*-irresolute, by theorem 4.3, $(g \circ f)^{-1}(G) = f^{-1}(g^{-1}(G))$ is nano regular*-open in $(U, \tau_R(X))$. Hence $g \circ f$ is nano regular*-irresolute.

V CONCLUSION

In this paper we have introduced contra nano regular*-continuous and contra nano regular*-irresolute functions and investigated their fundamental properties. Also, we have examined their relationships with other existing nano continuous and nano irresolute functions.

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TRIBONACCI CORDIAL LABELING OF PATH & CYCLE RELATED GRAPHS

D. Saranya

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

Abstract: The Tribonacci Cordial labeling is an extension of Fibonacci Cordial labeling, a well-known forms of vertex labelings. An injective function

$f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ is said to be Tribonacci Cordial labeling if the induced function $f^*: E(G) \rightarrow \{0,1\}$ defined by $f^*(uv) = (f(u) + f(v)) \pmod{2}$ satisfies the conditions $|e_f(0) - e_f(1)| \leq 1$. A Graph which admits Tribonacci Cordial labeling is called Tribonacci Cordial Graph. In this paper, we investigate whether some well-known Graphs are Tribonacci Cordial.

Keywords: Tribonacci Cordial labeling, Star Graph, Coconut Tree Graph, Total Path Graph, Quadrilateral Snake Graph, Jewel Graph.

I INTRODUCTION

Graph labeling is a significant area of research in discrete mathematics, with applications in network design, cryptography, coding theory and combinatorial optimization. It involves assigning numbers to the vertices or edges of a graph with specific conditions. Cordial labeling was introduced by Cahit in 1987[1], ensures a balanced distribution of assigning labels. In this paper, we study Tribonacci Cordial labeling for different Graphs, a variation of Cordial labeling that incorporates the Tribonacci sequence, where each term is the sum of the previous three terms. An injective function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ is said to be Tribonacci Cordial labeling if

the induced function $f^*: E(G) \rightarrow \{0,1\}$ defined by $f^*(uv) = (f(u) + f(v)) \pmod{2}$ satisfies the conditions $|e_f(0) - e_f(1)| \leq 1$. A Graph which admits Tribonacci Cordial labeling is called Tribonacci Cordial Graph. In this study, we examine the existence of Tribonacci Cordial labeling for Star Graph, Coconut Tree Graph, Total Path Graph, Quadrilateral Snake Graph and Jewel Graph.

II PRELIMINARIES

In this section, we recall some basic definitions related to this paper. In this paper, the Graphs considered are all simple, connected and undirected.

Definition 2.1: A Graph G consists of a pair $(V(G), X(G))$ where $V(G)$ is a non-empty finite set whose elements are called points or vertices and $X(G)$ is a set of unordered pairs of distinct elements of $V(G)$. The elements of $X(G)$ are called lines or edges of the Graph G .

Definition 2.2: A Path is a sequence of vertices where each consecutive pair of vertices is connected by an edge in the Graph.

Definition 2.3: A Cycle is a non-empty path in which the first and last vertices are identical.

Definition 2.4: A Tree is an undirected Graph in which any two vertices are connected by exactly one path, or equivalently a connected acyclic undirected Graph.

Definition 2.5: Total Graph $T(G)$ is a Graph with the vertex set $V(G) \cup E(G)$ in which two vertices are adjacent whenever they are either adjacent or incident in G .

Definition 2.6: A Star Graph S_n is a Tree where one vertex is connected to all other vertices.

Definition 2.7: A Coconut Tree Graph $CT(m, n)$ is obtained from the path P_m by appending n new pendent edges at an end vertex of P_m .

Definition 2.8: Total Path Graph $T(P_m)$ has $2m - 1$ vertices and $4m - 5$ edges, the vertex set and the edge set of $T(P_m)$ be

$$V(T(P_m)) = \{v_i, 0 \leq i \leq m - 1\} \cup \{u_i, 0 \leq i \leq m - 2\} \text{ and}$$

$$E(T(P_m)) = \{v_i v_{i+1} / 0 \leq i \leq m - 2\} \cup \{u_i u_{i+1} / 0 \leq i \leq m - 3\} \cup \{u_i v_{i+1} / 0 \leq i \leq m - 2\} \cup \{u_i v_i / 0 \leq i \leq m - 2\}.$$

Definition 2.9: The Fish Graph is a planer undirected Graph with 6 vertices and 7 edges in the form of a cycles (C_3, C_4) and adjoined by a common vertex.

Definition 2.10:[8] A Quadrilateral Snake Graph Q_n is obtained from a path $v_1, v_2, \dots, v_n$ by joining v_i and v_{i+1} to new vertices u_i and w_i for $1 \leq i \leq n - 1$ respectively and then joining u_i and w_i .

Definition 2.11: The Jewel Graph J_n is obtained from a cycle C_4 by adding a prime edge connecting two non-adjacent vertices of the cycle and also appending an edge from two vertices of the cycle C_4 , meeting at a common vertex.

Definition 2.12:[3] The Bull Graph is a planer undirected Graph with 5 vertices and 5 edges in the form of a triangle with two disjoint pendant edges attached to disjoint vertices.

Definition 2.13: The Cricket Graph is a planer undirected Graph with 5 vertices and 5 edges in the form of a triangle with two disjoint pendant vertices attached to same vertex.

Definition 2.14: Graph labeling is an assignment of integers to vertices or edges, or both, under certain conditions.

Definition 2.15:[7] A function $f: V(G) \rightarrow \{0,1\}$ is said to be **Cordial Labeling** if the induced function $f^*: E(G) \rightarrow \{0,1\}$ defined by $f^*(uv) = |f(u) - f(v)|$ satisfies the conditions $|v_f(0) - v_f(1)| \leq 1$, as well as $|e_f(0) - e_f(1)| \leq 1$, where,

$v_f(0)$ = Number of vertices with label 0,

$v_f(1)$ = Number of vertices with label 1,

$e_f(0)$ = Number of edges with label 0,

$e_f(1)$ = Number of edges with label 1.

Definition 2.16:[7] The Tribonacci Sequence is defined by each term is the sum of the three preceding terms. In other words, The sequence T_n of Tribonacci numbers is defined by the third order linear recurrence relation (for $n \geq 0$): $T_{n+3} = T_n + T_{n+1} + T_{n+2}; T_0 = 0, T_1 = T_2 = 1$ i.e., $\{0,1,1,2,4,7,13,24,44,81, \dots\}$ is the **Tribonacci sequence**.

Definition 2.17:[7] An injective function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ is said to be **Tribonacci Cordial Labeling** if the induced function $f^*: E(G) \rightarrow \{0,1\}$ defined by $f^*(uv) = (f(u) + f(v)) \pmod{2}$ satisfies the conditions $|e_f(0) - e_f(1)| \leq 1$. A Graph which admits Tribonacci Cordial labeling is called Tribonacci Cordial Graph.

III TRIBONACCI CORDIAL LABELING GRAPHS

Theorem 3.1: The Star Graph S_n is a Tribonacci cordial Graph.

Proof: A Star Graph is a tree with one internal node and multiple leaves. Let v be the central vertex. Let $\{v_1, v_2, \dots, v_n\}$ be the pendant vertices adjacent to v .

The resultant Graph is S_n with

$$V(S_n) = \{v\} \cup \{v_i / 1 \leq i \leq n-1\} \text{ and}$$

$$E(S_n) = \{vv_i / 1 \leq i \leq n-1\}.$$

Define a function $f: V(S_n) \rightarrow \{T_0, T_1, \dots, T_n\}$ by

$$f(v) = T_{n-1}$$

$$f(v_i) = T_{i-1}, 1 \leq i \leq n-1$$

$$f^*(uv) = (f(u) + f(v)) \pmod{2}$$

Example for Tribonacci cordial labeling for the Graph S_9 is given in the Figure 3.1

Edge label calculation for S_9 is given by the following equations

$$f^*(uv) = (f(u) + f(v))(\text{mod } 2)$$

$$f^*(vv_1) = (f(v) + f(v_1))(\text{mod } 2) = T_8 + T_0(\text{mod } 2) = 44 + 0(\text{mod } 2) = 0$$

$$f^*(vv_2) = (f(v) + f(v_2))(\text{mod } 2) = T_8 + T_1(\text{mod } 2) = 44 + 1(\text{mod } 2) = 1$$

$$f^*(vv_3) = (f(v) + f(v_3))(\text{mod } 2) = T_8 + T_2(\text{mod } 2) = 44 + 1(\text{mod } 2) = 1$$

$$f^*(vv_4) = (f(v) + f(v_4))(\text{mod } 2) = T_8 + T_3(\text{mod } 2) = 44 + 2(\text{mod } 2) = 0$$

$$f^*(vv_5) = (f(v) + f(v_5))(\text{mod } 2) = T_8 + T_4(\text{mod } 2) = 44 + 4(\text{mod } 2) = 0$$

$$f^*(vv_6) = (f(v) + f(v_6))(\text{mod } 2) = T_8 + T_5(\text{mod } 2) = 44 + 7(\text{mod } 2) = 1$$

$$f^*(vv_7) = (f(v) + f(v_7))(\text{mod } 2) = T_8 + T_6(\text{mod } 2) = 44 + 13(\text{mod } 2) = 1$$

$$f^*(vv_8) = (f(v) + f(v_8))(\text{mod } 2) = T_8 + T_7(\text{mod } 2) = 44 + 24(\text{mod } 2) = 0$$

$$|e_f(0) - e_f(1)| = |4 - 4| = 0 \leq 1$$

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Therefore, Star Graph S_n admits Tribonacci Cordial labeling for all $n \geq 3$.

Theorem 3.2: The Coconut Tree Graph $CT(m, n)$ is a Tribonacci Cordial Graph.

Proof: Let $v_i, 1 \leq i \leq m$ be the vertices of the path P_m and let $u_i, 1 \leq i \leq n$ be the new pendant vertices which are attached to the m^{th} vertex of the path P_m .

The resultant Graph is $CT(m, n)$ whose vertex set is

$$V[CT(m, n)] = \{\{v_i/1 \leq i \leq m\} \cup \{u_i/1 \leq i \leq n\}\} \text{ and edge set is}$$

$$E[CT(m, n)] = \{\{v_i v_{i+1}/1 \leq i \leq m-1\} \cup \{v_m u_i/1 \leq i \leq n\}\} \text{ such that}$$

$$|V[CT(m, n)]| = p = m + n \text{ and } |E[CT(m, n)]| = q = m + n - 1.$$

Define a function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$.

In order to assign Tribonacci Cordial labeling to the Graph $CT(m, n)$, the labeling is given under two cases.

Case (i): If $m = n$. The vertex and edge labeling is given by the following equation.

$$f(v_i) = T_{i-1}, 1 \leq i \leq m$$

$$f(u_i) = T_{n-1+i}, 1 \leq i \leq n$$

Case (ii): If $m \neq n$. The vertex and edge labeling is given by the following equation.

$$f(v_m) = T_{m+n-1}$$

$$f(v_i) = T_{i-1}, 1 \leq i \leq m-1$$

$$f(u_i) = T_{(m-2)+i}, 1 \leq i \leq n$$

Example for Tribonacci Cordial labeling for the Graph $CT(5,5)$ and $CT(3,7)$ is shown in the Figure 3.2(a) and Figure 3.2(b) for case (i) & case (ii) respectively.

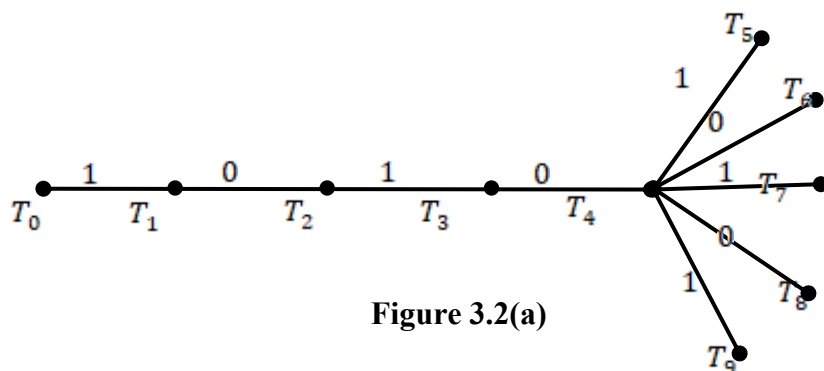


Figure 3.2(a)

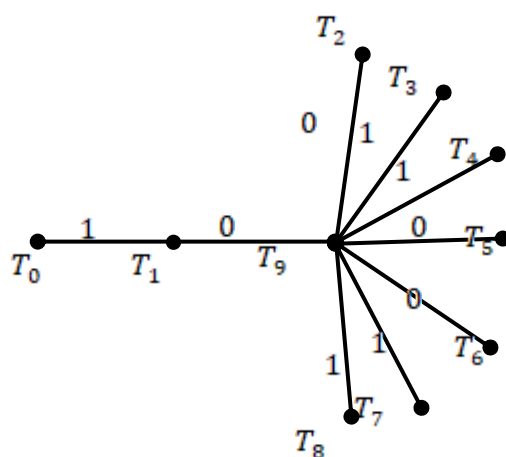


Figure 3.2(b)

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Hence we conclude that the Coconut Tree Graph $CT(m, n)$ admits Tribonacci Cordial labeling for all $m \geq 2, n \geq 1$.

Theorem 3.3: Total Path Graph $T(P_m)$ is a Tribonacci Cordial Graph.

Proof: Let $V(T(P_m)) = \{v_i, 0 \leq i \leq m-1\} \cup \{u_i/0 \leq i \leq m-2\}$

Let $E(T(P_m)) = \{v_i v_{i+1}/0 \leq i \leq m-2\} \cup \{u_i u_{i+1}/0 \leq i \leq m-3\} \cup \{u_i v_{i+1}/0 \leq i \leq m-2\} \cup \{u_i v_i/0 \leq i \leq m-2\}$

The cardinality of the vertex set and the edge set of $T(P_m)$ are

$|V(T(P_m))| = p = 2m - 1$ and $|E(T(P_m))| = q = 4m - 5$.

Define a function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ by

$$f(v_i) = \begin{cases} T_{2i}, & \text{if } i \equiv 0 \pmod{2}; \\ T_{2i+1}, & \text{if } i \equiv 1 \pmod{2}, \end{cases}$$

$$f(u_i) = \begin{cases} T_{2i+1}, & \text{if } i \equiv 0 \pmod{2}; \\ T_{2i}, & \text{if } i \equiv 1 \pmod{2}, \end{cases}$$

Example for Tribonacci Cordial labeling for the Graph $T(P_6)$ is given in the Figure 3.3

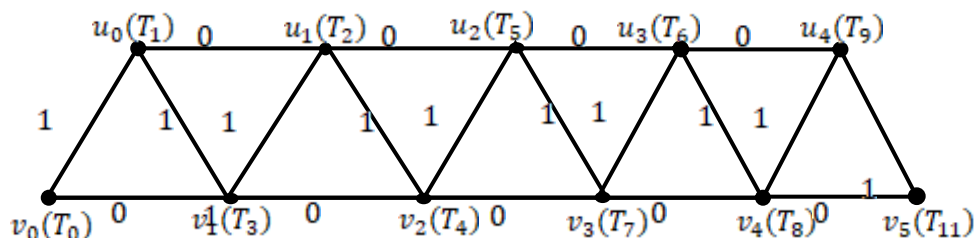


Figure 3.3

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Therefore, Total Graph of Path $T(P_m)$ admits Tribonacci Cordial labeling.

Theorem 3.4: Fish Graph is a Tribonacci Cordial Graph.

Proof: Let $V(G) = \{v_i/1 \leq i \leq 6\}$ be the vertices of C_3 and C_4 which are adjoined by a common vertex v_3 which results a Fish Graph such that $|V(G)| = p = 6$ and $|E(G)| = q = 7$. The following function assigns Tribonacci Cordial labeling to the vertices of the Fish Graph.

Define a function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ by $f(v_i) = T_{i-1}, 1 \leq i \leq 6$.

Tribonacci Cordial labeling for Fish Graph is given in the Figure 3.4

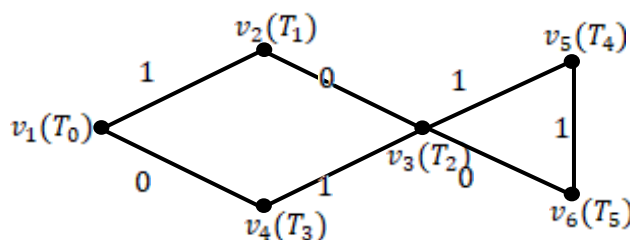


Figure 3.4

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Therefore, Fish Graph admits Tribonacci Cordial labeling.

Theorem 3.5: The Quadrilateral Snake Graph Q_n is a Tribonacci Cordial Graph.

Proof: Let $\{v_i/0 \leq i \leq n-1\}$ be the vertices of the path P_n and

Let $\{u_i, w_i/1 \leq i \leq n-1\}$ be the new vertices which are joined to each vertices of the path P_n . The resultant Graph is Q_n whose vertex set is

$$V(Q_n) = \{\{v_i/1 \leq i \leq n\} \cup \{u_i, w_i/1 \leq i \leq n-1\}\}$$

$$E(Q_n) = \{\{v_i v_{i+1}/1 \leq i \leq n-1\} \cup \{u_i, w_i/1 \leq i \leq n-1\} \cup \{v_i u_i/1 \leq i \leq n-1\} \cup \{v_i w_{i-1}/2 \leq i \leq n\}\}$$

such that

$$|V(Q_n)| = p = 3n - 2 \text{ and } |E(Q_n)| = q = 4n - 4.$$

Define a function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ by

$$f(v_1) = T_0$$

$$f(u_1) = T_3$$

$$f(w_1) = T_2$$

$$f(v_i) = T_{3i-5}, 2 \leq i \leq n$$

$$f(u_i) = T_{3i-1}, 2 \leq i \leq n-1$$

$$f(w_i) = T_{3i}, 2 \leq i \leq n-1$$

Example for Tribonacci Cordial labeling for the Graph Q_7 is given in the Figure 3.5

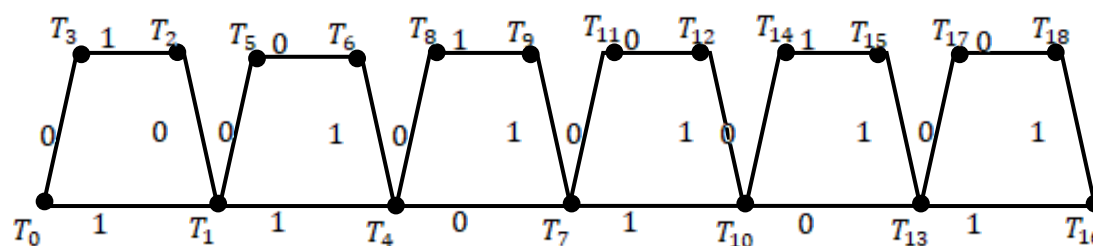


Figure 3.5

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Therefore, Quadrilateral Snake Graph Q_n admits Tribonacci Cordial labeling for all $n \geq 2$.

Theorem 3.6: Jewel Graph J_n is a Tribonacci Cordial Graph.

Proof: Let u, v, x, y be the vertices of C_4 formed by joining x and y with a prime edge and also by appending an edge from u and v which meets at common vertices

$v_i, 1 \leq i \leq n$. The resultant Graph is J_n whose vertex set is

$$V(J_n) = \{u, v, x, y, v_i/1 \leq i \leq n\} \text{ and edge set is}$$

$$E(J_n) = \{ux, uy, vx, vy, xy, uv_i, vv_i/1 \leq i \leq n\} \text{ such that}$$

$$|V(J_n)| = p = n + 4 \text{ and } |E(J_n)| = q = 2n + 5.$$

Define a function $f: V(G) \rightarrow \{T_0, T_1, \dots, T_n\}$ by

$$f(u) = T_0, f(x) = T_1, f(v) = T_2, f(y) = T_3, f(v_i) = T_{3+i}, 1 \leq i \leq n.$$

Example for Tribonacci Cordial labeling for the Graph J_3 is given in the Figure 3.6

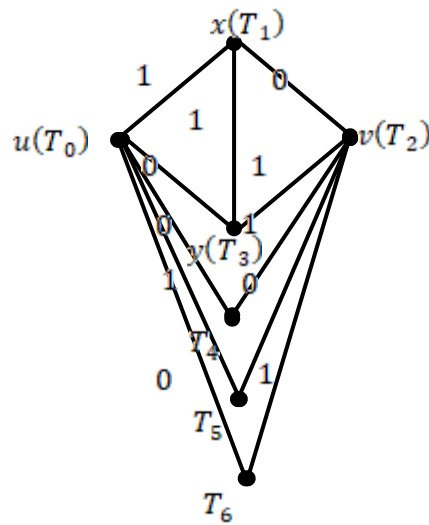


Figure 3.6

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Therefore, Jewel Graph Q_n admits Tribonacci Cordial labeling for all $n \geq 1$.

Theorem 3.7: Bull Graph is a Tribonacci Cordial Graph.

Proof: Let $V(G) = \{v_i/1 \leq i \leq 5\}$ be the vertices and $E(G) = \{e_i/1 \leq i \leq 5\}$ be the edges of G which is in the form of triangle with two disjoint pendant edges. Let v_2, v_3, v_4 be the vertices of the triangle and v_1, v_5 be the pendant vertices adjacent to v_2, v_4 which results a Bull Graph. The following function assigns Tribonacci Cordial labeling to the vertices of the Bull Graph, $f(v_i) = T_{i-1}, 1 \leq i \leq 5$.

Tribonacci Cordial labeling for Bull Graph is given in the Figure 3.7

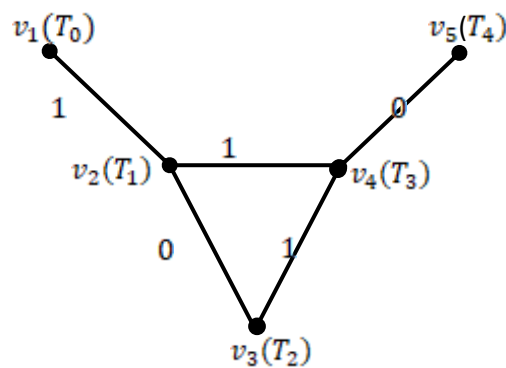


Figure 3.7

Hence the condition $|e_f(0) - e_f(1)| \leq 1$ is satisfied.

Therefore, Bull Graph admits Tribonacci Cordial labeling.

Remark 3.8: Cricket Graph, which has the same vertex set $V(G)$ and edge set $E(G)$ with same labeling as Bull Graph is Tribonacci Cordial Graph.

IV CONCLUSION

In this study, we explored Tribonacci Cordial labeling for various Graph structures. The findings contribute to the broader field of Graph labeling, particularly in the application of Tribonacci sequences. The successful labeling of these Graphs suggests that Tribonacci Cordial labeling can be extended to other families of Graphs, paving the way for future research. The main objective was to determine whether the given Graphs admits a Tribonacci Cordial labeling and analyze their properties in relation to Tribonacci numbers.

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A View on Separation Axioms via Nano $g\alpha^*$ - Open Sets

J. Esther Rani

Department of Mathematics, St. Mary's College (Autonomous) Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT: The basic objective of this paper is to define nano generalized α^*-T_0 space, nano generalized α^*-T_1 space, nano generalized α^*-T_2 space and investigate their properties. Also we have obtained some of their basic results and given appropriate examples to understand the abstract concepts clearly.

KEY WORDS: Nano generalized α^*-T_0 space, Nano generalized α^*-T_1 space,
Nano generalized α^*-T_2 space.

I INTRODUCTION

The theory of nano topology proposed by Lellis Thivagar [3] and Carmel Richard is an extension of set theory for the study of intelligent systems characterized by insufficient and incomplete information. The elements of a nano topological space are called the nano open sets. The author has defined nano topological space in terms of lower and upper approximations and boundary region. Further, various topological concepts were studied in the subsequent years. The concept of separation axioms in nano topology was introduced by Sathishmohan et.al.[5] P. Anbarasi Rodrigo and P. Subithra [1] have presented a new class of nano generalized closed sets namely nano generalized α^* -closed sets. The aim of this paper is to introduce and study the properties of nano generalized α^*-T_0 , nano generalized α^*-T_1 and nano generalized α^*-T_2 in nano topological spaces.

II PRELIMINARIES

Throughout this paper $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ represent nano topological spaces on which no separation axioms are assumed unless and otherwise mentioned. For a subset $\mathbb{S}$ of $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$, $Ncl(\mathbb{S})$ and $Nint(\mathbb{S})$ denote the nano closure of $\mathbb{S}$ and nano interior of $\mathbb{S}$ respectively. We recall the following definitions, which are useful in the sequel.

Definition 2.1[3]: Let $\mathbb{U}$ be a non-empty finite set of objects called the universe and $\mathbb{R}$ be an equivalence relation on $\mathbb{U}$ named as the indiscernibility relation. Elements belonging to the same equivalence class are said to be indiscernible with one another. The pair $(\mathbb{U}, \mathbb{R})$ is said to be the approximation space. Let $\mathbb{X} \subseteq_{\mathbb{N}} \mathbb{U}$. Then

1) The lower approximation of $\mathbb{X}$ with respect to $\mathbb{R}$ is the set of all objects, which can be for certain classified as $\mathbb{X}$ with respect to $\mathbb{R}$ and it is denoted by $\mathbb{L}_{\mathbb{R}}(\mathbb{X})$.

$$\mathbb{L}_{\mathbb{R}}(\mathbb{X}) = \bigcup_{x \in \mathbb{U}} \{\mathbb{R}(x) : \mathbb{R}(x) \subseteq_{\mathbb{N}} \mathbb{X}\}.$$

2) The upper approximation of $\mathbb{X}$ with respect to $\mathbb{R}$ is the set of all objects, which can be possibly classified as $\mathbb{X}$ with respect to $\mathbb{R}$ and it is denoted by $\mathbb{U}_{\mathbb{R}}(\mathbb{X})$.

$$\mathbb{U}_{\mathbb{R}}(\mathbb{X}) = \bigcup_{x \in \mathbb{U}} \{\mathbb{R}(x) : \mathbb{R}(x) \cap \mathbb{X} \neq \emptyset\}.$$

3) The boundary region of $\mathbb{X}$ with respect to $\mathbb{R}$ is the set of all objects, which can be classified neither as $\mathbb{X}$ nor as not $-\mathbb{X}$ with respect to $\mathbb{R}$ and it is denoted by $\mathbb{B}_{\mathbb{R}}(\mathbb{X})$.

$$\mathbb{B}_{\mathbb{R}}(\mathbb{X}) = \mathbb{U}_{\mathbb{R}}(\mathbb{X}) - \mathbb{L}_{\mathbb{R}}(\mathbb{X}).$$

Definition 2.2[3]: Let $\mathbb{U}$ be the universe, $\mathbb{R}$ be an equivalence relation on $\mathbb{U}$ and

$\tau_{\mathbb{R}}(\mathbb{X}) = \{\mathbb{U}, \emptyset, \mathbb{L}_{\mathbb{R}}(\mathbb{X}), \mathbb{U}_{\mathbb{R}}(\mathbb{X}), \mathbb{B}_{\mathbb{R}}(\mathbb{X})\}$ where $\mathbb{X} \subseteq_{\mathbb{N}} \mathbb{U}$. Then $\tau_{\mathbb{R}}(\mathbb{X})$ satisfies the following axioms:

- 1) $\mathbb{U}$ and $\emptyset \in \tau_{\mathbb{R}}(\mathbb{X})$.
- 2) The union of the elements of any sub collection of $\tau_{\mathbb{R}}(\mathbb{X})$ is in $\tau_{\mathbb{R}}(\mathbb{X})$.
- 3) The intersection of the elements of any finite sub collection of $\tau_{\mathbb{R}}(\mathbb{X})$ is in $\tau_{\mathbb{R}}(\mathbb{X})$. That is, $\tau_{\mathbb{R}}(\mathbb{X})$ is a topology on $\mathbb{U}$ called the nano topology on $\mathbb{U}$ with respect to $\mathbb{X}$. We call $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ as the nano topological space. The elements of $\tau_{\mathbb{R}}(\mathbb{X})$ are called as nano open sets. The complement of nano-open sets is called nano closed sets.

Definition 2.3[3]: If $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ is a nano topological space with respect to $\mathbb{X}$ and if $\mathbb{S} \subseteq_{\mathbb{N}} \mathbb{U}$, then

- (i) The nano interior of $\mathbb{S}$ is defined as the union of all nano open subsets of $\mathbb{S}$ and it is denoted by $\mathbb{N}(\mathbb{S})$. That is, $\mathbb{N}(\mathbb{S})$ is the largest open subset of $\mathbb{S}$.
- (ii) The nano closure of $\mathbb{S}$ is define as the intersection of all nano closed sets containing $\mathbb{S}$ and it is denoted by $\mathbb{N}(\mathbb{S})$. That is, $\mathbb{N}(\mathbb{S})$ is the smallest nano closed set containing $\mathbb{S}$.

Definition 2.4[5]: A nano topological space $\mathbb{U}$ is called nano T_0 space for $u, v \in \mathbb{U}$ and $u \neq v$, there exists a nano-open set $\mathbb{G}$ such that $u \in \mathbb{G}$ and $v \notin \mathbb{G}$.

Definition 2.5[5]: A nano topological space $\mathbb{U}$ is called nano T_1 space for $u, v \in \mathbb{U}$ and $u \neq v$, there exists a nano-open sets $\mathbb{G}$ and $\mathbb{H}$ such that $u \in \mathbb{G}$, $v \notin \mathbb{G}$ and $v \in \mathbb{H}$, $u \notin \mathbb{H}$.

Definition 2.6[5]: A nano topological space $\mathbb{U}$ is called nano T_2 space for $u, v \in \mathbb{U}$ and $u \neq v$, there exists disjoint nano open sets $\mathbb{G}$ and $\mathbb{H}$ such that $u \in \mathbb{G}$ and $v \in \mathbb{H}$.

Definition 2.7[1]: A nano generalized α^* -closed set is a subset $\mathbb{S}$ of a $N(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ if $Nacl(\mathbb{S}) \subseteq_{\mathbb{N}} Nint^*(\mathbb{F})$ whenever $\mathbb{S} \subseteq_{\mathbb{N}} \mathbb{F}$ and $\mathbb{F}$ is $\mathbb{N}g$ -open in $\mathbb{U}$.

Definition 2.8[1]: A subset $\mathbb{S}$ of a $NTS(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ is called nano generalized α^* -open set if its complement is nano generalized α^* -closed.

Theorem 2.9[1]: Every nano open set is nano generalized α^* -open.

Theorem 2.10[1]: If $\mathbb{G}$ and $\mathbb{H}$ are nano generalized α^* -open sets in nano topological space, then $\mathbb{G} \cup \mathbb{H}$ is a nano generalized α^* -open set.

Definition 2.11[1]: Let $\mathbb{S}$ be a subset of the $NTS(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$. Then the intersection of all nano generalized α^* -closed sets containing $\mathbb{S}$ is called nano generalized α^* -closure of $\mathbb{S}$. That is, nano generalized α^* - $cl(\mathbb{S}) = \cap \{ \mathbb{R} : \mathbb{R} \text{ is nano generalized } \alpha^* \text{- closed sets and } \mathbb{S} \subseteq_{\mathbb{N}} \mathbb{R} \}$.

Theorem 2.12[1]: Let $\mathbb{S}$ be a subset of $\mathbb{U}$, then

- nano generalized α^* - $cl(\mathbb{S})$ is nano generalized α^* -closed in $\mathbb{U}$ and nano generalized α^* - $cl(\mathbb{S})$ is the smallest nano generalized α^* - closed set in $\mathbb{U}$ containing $\mathbb{S}$.
- $\mathbb{S}$ is nano generalized α^* -closed if and only if nano generalized α^* - $cl(\mathbb{S}) = \mathbb{S}$.

Definition 2.13[2]: A function $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ is called Nano generalized α^* -continuous if $f^{-1}(\mathbb{S})$ is nano generalized α^* -closed in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ for every nano closed set $\mathbb{S}$ in $(\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$. That is, if the inverse image of every nano closed set in $(\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ is nano generalized α^* -closed in $\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})$ then f is nano generalized α^* - continuous.

Definition 2.14[2]: A function $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ is called Nano generalized α^* -irresolute function if the inverse image of every nano generalized α^* -closed set in $(\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ is nano generalized α^* -closed in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$.

Remark 2.15: A nano topological space $\mathbb{U}$ is $\mathbf{T}_1$ iff $\{ u \}$ is closed in $\mathbb{U}$ for every $u \in \mathbb{U}$.

III NANO GENERALIZED α^* - T_0 SPACES

Definition 3.1: A nano topological space $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ is said to be nano generalized α^*-T_0 if whenever u and v are distinct points in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ there exists a nano generalized α^* -open set in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ containing one of u and v but not the other.

Example 3.2: Let $\mathbb{U} = \{p, q, r\}$ with $\mathbb{U}/\mathbb{R} = \{\{p\}, \{p, q\}\}$ and $\mathbb{X} = \{p\} \subseteq_{\mathbb{N}} \mathbb{U}$. Then $\tau_{\mathbb{R}}(\mathbb{X}) = \{\mathbb{U}, \phi, \{p\}, \{q\}, \{p, q\}\}$. Here $\text{Ng}\alpha^*\text{-open} = \{\mathbb{U}, \phi, \{p, q\}, \{q\}, \{p\}\}$. Clearly, it is $\text{Ng}\alpha^*-T_0$.

Theorem 3.3: Every Nano T_0 space is $\text{Ng}\alpha^*-T_0$ space.

Proof: Let $\mathbb{U}$ be Nano T_0 space, u and v be two distinct points of $\mathbb{U}$. As $\mathbb{U}$ is Nano T_0 there exists a nano-open set $\mathbb{G}$ such that $u \in \mathbb{G}$ and $v \notin \mathbb{G}$, by theorem 2.9, $\mathbb{G}$ is $\text{Ng}\alpha^*$ -open. Hence $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$ space.

Remark 3.4: The converse of the theorem need not be true in general as shown in the following example.

Example 3.5: Let $\mathbb{U} = \{p, q, r, s\}$ with $\mathbb{U}/\mathbb{R} = \{\{p\}, \{r\}, \{q, s\}\}$ and $\mathbb{X} = \{p, q\} \subseteq_{\mathbb{N}} \mathbb{U}$.

Then $\tau_{\mathbb{R}}(\mathbb{X}) = \{\mathbb{U}, \phi, \{p\}, \{q, s\}, \{p, q, s\}\}$.

Here $\text{Ng}\alpha^*\text{-open} = \{\mathbb{U}, \phi, \{p, q, s\}, \{q, s\}, \{p, s\}, \{p, q\}, \{s\}, \{q\}, \{p\}\}$. Clearly, it is $\text{Ng}\alpha^*T_0$ space. Now, for any two points q and s , there does not exist any Nano open set containing one but not the other. Hence $\mathbb{U}$ is not Nano T_0 .

Theorem 3.6: A nano topological space $\mathbb{U}$ is a $\text{Ng}\alpha^*-T_0$ if and only if the $\text{Ng}\alpha^*$ -closure of distinct points are distinct.

Proof: Let u and v be two distinct points of a $\text{Ng}\alpha^*-T_0$ space $\mathbb{U}$. We prove that $\text{Ng}\alpha^*cl(\{u\}) \neq \text{Ng}\alpha^*cl(\{v\})$. Since, $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$, there exists a $\text{Ng}\alpha^*$ -open set $\mathbb{S}$ in $\mathbb{U}$ such that $u \in \mathbb{S}, v \notin \mathbb{S}$. Also, $u \notin U - \mathbb{S}$ and $v \in U - \mathbb{S}$, where $U - \mathbb{S}$ is $\text{Ng}\alpha^*$ -closed set in $\mathbb{U}$. Since $\text{Ng}\alpha^*cl(\{v\})$ is the intersection of all $\text{Ng}\alpha^*$ -closed sets which contain v , $v \in \text{Ng}\alpha^*cl(\{v\})$ and $u \notin \text{Ng}\alpha^*cl(\{v\})$ as $u \notin U - \mathbb{S}$. Therefore, $\text{Ng}\alpha^*cl(\{u\}) \neq \text{Ng}\alpha^*cl(\{v\})$.

Conversely, suppose the $\text{Ng}\alpha^*$ -closure of distinct points are different. Let u and v be two distinct points of $\mathbb{U}$. Then $\text{Ng}\alpha^*cl(\{u\}) \neq \text{Ng}\alpha^*cl(\{v\})$. Hence there exist a point w in $\mathbb{U}$ such that w lies in only one of the two sets $\text{Ng}\alpha^*cl(\{u\})$ and $\text{Ng}\alpha^*cl(\{v\})$, say $\text{Ng}\alpha^*cl(\{u\})$. If $u \in \text{Ng}\alpha^*cl(\{v\})$ then $w \in \text{Ng}\alpha^*cl(\{u\}) \subseteq \text{Ng}\alpha^*cl(\{v\})$ which implies $w \in \text{Ng}\alpha^*cl(\{v\})$ which is a contradiction to $w \notin \text{Ng}\alpha^*cl(\{v\})$. Therefore $u \notin \text{Ng}\alpha^*cl(\{v\})$.

Hence $\mathbb{U} - \text{Ng}\alpha^*cl(\{v\})$ is a $\text{Ng}\alpha^*$ open set in $\mathbb{U}$ containing u but not v . Hence, $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$ space.

Theorem 3.7: Let $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ be a bijection. If f is $\text{Ng}\alpha^*$ -open and $\mathbb{U}$ is NT_0 , then $\mathbb{V}$ is $\text{Ng}\alpha^*-T_0$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -open and $\mathbb{U}$ is NT_0 . Let $v_1 \neq v_2 \in \mathbb{V}$. Since f is a bijection, there exist u_1, u_2 in $\mathbb{U}$ such that $f(u_1) = v_1$ and $f(u_2) = v_2$ with $u_1 \neq u_2$. Since $\mathbb{U}$ is NT_0 , there exists a nano open set $\mathbb{S}$ in $\mathbb{U}$ containing one of u_1 and u_2 but not the other. Since f is $\text{Ng}\alpha^*$ -open bijection, $(\mathbb{S})$ is a $\text{Ng}\alpha^*$ -open set in $\mathbb{V}$ containing v_1 or v_2 but not the other. Thus $\mathbb{V}$ is $\text{Ng}\alpha^*-T_0$.

Theorem 3.8: Let $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ be a bijection. If f is $\text{Ng}\alpha^*$ -continuous and $\mathbb{V}$ is NT_0 , then $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -continuous and $\mathbb{V}$ is NT_0 . Let $u_1, u_2 \in \mathbb{U}$ with $u_1 \neq u_2$. Let $v_1 = f(u_1)$ and $v_2 = f(u_2)$. Since f is one to one, $v_1 \neq v_2$. Since $\mathbb{V}$ is NT_0 , there exists an nano open set $\mathbb{S}$ in $\mathbb{V}$ containing one of v_1 or v_2 but not the other. Since f is $\text{Ng}\alpha^*$ -continuous, $f^{-1}(\mathbb{S})$ is a $\text{Ng}\alpha^*$ -open set in $\mathbb{U}$ containing one of u_1 and u_2 but not the other. Thus $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$.

Theorem 3.9: Let $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ be a bijection. If f is $\text{Ng}\alpha^*$ -irresolute and $\mathbb{V}$ is $\text{Ng}\alpha^*-T_0$, then $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -irresolute and $\mathbb{V}$ is $\text{Ng}\alpha^*-T_0$. Let $u_1, u_2 \in \mathbb{U}$, with $u_1 \neq u_2$. Let $v_1 = f(u_1)$ and $v_2 = f(u_2)$. Since f is one to one, $v_1 \neq v_2$. Since $\mathbb{V}$ is $\text{Ng}\alpha^*-T_0$, there exists a $\text{Ng}\alpha^*$ -open set $\mathbb{S}$ in $\mathbb{V}$ containing one of v_1 or v_2 but not the other. Since f is $\text{Ng}\alpha^*$ -irresolute, $f^{-1}(\mathbb{S})$ is a $\text{Ng}\alpha^*$ -open set in $\mathbb{U}$ containing one of u_1 and u_2 but not the other. Thus $\mathbb{U}$ is $\text{Ng}\alpha^*-T_0$.

IV NANO GENERALIZED α^*-T_1 SPACES

Definition 4.1: A nano topological space $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ is said to be nano generalized α^*-T_1 if whenever u and v are distinct points in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$, there exist nano generalized α^* open sets, one containing u but not v and the other containing v but not u .

Theorem 4.2: For a nano topological space $\mathbb{U}$ the following are equivalent.

- (i) $\mathbb{U}$ is a $\text{Ng}\alpha^*-T_1$ space.

- (ii) for every $u \in U$, $\{u\}$ is $\text{Ng}\alpha^*$ -closed in U .
- (iii) Each subset of U is the intersection of $\text{Ng}\alpha^*$ -open sets containing it.
- (iv) The intersection of all $\text{Ng}\alpha^*$ -open sets in U containing the point u is $\{u\}$.

Proof: (i) $\Rightarrow$ (ii) Suppose that U is $\text{Ng}\alpha^*-T_1$. Let $u \in U$. Then for every $v \neq u$, there exists a $\text{Ng}\alpha^*$ -open set G_v in U containing v but not u . Hence $v \in G_v \subseteq U \setminus \{u\}$. Therefore $U \setminus \{u\} = \bigcup \{G_v : v \in U \setminus \{u\}\}$. By theorem 2.10 $U \setminus \{u\}$ is $\text{Ng}\alpha^*$ -open in U . Therefore $\{u\}$ is $\text{Ng}\alpha^*$ -closed.

(ii) $\Rightarrow$ (iii) Let $S \subseteq U$. Then, for each $u \in U \setminus S$, $\{u\}$ is $\text{Ng}\alpha^*$ -closed in U and hence, $U \setminus \{u\}$ is $\text{Ng}\alpha^*$ -open. Clearly, $S \subseteq U \setminus \{u\}$ for each $u \in U \setminus S$. Therefore, $S \subseteq \bigcap \{U \setminus \{u\} : u \in U \setminus S\}$. On the other hand, if $v \notin S$, then $v \in U \setminus S$ and $v \notin U \setminus \{v\}$. This implies $v \notin \bigcap \{U \setminus \{u\} : u \in U \setminus S\}$. Hence, $\bigcap \{U \setminus \{u\} : u \in U \setminus S\} \subseteq S$. Therefore, $S = \bigcap \{U \setminus \{u\} : u \in U \setminus S\}$ which proves (iii).

(iii) $\Rightarrow$ (iv) Taking $S = \{u\}$, by (iii) $S = \{u\} = \bigcap \{G : G \text{ is } \text{Ng}\alpha^*\text{-open and } u \in G\}$. This proves (iv).

(iv) $\Rightarrow$ (i) Let $u, v \in U$ with $v \neq u$. Then $v \notin \{u\} = \bigcap \{G : G \text{ is } \text{Ng}\alpha^*\text{-open and } u \in G\}$. Hence, there exists a $\text{Ng}\alpha^*$ -open set G containing u but not v . Similarly, there exists a $\text{Ng}\alpha^*$ -open set H containing v but not u . Thus, U is $\text{Ng}\alpha^*-T_1$.

Theorem 4.3: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a bijection. If f is $\text{Ng}\alpha^*$ -open and U is NT_1 , then V is $\text{Ng}\alpha^*-T_1$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -open and U is NT_1 . Let $v_1 \neq v_2 \in V$. Since f is a bijection, there exist $u_1, u_2 \in U$ such that $v_1 = f(u_1)$ and $v_2 = f(u_2)$ with $u_1 \neq u_2$. Since U is NT_1 , there exist nano open sets G and H such that $u_1 \in G$, $u_2 \notin G$ and $u_2 \in H$, $u_1 \notin H$. Since f is $\text{Ng}\alpha^*$ -open, $f(G)$ and $f(H)$ are $\text{Ng}\alpha^*$ -open sets in V such that $v_1 \in f(G)$, $v_2 \in f(H)$, $v_1 \notin f(H)$ and $v_2 \notin f(G)$. Thus V is $\text{Ng}\alpha^*-T_1$.

Theorem 4.4: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a bijection. If f is $\text{Ng}\alpha^*$ -closed and U is NT_1 , then V is $\text{Ng}\alpha^*-T_1$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -closed bijection and U is NT_1 . Let $v \in V$. Since f is bijection, there exist $u \in U$ such that $f(u) = v$. Since U is NT_1 , by remark 2.15, $\{u\}$ is closed in U . Since f is $\text{Ng}\alpha^*$ -closed, $\{f(u)\} = \{v\}$ is $\text{Ng}\alpha^*$ -closed. Since every singleton set in V is $\text{Ng}\alpha^*$ -closed, by theorem 4.2 V is $\text{Ng}\alpha^*-T_1$.

Theorem 4.5: Let $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ be a bijection. If f is $\text{Ng}\alpha^*$ -continuous and $\mathbb{V}$ is NT_1 , then $\mathbb{U}$ is $\text{Ng}\alpha^*-T_1$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -continuous and $\mathbb{V}$ is NT_1 . Let $u_1, u_2 \in \mathbb{U}$ with $u_1 \neq u_2$. Let $v_1 = f(u_1)$ and $v_2 = f(u_2)$. Since f is one to one, $v_1 \neq v_2$. Since $\mathbb{V}$ is NT_1 , there exist nano open sets $\mathbb{G}$ and $\mathbb{H}$ such that $v_1 \in \mathbb{G}$, $v_2 \notin \mathbb{G}$ and $v_1 \notin \mathbb{H}$, $v_2 \in \mathbb{H}$. Since f is a bijection, $u_1 \in f^{-1}(\mathbb{G})$, $u_2 \notin f^{-1}(\mathbb{G})$ and $u_2 \in f^{-1}(\mathbb{H})$, $u_1 \notin f^{-1}(\mathbb{H})$. Since f is $\text{Ng}\alpha^*$ -continuous, $f^{-1}(\mathbb{G})$ and $f^{-1}(\mathbb{H})$ are $\text{Ng}\alpha^*$ -open sets in $\mathbb{U}$. Thus $\mathbb{U}$ is $\text{Ng}\alpha^*-T_1$.

Theorem 4.6: Let $f: (\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X})) \rightarrow (\mathbb{V}, \sigma_{\mathbb{R}}(\mathbb{Y}))$ be a bijection. If f is $\text{Ng}\alpha^*$ -irresolute and $\mathbb{V}$ is $\text{Ng}\alpha^*-T_1$, then $\mathbb{U}$ is $\text{Ng}\alpha^*-T_1$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -irresolute and $\mathbb{V}$ is $\text{Ng}\alpha^*-T_1$. Let $u_1, u_2 \in \mathbb{U}$, with $u_1 \neq u_2$. Let $v_1 = f(u_1)$ and $v_2 = f(u_2)$. Since f is one to one, $v_1 \neq v_2$. Since $\mathbb{V}$ is $\text{Ng}\alpha^*-T_1$, there exist $\text{Ng}\alpha^*$ -open sets $\mathbb{G}$ and $\mathbb{H}$ such that $v_1 \in \mathbb{G}$, $v_2 \notin \mathbb{G}$ and $v_2 \in \mathbb{H}$, $v_1 \notin \mathbb{H}$. Since f is a bijection, $u_1 \in f^{-1}(\mathbb{G})$, $u_2 \notin f^{-1}(\mathbb{G})$ and $u_2 \in f^{-1}(\mathbb{H})$, $u_1 \notin f^{-1}(\mathbb{H})$. Since f is $\text{Ng}\alpha^*$ -irresolute, $f^{-1}(\mathbb{G})$ and $f^{-1}(\mathbb{H})$ are $\text{Ng}\alpha^*$ -open sets in $\mathbb{U}$. Thus $\mathbb{U}$ is $\text{Ng}\alpha^*-T_1$.

V NANO GENERALIZED α^*-T_2 SPACES

Definition 5.1: A nano topological space $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ is said to be nano generalized α^*-T_2 if whenever u and v are distinct points in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$, there exist disjoint nano generalized α^* -open sets $\mathbb{G}$ and $\mathbb{H}$ in $(\mathbb{U}, \tau_{\mathbb{R}}(\mathbb{X}))$ containing u and v respectively.

Theorem 5.2: For a nano topological space $\mathbb{U}$, the following statements are equivalent:

- (i) $\mathbb{U}$ is $\text{Ng}\alpha^*-T_2$ space.
- (ii) Let $u \in \mathbb{U}$. Then for each $u \neq v$, there exists a $\text{Ng}\alpha^*$ -open $\mathbb{G}$ containing u such that $v \notin \text{Ng}\alpha^*cl(\mathbb{G})$.
- (iii) For each $u \in \mathbb{U}$, $\cap \{ \text{Ng}\alpha^*cl(\mathbb{G}) : \mathbb{G} \text{ is } \text{Ng}\alpha^*\text{-open and } u \in \mathbb{G} \} = \{u\}$.

Proof: (i) $\Rightarrow$ (ii) Suppose $\mathbb{U}$ is a $\text{Ng}\alpha^*-T_2$ space. Let $u, v \in \mathbb{U}$ with $u \neq v$. Then there exist disjoint $\text{Ng}\alpha^*$ -open sets $\mathbb{G}$ and $\mathbb{H}$ such that $u \in \mathbb{G}$ and $v \in \mathbb{H}$. Since $\mathbb{H}$ is $\text{Ng}\alpha^*$ -open, $\mathbb{U} \setminus \mathbb{H}$ is $\text{Ng}\alpha^*$ -closed and $\mathbb{G} \subseteq \mathbb{U} \setminus \mathbb{H}$. This implies that $\text{Ng}\alpha^*(\mathbb{G}) \subseteq \mathbb{U} \setminus \mathbb{H}$. Since $v \in \mathbb{U} \setminus \mathbb{H}$, $v \notin \text{Ng}\alpha^*cl(\mathbb{G})$.

(ii) $\Rightarrow$ (iii) If $u \neq v$ then there exist a $\text{Ng}\alpha^*$ -open set G such that $u \in G$ and $v \notin \text{Ng}\alpha^*cl(G)$. Hence $v \notin \cap\{\text{Ng}\alpha^*cl(G): G \text{ is } \text{Ng}\alpha^*\text{-open and } u \in G\}$. This proves (iii).

(iii) $\Rightarrow$ (i) Let $u \neq v$ in U . Then $v \notin \cap\{\text{Ng}\alpha^*cl(G): G \text{ is } \text{Ng}\alpha^*\text{-open and } u \in G\}$. This implies that there exist a $\text{Ng}\alpha^*$ -open set G such that $u \in G$ and $v \notin \text{Ng}\alpha^*cl(G)$. Then $H = U \setminus \text{Ng}\alpha^*cl(G)$ is $\text{Ng}\alpha^*$ -open and $v \in H$. Now, $G \cap H = G \cap (U \setminus \text{Ng}\alpha^*cl(G)) \subseteq G \cap (U \setminus G) = \phi$. This proves (i).

Theorem 5.3: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a bijection. If f is $\text{Ng}\alpha^*$ -open and U is NT_2 , then V is $\text{Ng}\alpha^*-T_2$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -open and U is NT_2 . Let $v_1 \neq v_2 \in V$. Since f is a bijection, there exist $u_1, u_2 \in U$ such that $v_1 = f(u_1)$ and $v_2 = f(u_2)$ with $u_1 \neq u_2$. Since U is NT_2 , there exist disjoint nano open sets G and H such that $u_1 \in G$ and $u_2 \in H$. Since f is $\text{Ng}\alpha^*$ -open in V such that $v_1 \in f(G)$, $v_2 \in f(H)$, $v_1 \notin f(H)$ and $v_2 \notin f(G)$. Thus V is $\text{Ng}\alpha^*-T_2$.

Theorem 5.4: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a bijection. If f is $\text{Ng}\alpha^*$ -continuous and V is NT_2 , then U is $\text{Ng}\alpha^*-T_2$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -continuous and V is NT_2 . Let $u_1, u_2 \in U$ with $u_1 \neq u_2$. Let $v_1 = f(u_1)$ and $v_2 = f(u_2)$. Since f is one to one, $v_1 \neq v_2$. Since V is NT_2 , there exist disjoint nano open sets G and H containing v_1 and v_2 respectively. Since f is $\text{Ng}\alpha^*$ -continuous bijection, $f^{-1}(G)$ and $f^{-1}(H)$ are disjoint $\text{Ng}\alpha^*$ -open sets in U containing u_1 and u_2 respectively. Thus U is $\text{Ng}\alpha^*-T_2$.

Theorem 5.5: Let $f: (U, \tau_R(X)) \rightarrow (V, \sigma_R(Y))$ be a bijection. If f is a $\text{Ng}\alpha^*$ -irresolute and V is $\text{Ng}\alpha^*-T_2$, then U is $\text{Ng}\alpha^*-T_2$.

Proof: Suppose f is $\text{Ng}\alpha^*$ -irresolute and V is $\text{Ng}\alpha^*-T_2$. Let $u_1, u_2 \in U$, with $u_1 \neq u_2$. Let $v_1 = f(u_1)$ and $v_2 = f(u_2)$. Since f is one to one, $v_1 \neq v_2$. Since V is $\text{Ng}\alpha^*-T_2$, there exist disjoint $\text{Ng}\alpha^*$ -open sets G and H containing v_1 and v_2 respectively. Since f is $\text{Ng}\alpha^*$ -irresolute bijection, $f^{-1}(G)$ and $f^{-1}(H)$ are disjoint $\text{Ng}\alpha^*$ -open sets in U containing u_1 and u_2 respectively. Thus U is $\text{Ng}\alpha^*-T_2$.

VI CONCLUSION

In this paper we have introduced Nano generalized α^* - T_0 space and discussed some of its properties. Further more, Nano generalized α^* - T_1 space and Nano generalized α^* - T_2 space are defined and its properties are discussed.

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STRUCTURAL ANALYSIS OF CdO THIN FILM BY SILAR METHOD

S.Anna Swathi

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Cadmium Oxide (CdO) thin films have garnered significant attention for their optoelectronic and semiconductor applications. In this study, CdO thin films were successfully synthesized using the Successive Ionic Layer Adsorption and Reaction (SILAR) method. The structural properties of the deposited films were analyzed using X-ray diffraction (XRD), scanning electron microscopy (SEM), and energy-dispersive X-ray analysis (EDAX). The XRD patterns confirmed the polycrystalline nature of the CdO films with a cubic phase, and the crystallite size was estimated using Scherrer's equation. SEM images revealed a uniform and well-defined surface morphology, while EDAX confirmed the elemental composition of Cd and O in appropriate stoichiometric ratios. The films exhibited excellent structural stability upon annealing, with the best crystalline quality observed at 300°C. These findings demonstrate that the SILAR technique is an effective and cost-efficient method for fabricating high-quality CdO thin films with potential applications in photovoltaic cells, sensors, and transparent conductive electrodes.

KEYWORDS: CdO thin films, SILAR method, structural analysis, XRD, SEM, EDAX.

INTRODUCTION:

Cadmium oxide (CdO) is an n-type semiconductor with a wide band gap, high transparency, and good electrical conductivity, making it suitable for applications such as transparent conductive electrodes, gas sensors, and photovoltaic devices. Its excellent optical and electrical properties make it a promising material for various optoelectronic applications [1].

This study aims to synthesize and characterize CdO thin films, focusing on their structural properties. The work includes analyzing crystallinity and phase composition using X-ray diffraction (XRD), examining surface morphology and elemental composition via scanning electron microscopy (SEM) with energy-dispersive X-ray analysis (EDAX), and measuring film thickness. These analyses are essential for understanding and optimizing the performance of CdO thin films in technological applications.

MATERIALS AND METHODS:

MATERIALS USED:

In this project, cadmium nitrate ($\text{Cd}(\text{NO}_3)_2$) is used as the Cd^{2+} precursor, a highly soluble inorganic salt that provides cadmium ions for film formation and Hydrogen peroxide (H_2O_2) which serves as the oxidizing agent, promoting the conversion of cadmium ions into cadmium oxide (CdO). [2] The substrate used is glass, chosen for its optical transparency, chemical stability, and smooth surface, which aids in uniform film deposition. The deposited CdO thin films exhibit semiconducting properties, with a direct bandgap that varies based on synthesis conditions. CdO is known for its high electrical conductivity, optical transparency in the visible region, and n-type conductivity due to inherent oxygen vacancies. These properties make CdO suitable for applications in optoelectronic devices, sensors, and transparent conductive coatings.[3]

METHODOLOGY:

The Successive Ionic Layer Adsorption and Reaction (SILAR) method was chosen for preparing CdO thin films due to its simplicity, cost-effectiveness, and ability to control film thickness and uniformity. The SILAR method allows for the deposition of thin films at room temperature, which is beneficial for preserving the substrate's properties. Additionally, the SILAR technique enables the precise control of deposition parameters, making it an ideal method for achieving high-quality CdO thin films with desired properties.

For the deposition of CdO thin films, the cation solution was prepared using cadmium nitrate, while the anion solution was made with hydrogen peroxide (H_2O_2). The films were deposited onto a glass substrate under controlled conditions, with the deposition cycles being repeated for a total of 40 cycles. The concentration of cadmium nitrate and H_2O_2 was optimized to ensure uniform film growth. After deposition, the films were annealed at 200°C , 300°C , and 400°C , with the best coating achieved at 300°C . Following annealing, the properties of the films are studied using X-ray diffraction (XRD), scanning electron microscopy (SEM) with energy-dispersive X-ray analysis (EDAX), to analyze their structural and morphological characteristics. The results indicated that annealing at 300°C produced the most optimal properties for the CdO thin films. The CdO thin film prepared by SILAR method and annealed at various temperature is given in the fig.1.

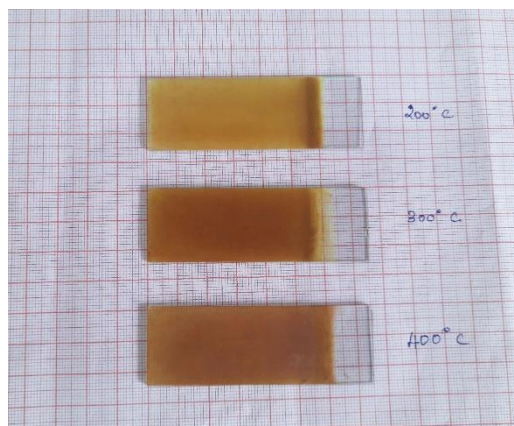


Fig. 1. CdO thin films prepared by SILAR and annealed at different temperatures.

RESULT AND DISCUSSION:

The CdO thin film prepared by SILAR method was investigated with XRD, SEM with EDAX and the thickness was measured.

X- RAY DIFFRACTION (XRD):

X-ray Diffraction (XRD) is a powerful analytical technique used to determine the crystalline structure, phase composition, and other structural properties of materials.

Principle of XRD:

XRD works based on Bragg's Law:

$$n\lambda = 2d\sin\theta$$

where:

n = order of reflection (integer)

λ = X-ray wavelength

d = interplanar spacing

θ = diffraction angle

When X-rays hit a crystalline sample, they are scattered by atoms in specific directions based on the crystal lattice. The diffraction pattern is recorded, and the resulting peaks provide information about the structure.[4]

To study the structural properties of the deposited CdO thin films X-Ray diffraction (XRD) study was carried out using X-ray diffractometer D8 Advance ECO. Fig 1.1 shows the XRD pattern of CdO deposited by SILAR method with 40 deposition cycles and annealed at 300°C. The presence of four peaks (1 1 1), (2 0 0), (2 0 2), (3 1 1) indicates the polycrystalline with the cubic structure of the film and is well matched with the standard data (JCPDS File no. 96-900-6674). [5]

The crystalline size of CdO thin film is calculated from the XRD patterns by using Scherrer's formula:

$$D = k\lambda / \beta \cos \theta$$

Where:

D = crystallite size (nm)

K = Scherrer constant

λ = X-ray wavelength

β = Full Width at Half Maximum (FWHM)

θ = Bragg's angle in degrees

The dislocation density has been calculated using crystallite size, by the equation,

$$\text{Dislocation} = 1/D^2$$

The microstrain has been calculated by the given formula,

$$\text{Microstrain} = \beta \cos \theta / 4$$

The lattice parameter calculated for CdO by the given formula,

$$a = d \sqrt{(h^2 + k^2 + l^2)}$$

The lattice parameter has been calculated and reported. The grain size, dislocation density, micro strain and lattice spacing of CdO thin film for various deposition cycles have been tabulated in table 1.2.

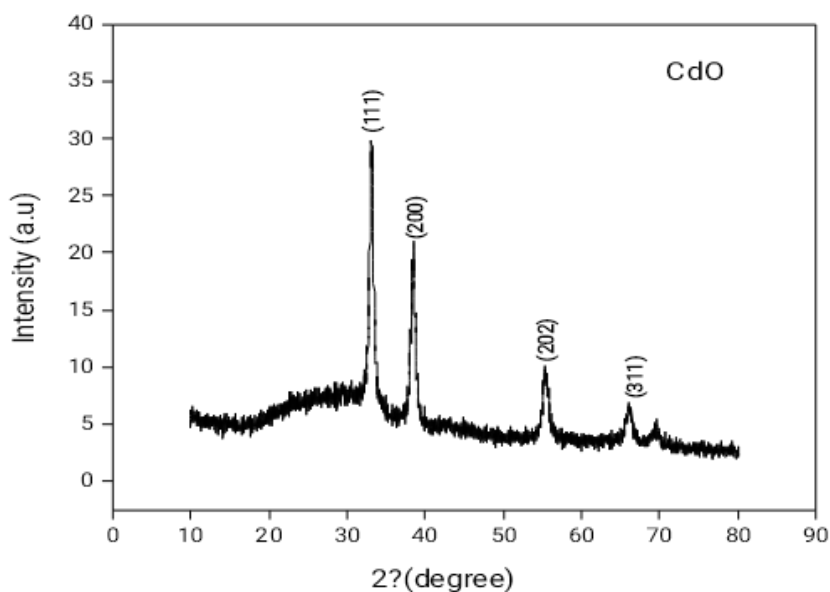


Fig. 1.1. XRD pattern of CdO thin film (40 cycles, 300 °C) showing cubic phase peaks at (111), (200), (202), and (311).

Table 1.2 XRD data

Deposition cycle	h k l	2θ degree	Grain size(nm)	Dislocation density(line/m ²)	Microstrain (10 ⁻⁴)	Lattice constant(Å)
40 (300°C)	(1 1 1)	33.135	14.5586	4.718	0.00238	a = 4.682
	(2 0 0)	38.434	12.9042	6.005	0.00254	
	(2 0 2)	55.372	11.6891	7.31	0.00263	
	(3 1 1)	65.666	13.5412	5.455	0.00215	

MORPHOLOGICAL AND COMPOSITIONAL ANALYSIS:

SEM (Scanning Electron Microscopy) provides high-resolution images of a material's surface morphology and structure. EDX (Energy Dispersive X-ray Spectroscopy), also called EDAX, is an analytical technique used along with SEM to determine the elemental composition of a sample.

The SEM electron beam interacts with the sample, producing secondary electrons (for imaging) and characteristic X-rays (for elemental analysis). The EDX detector collects these X-rays and identifies elemental peaks, allowing for qualitative and quantitative analysis. [6]

Scanning Electron Microscopy (SEM) combined with Energy Dispersive X-ray Analysis (EDAX) is an essential technique for studying the surface morphology and elemental composition of thin films. The SEM images and EDAX spectra of CdO thin films are analyzed to understand their structural characteristics and elemental composition using the Energy dispersive X-ray spectrometer quantax 200 with X flash 6130.

The SEM images (Fig. 2 and Fig. 2.1) show closely packed particles with a smooth surface and no visible pores. The clustered nanostructures indicate that the film has polycrystalline grains, with some regions showing agglomeration.

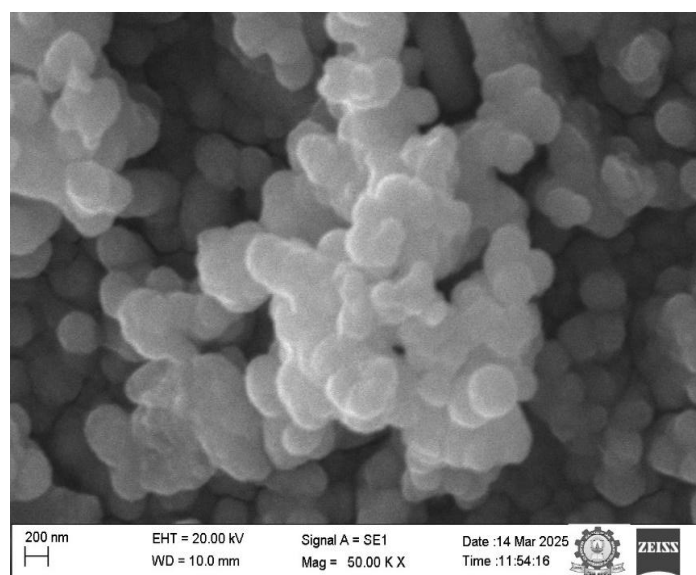


Fig. 2. SEM image of CdO thin film with closely packed particles and no visible pores.

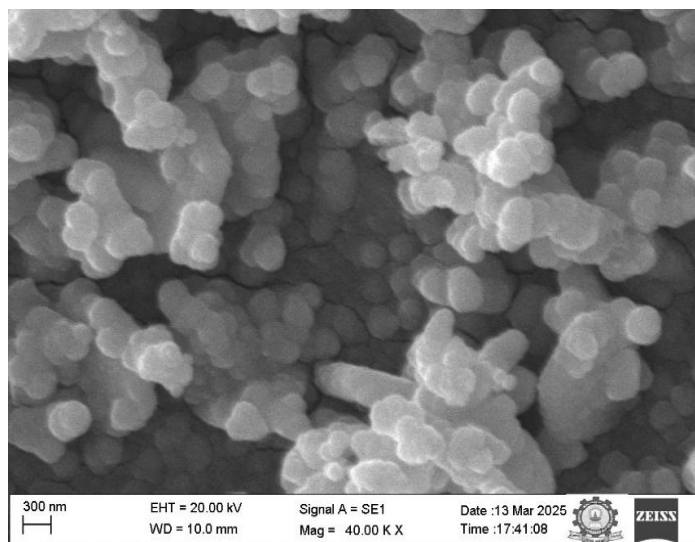


Fig. 2.1. High-magnification SEM image showing uniform grain structure.

The film shows a peak corresponding to Cd and O elements(fig 2.2). The atomic percentages of Cd and O were recorded as 68.6% and 31.4% respectively. Hence the result indicates the presence of cadmium oxide thin film. The quantitative result of CdO is given in the table 2.3.

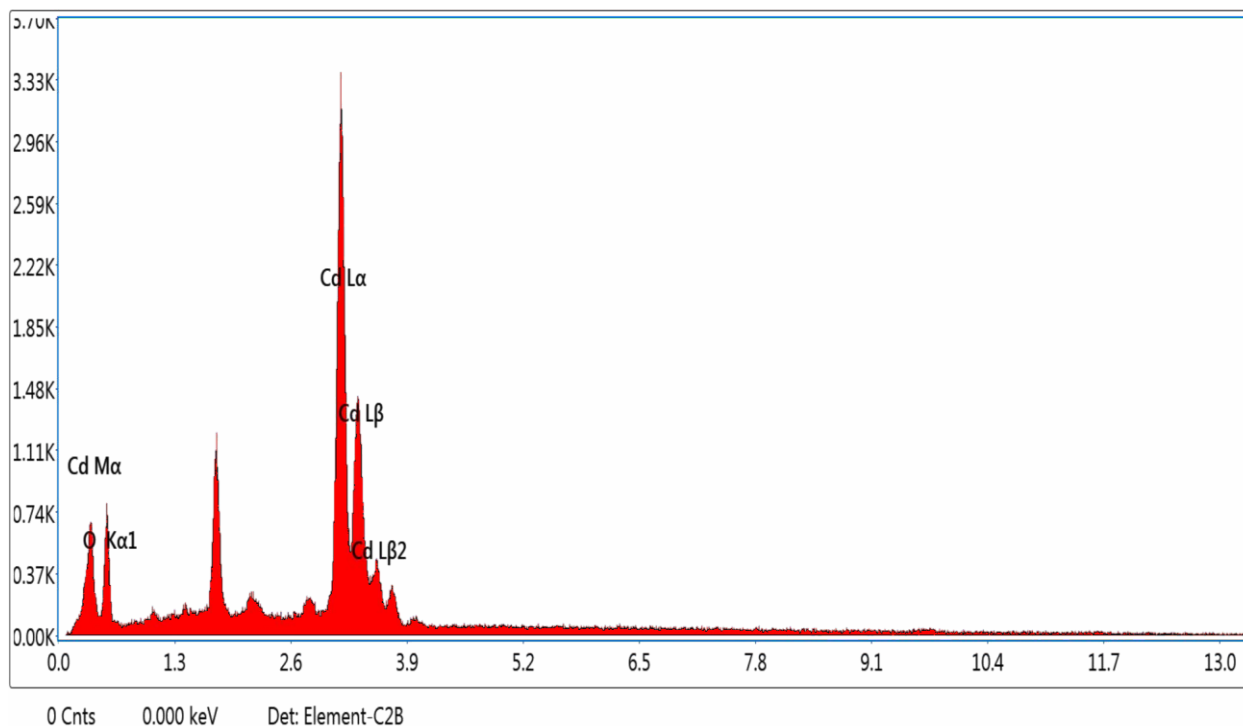


Fig. 2.2. EDAX spectrum showing cadmium (Cd) and oxygen (O) peaks.

Table 2.3

Element	Weight%	Atomic%	Error%	Kratio
O k	23.7	68.6	12.0	0.0370
CdL	76.3	31.4	2.2	0.7098

THICKNESS MEASUREMENT:

The thickness of thin films is a crucial parameter that influences their optical, electrical, and structural properties. In this study, the thickness of CdO thin films deposited by the SILAR method was determined using the Weight Gain Method. This technique is based on measuring the mass difference before and after deposition and using the film's area and density to estimate thickness.

The thickness (t) of the CdO thin film was calculated using the formula:

$$t = m / (Ap)$$

where,

m = mass difference before and after deposition (g),

A = area of the deposited film (cm²),

ρ = density of CdO (g/cm³).

The film, deposited over 40 cycles and annealed at 300°C, exhibited a thickness of 416 nm which is in accordance with other reports. [7]. This indicates a uniform and controlled deposition process.

CONCLUSION:

The successful deposition of CdO thin films using the SILAR (Successive Ionic Layer Adsorption and Reaction) method demonstrates the potential of this technique for producing high-quality thin films for optoelectronic and sensor applications. CdO thin films, deposited with 40 cycles and annealed at different temperatures, showed the best structural properties at 300°C, as confirmed by X-ray diffraction (XRD), SEM-EDAX analysis. The XRD results matched the standard JCPDS file 96-900-6674, confirming the crystallinity of CdO. SEM images revealed a uniform surface morphology, and EDAX confirmed the elemental

composition. The structural analysis showed that the mean crystalline size of the CdO thin films was approximately 13.17 nm, with a mean dislocation density of 5.8725×10^4 line/m² and a mean microstrain of 0.00243×10^{-4} . The lattice constant was found to be 4.682 Å and the thickness is measured to be 416 nm indicating good agreement with standard CdO values.

CdO thin films have potential applications in solar cells, gas sensors, and electronic devices. Future research can focus on investigating electrical properties, optimizing deposition parameters, and exploring CdO-based heterojunctions for enhanced device performance. Additionally, doping or composite thin films could further improve their efficiency in various technological applications. This study demonstrates the effectiveness of the SILAR method for depositing CdO thin films and provides a strong foundation for future research in thin-film technology.

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GREEN SYNTHESIS OF BaFeO₃ PEROVSKITE USING CITRUS LIMON EXTRACT

B. Breezy, C. Infant Francita Fonseka

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

This study reports the green synthesis of BaFeO₃ perovskite using Citrus limon extract as a reducing agent. The structural, optical, and morphological properties of the synthesized material were analyzed using X-ray diffraction (XRD) and ultraviolet-visible spectroscopy (UV-Vis). The XRD pattern confirmed the formation of the BaFeO₃ perovskite phase with the crystallite size to be 9.49 nm, while the UV-Vis spectrum showed a bandgap energy of approximately 1.348 eV. The results of this study demonstrate the potential of green synthesis methods for the production of functional materials, while also highlighting the promise of BaFeO₃ perovskite.

KEYWORDS: BaFeO₃, perovskite, supercapacitor, XRD, UV, nanoparticles

INTRODUCTION:

Nanotechnology represents a revolutionary path for technological development that concerns the management of materials at the nanometer scale. Nano-fabrication is a natural step toward further reducing the physical size of the components and functional parts to provide a variety of applications [1]. Unique electrical properties, such as high conductivity in materials like carbon nanotubes and graphene. Perovskite refers to a class of materials with a specific crystal structure. Nanomaterial-based supercapacitors are used to increase the electrode surface area so as to achieve high performance and enhanced capacitance [2].

OBJECTIVE OF THE PRESENT WORK:

- To synthesize BaFeO₃ perovskite material using the fresh juice of citrus limon through green synthesis.
- To find the crystalline size and phase of BaFeO₃ perovskite using XRD.
- To find the optical characteristics of BaFeO₃ perovskite to be employed in optoelectronic field using UV.

MATERIALS AND METHODOLOGY:

$\text{Ba}(\text{NO}_3)_2$ is an inorganic compound with chemical name Barium nitrate. It is a good oxidizing agent, burns with a green coloured flame. It is a non-combustible compound, but enhances the burning of combustible elements. When exposed to fire or heat for a long duration it may explode. Ferric nitrate is also referred to as Iron (III) nitrate or iron trinitrate, whose chemical or molecular formula is $\text{Fe}(\text{NO}_3)_3$ or FeN_3O_9 . It is a strong oxidant and non-combustible chemical compound. Though it is non-flammable, it will increase the intensity of a fire if it comes in contact with combustible materials. Citrus limon is a bright yellow citrus fruit. Lemon juice is a rich source of citric acid, containing around 48 grams per liter. It is a weak organic acid naturally found in citrus fruits. Citric acid acts as a preservative, antioxidant and adds acidity, while also altering the pH and enhancing mineral absorption.

EXPERIMENTAL PROCEDURE:

The preparation of BaFeO_3 was done by sol-gel process. 5.23 g of $\text{Ba}(\text{NO}_3)_2$ and 8.07 g of $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$ was measured and added to a beaker along with 150 ml of deionized water and 50 ml of fresh juice of citrus limon was added. This mixture was placed in a magnetic stirrer and heated. 45 ml of Ethylene glycol was added as a complexing agent. The mixture was heated until completely evaporated forming a dry brown precipitate. This precipitate was placed in the muffle furnace for 4 hours at 600 °C and the resultant was crushed finely with the help of a motor and pestle, thus obtaining a reddish brown sample. Further, BaFeO_3 was sent for various analysis.



Figure 1: Precipitate before and after calcination

X-RAY DIFFRACTION:

X-ray diffraction (XRD) is a versatile non-destructive analytical technique used to analyze physical properties such as phase composition, crystal structure and orientation of powder, solid, liquid samples and even dispersed particles in a liquid matrix. Sample preparation is minimal and is suitable for use both in industrial process applications and in materials research.

The Debye-Scherrer method is a technique that uses X-ray diffraction to analyze the crystalline structure of a powder sample, forming Debye-Scherrer rings, which can be used to determine lattice spacing and estimate particle size.

UV-VIS SPECTROSCOPY:

UV-Vis spectroscopy is an analytical method that can measure the analyte quantity depending on the amount of light received by the analyte. Applicable for both organic and inorganic samples. As a function of wavelength, UV-vis spectrophotometers measure the absorption or transmission of light that passes through a medium. According to the Beer-Lambert Law, the absorbance is directly proportional to the concentration of the substance in the solution.

RESULTS AND DISCUSSIONS:**CHARACTERIZATION USING XRD:**

The structural characterization of the synthesized material BaFeO_3 is carried out by the XRD method. The X-ray diffraction experiments are carried out at wavelength $1.5406 \text{ \AA}$. Peak in the pattern corresponds to constructive interference of X-ray of X-rays from the

specific

crystallographic

planes.

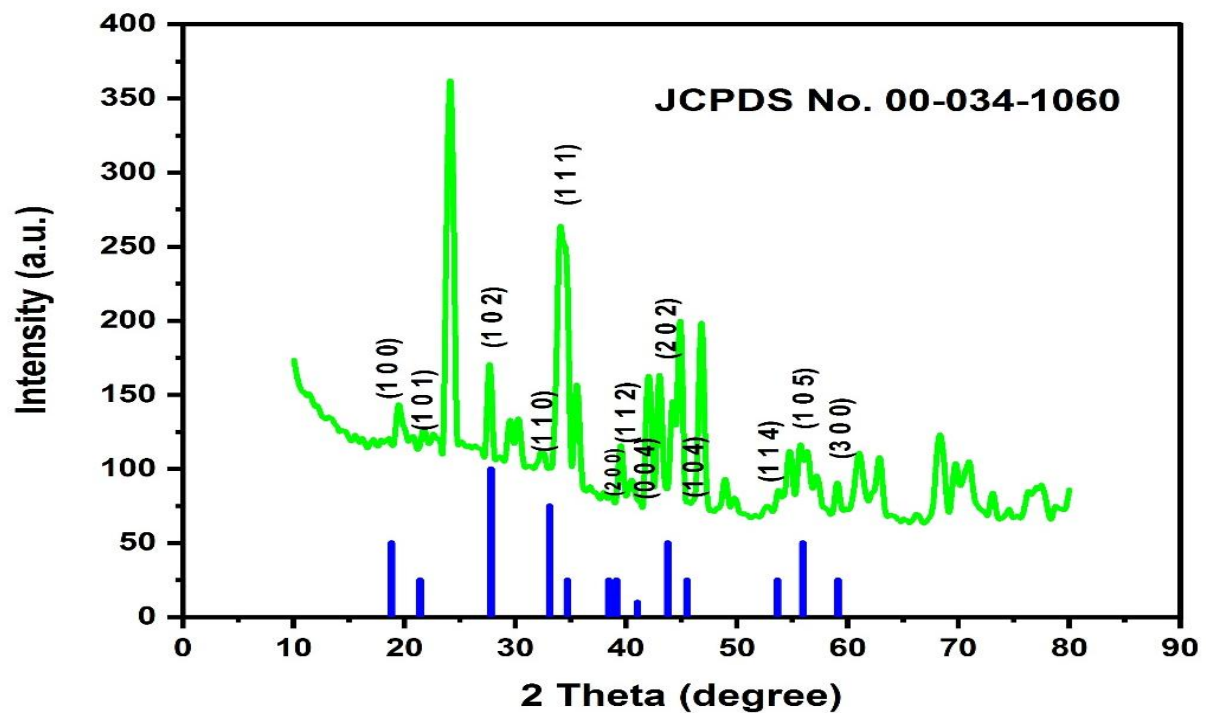


Figure 2: XRD pattern for BaFeO₃ perovskite

The average grain size is calculated using the Debye Scherrer formula, $D = \frac{K\lambda}{\beta \cos \theta}$ (nm)

K - Shape factor (approximately 0.9)

β - Full width at half maximum (FWHM) of a diffraction peak

λ - X-ray wavelength

θ - Bragg angle

The XRD results for the BaFeO₃ perovskite nanoparticles, by Debye Scherrer equation is found to be 9.49407 nm. The XRD results for the BaFeO₃ exhibit strong peaks around 24.587°.

Crystal system	Hexagonal
Crystalline size (nm)	9.49
Lattice parameter a(A°)	5.4090
Lattice parameter b(B°)	5.4090
Lattice parameter c(C°)	8.7950
Volume of the unit cell	222.84

CHARACTERIZATION USING UV-Visible Absorption Spectra of BaFeO₃ Nanoparticles:

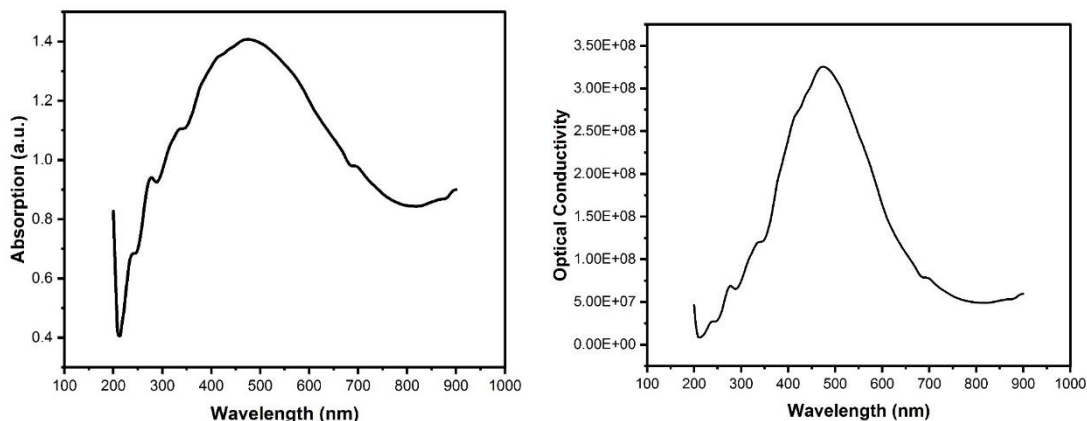


Figure 3: Absorption and optical conductivity of BaFeO₃

The absorption is relatively low near 300 nm (UV) and reaches a maximum peak around the range 400–500 nm, indicating a strong absorption of light in this region. After this region, the adsorption gradually decreases. Moreover there is a dip in absorption around 300-350 nm before reaching the peak. The peak 400-450 nm range shows that the sample absorbs visible light, hence could find its application in photodetectors and optoelectronics devices.

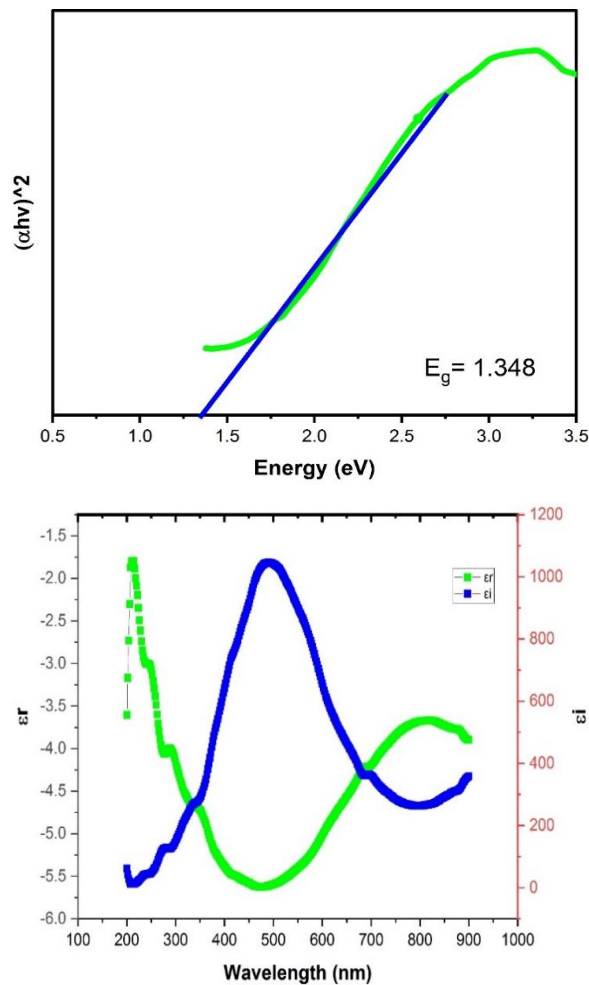


Figure 4: Energy bandgap and dielectric constant of BaFeO₃

The optical conductivity increases as the wavelength is 100 nm, reaching a broad maximum peak around 400 to 500 nm. After reaching its peak, the optical conductivity decreases as the wavelength increases beyond 550 nm. The peak indicates more absorption around 400-550 nm and hence conducts the most electrical current due to photo-generated carriers. The observe peaks and valleys in the graph related to electronic transitions between different energy bands in the material. Due to high optical conductivity in the visible light region, BaFeO₃ can be employed in solar cells and other devices that requires visible light absorption.

The graph represented is a Tauc plot utilized for determining the energy bandgap and this method is important for analyzing the electronic properties of a semiconductor material. The bandgap is identified by extrapolating the linear portion to the x-axis. In this case the value is $E_g=1.348$ eV.

This graph presents the dielectric properties of the synthesize material, BaFeO₃, with ϵ_r as the real and ϵ_i as the imaginary plot. Real part: Represents the material's ability to store

electrical energy. There is a sharp increase in value near 400 nm, then 400-700 nm shows variability and beyond 700 nm it stabilizes and decreases gradually. Imaginary part: This part of the graph represents the material's dielectric loss, which is dissipated as heat. Near 320-450 nm there is a significant peak indicating high energy loss and from 450 to 900 nm there is a gradual decrease with minor fluctuations.

CONCLUSION:

This study focused on the synthesis and characterization of BaFeO₃, a perovskite material as a potential electrode material. Green synthesis of the material was carried out with citrus limon to promote an eco-friendly move in energy application.

The XRD characterization revealed that the crystalline nature of the prepared BaFeO₃ is hexagonal structure. The average particle size is found to be 9.494 nm. From the UV analysis the energy bandgap is found to be 1.348 eV and shows good absorbance.

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ACOUSTIC-ASSISTED TAMIL MEDICINAL PLANT EXTRACTS AND THEIR THERMO ACOUSTICAL RESEARCH

S. Santhana Priya, S. Irudaya Sahaya Lancy

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Up to 80% of people in some developing nations, according to the World Health Organisation (WHO), practise traditional medicine. In India, conventional herbal medicine remains a vital part of medical care. India, home to cover a billion people from a variety of sociocultural origins, is the second-largest country in the world. The British first used the word “Siddha medicine” in 1923, however Thamzhil maruthuvam or Tamil medicine, was the previous name for traditional medicine in Tamil Nadu. The siddha system of traditional medicine is primarily used in Tamil Nadu and other Tamil populated areas. Research indicates that the ancient Tamil peoples had their own literature and had maritime connections with other regions of the world starting in the third century BC. Some literary works date back to the Sangam period (300BC-300AD). **The purpose of this study is to both record and quantitatively analyse the existing knowledge about traditional plants (Tulsi – Ocimum Sanctum, Karpooravalli – Plectranthus Amboinicus), using Ultrasonic interferometer. In summary, further research into medicinal plants is crucial not only for enhancing healthcare outcomes but also for promoting economic development, conserving biodiversity, advancing scientific knowledge, and preserving cultural heritage.**

KEY WORDS: Medicinal plants, Ultrasonic velocity, Density, Adiabatic Compressibility, Ultrasonic Interferometer.

INTRODUCTION:

Ultrasonic technique has been a powerful tool nowadays, improving valuable information regarding the molecular behaviour of liquids. Recent developments have made it possible to use ultrasonic energy in medicine, engineering, agriculture and industry [1]. This technique is frequently used because of its ability in characterizing the physicochemical behaviour of the liquid systems. This method is preferred due to its simplicity as well as sensitivity of its very low density at higher energy states.

AIM OF THE PROJECT:

Aim of the project is to study the elastic properties, structural aspects, molecular relaxation process and molecular interaction process by Ultrasonic provides the valuable information about Tulsi – Ocimum Sanctum, Karpooravalli – Plectranthus Amboinicus)

- To measure the ultrasonic velocity of medicinal plant extract using ultrasonic interferometer.
- To measure the viscosity of medicinal plant extract using Ostwald's viscometer.
- To measure the density of medicinal plant extract.
- To calculate the thermo-acoustical parameters.

MATERIALS AND METHODS:**MATERIAL CHOSEN:**

Ocimum sanctum, commonly known as Tulsi or Holy basil which it is one type of plant that appears as strong aroma, and bitter in taste. Tulsi have precious ingredients that can be alternative herbal treatment to treat ailments and problems such as common cold, headache, liver diseases and many more.

Plectranthus amboinicus belonging to the family Lamiaceae commonly known as Karpooravalli or Omavalli in Tamil as a large succulent aromatic perennial herb. It is highly aromatic pubescent herb with distinctive smelling leaves. The leaves of this plant have been used in malarial fever, hepatopathy, renal and vesical calculi, cough, chronic asthma.

METHODOLOGY:

Collect fresh, healthy leaves from the plants of (Tulasi – Ocimum Sanctum, Karpooravalli – Plectranthus Amboinicus) Avoid leaves with visible disease or insect damage. Rinse the leaves under running tap water to remove surface dirt and debris. Next Soak the leaves in distilled water to remove residual impurities. Once purified, you can proceed with extraction using double distilled water. The extract is poured in the beaker, kept in the Digital Ultrasonic cleaner for 15 minutes. Using ultrasonic interferometer, the density, ultrasonic wavelength and viscosity is measured for the extract.

RESULT AND DISCUSSION:

OCIMUN SANCTUM (TULSI):

SAMPLE	Ultrasonic Velocity(U) (m/s)	Density (ρ) $\times 10^3$ kgm^{-3}	Viscosity (η) $\times 10^{-4}$ Nsm^{-2}	Adiabatic Compressibility (β_a) $\times 10^{-10}$ $\text{N}^{-1}\text{m}^{-2}$	Acoustic impedance (Z) $\times 10^5$ $\text{kgm}^{-3}\text{s}^{-1}$
Ocimum Sanctum (Tulsi)	1487	1273	0.2248	3.5526	18.929

Table 1: Values of Ultrasonic Velocity, Density, Viscosity, Adiabatic Compressibility and Acoustic impedance of Ocimum Sanctum (Tulsi).

From the above table it is observed that the Ocimum Sanctum is slightly higher velocity (1487 m/s) with moderate density having the applications of Reduce stress & anxiety, Regular blood sugar and support liver and kidney function.

It has a moderately low viscosity (0.2248×10^{-4}), suggesting a lighter consistency with fewer gel-forming compounds. Due to its moderate viscosity, it's used in cough syrups and herbal teas. Tulasi (Ocimum sanctum) ($3.5526 \times 10^{-10} \text{ Pa}^{-1}$) extracts show relatively high compressibility, meaning they are still flexible but have slightly denser molecular arrangements. And it has the ($18.929 \times 10^5 \text{ kg m}^{-2}\text{s}^{-1}$) Lowest Impedance.

SAMPLE	Free length (L_f) $\times 10^{-10}$ kgms^{-2}	Wada's Constant (W)	Relaxation Time (τ) $\times 10^{-12}\text{s}$	Isentropic Compressibility (K_s) $\times 10^{-7}\text{pa}^{-1}$	Ultrasonic Attenuation ($\frac{\alpha}{f^2}$) $\times 10^{-15}\text{NP}/\text{ms}^{-2}$
Ocimum Sanctum (Tulsi)	0.3807	16795.75	0.01064	5.2827	1.4120

Table 2: Value of Free length, Wada's constant, Relaxation time. Isentropic compressibility and Ultrasonic attenuation of Tulsi.

From the above tabulated value, it is observed that the Tulsi ($0.3807296 \times 10^{-10}\text{m}$) has the Highest Free Length meaning that their molecular structure is more loosely packed and it has the highest Wada's constant, indicating strong intermolecular interactions and a more compact

molecular structure. Tulasi (0.010645×10^{-12} s) has the Comparatively lower relaxation time, suggesting moderate interaction strength. From the tabulated value its observed that Tulasi has the highest isentropic compressibility ($K_s = 5.2827 \times 10^{-7}$) and it Likely has a moderate molecular interaction level.

PLECTRANTHUS AMBOINICUS (KARPOORAVALLI):

SAMPLE	Ultrasonic Velocity(U) (m/s)	Density (ρ) $\times 10^3$ kgm^{-3}	Viscosity (η) $\times 10^{-4}$ Nsm^{-2}	Adiabatic Compressibility (β_a) $\times 10^{-10}$ $\text{N}^{-1}\text{m}^{-2}$	Acoustic impedance (Z) $\times 10^5$ $\text{kgm}^{-3}\text{s}^{-1}$
Plectranthus Amboinicus (Karpooravalli)	1640	1367	0.1345	2.7198	22.4188

Table 3: Values of Ultrasonic Velocity, Density, Viscosity, Adiabatic Compressibility and Acoustic impedance of Karpooravalli.

From the above table it's observed that the Karpooravalli (1640 m/s) has the highest ultrasonic velocity with more rigid or denser and they are showing Highest density. They contain high fibre content or structural compounds like lignin and cellulose, which improve sound wave propagation. Karpooravalli exhibit very low viscosity and lowest adiabatic compressibility, making them highly free-flowing. Low viscosity makes it easy to mix into tonics and herbal decoctions Used in traditional medicine for treating colds, coughs, and asthma. And It's observed that the Karpooravalli ($22.418 \times 10^5 \text{ kg m}^{-2}\text{s}^{-1}$) extract has the highest resistance to sound transmission, indicating greater density or higher molecular rigidity. Higher impedance suggests that the extract has a compact structure with strong intermolecular forces.

SAMPLE	Free length (L_f) $\times 10^{-10}$ kgms^{-2}	Wada's Constant (W)	Relaxation Time (τ) $\times$ 10^{-12}s	Isentropic Compressibility (K_s) $\times$ 10^{-7}pa^{-1}	Ultrasonic Attenuation $(\frac{\alpha}{f^2}) \times$ $10^{-15}\text{NP}/$ ms^{-2}
Plectranthus Amboinicus (Karpooravalli)	0.3331	15781.13	0.00487	4.4605	0.5864

Table 4: Value of Free length, Wada's constant, Relaxation time. Isentropic compressibility and Ultrasonic attenuation of Karpooravalli.

From the table it is observed that Karpooravalli ($0.3331182 \times 10^{-10}\text{m}$) has the Lower Free Length. This extract has a significantly lower intermolecular free length, suggesting that its molecular packing is tighter compared to the others. And it has relatively lower Wada's constant, suggesting a more open molecular structure with weaker intermolecular bonding. The extract has Lowest relaxation times, indicating weaker molecular interactions. Karpooravalli has the lowest isentropic compressibility ($K_s=4.4605 \times 10^{-7}$) and it is the least compressible, meaning it offers higher resistance to compression. And it is also lowest in attenuation (0.5864×10^{-15}). This suggests that Karpooravalli is the least resistance to ultrasound wave propagation. Indicates low viscosity and fewer molecular interactions.

CONCLUSION:

Optimizing herbal extracts for drug delivery, ultrasound-assisted therapy, and biomedical imaging by leveraging their viscosity, compressibility, and acoustic properties. Future research can focus on nano formulations, personalized medicine, and regenerative therapies.

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STRUCTURAL, MORPHOLOGICAL & ANTI MICROBIAL PERFORMANCE OF NiO THINFILMS SYNTHESIZED BY SILAR METHOD

D. Simona, A. Nirmala Shirley

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Nickel oxide (NiO) thin films have garnered significant attention in recent years due to their potential application in recent years due to their potential applications in energy storage and biomedical devices. In this study, we report the advanced synthesis and characterization of NiO thin film via facile and cost-effective method. The structural, morphological and optical properties of the NiO were systematically investigated using X-ray diffraction, Scanning electron microscopy and UV-Vis spectroscopy. The super capacitor efficiency of the NiO thin film was evaluated using cyclic voltametry, demonstrating a high specific capacitance and excellent cycling stability. Furthermore, the antimicrobial performance of the NiO assessed against Gram-positive and Gram-negative bacteria, exhibiting significant antimicrobial activity. The results of this study demonstrate the potential of NiO thin films for applications in energy storage and biomedical devices, and provide a foundation for further research and development in these areas.

Keywords: Nickel Oxide (NiO), Super capacitor, Antimicrobial Performance, energy storage, Cyclic voltametry.

INTRODUCTION

Nickel oxide (NiO) thin films have generated significant attention in recent years due to their exceptional electrochemical and anti microbial properties, making them for various applications. In the realm of energy storage, NiO thin films have shown great promise as electrode for super capacitor, offering high specific capacitance, excellent cycling stability and rapid charge-discharge rates. Additionally, NiO's anti microbial activity against a broad spectrum of microorganisms has been extensively studied, revealing its potential as a coating material for biomedical devices and surfaces.

MATERIALS AND METHOD

As a synthesis of NiO thin film, we want to use SILAR method. It is the best method for preparing thin films at room temperature.

PREPARATION OF SUBSTRATE:

Before deposition, the glass substrate is cleaned by acetone, ethanol and demonized water for removing any contamination in the glass substrate.

PREPARATION OF NiO THIN FILMS:

To synthesise the NiO thin films, aqueous nickel- ammonia complex ions ($[\text{Ni}(\text{NH}_3)_4]^{2+}$) were chosen for the cation precursor, using reagents of $\text{NiCl}_2(99\%)$ and concentrated ammonia(25-28%) were used. The concentration values defined for Ni solution was 0.1M and the molar ratio $\text{Ni}:\text{NH}_3$ is 1:10.

For synthesis of the NiO thin films, one SILAR growth cycle included the following four steps:

- Immersing the substrate in the complex $[\text{Ni}(\text{NH}_3)_4]^{2+}$ on the substrate for 30seconds to create a liquid film.
- Immersing the withdrawn substrate immediately in hot water (90°C) for 7 seconds to form NiO layer.
- Drying the substrate in the air for 60 seconds.
- Rinsing the substrate in a separate beaker for 30 seconds to remove large and loosely bound NiO particles.

Thus one SILAR cycle of NiO deposition is completed. By repeating deposition cycles we obtain the NiO thin films.

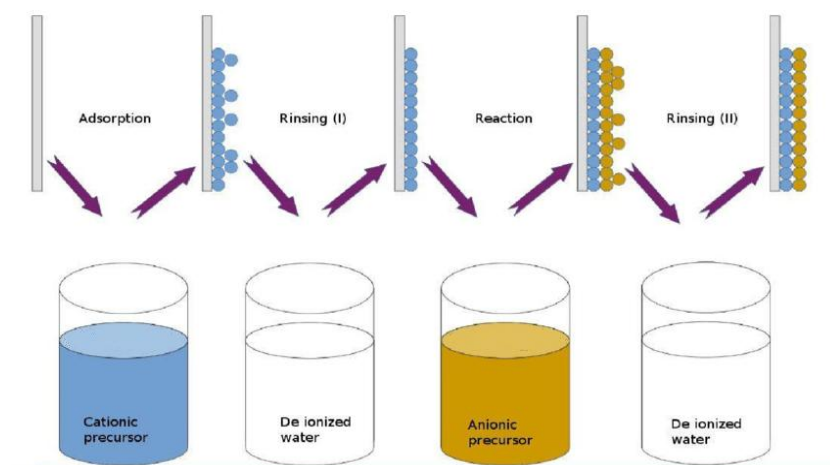


Fig 1. SILAR method

Here we choose $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$ and hot distilled water as a cationic and anionic precursors. The SILAR method involves successive adsorption of ionic species onto a surface, followed by a reaction triggered by the adsorption of a different ionic species. This reaction leads to the formation of an insoluble product, which constitutes the thin-film coating.

RESULT AND DISSCUSSION

XRD PATTERN FOR NiO THIN FLM BY SILAR METHOD

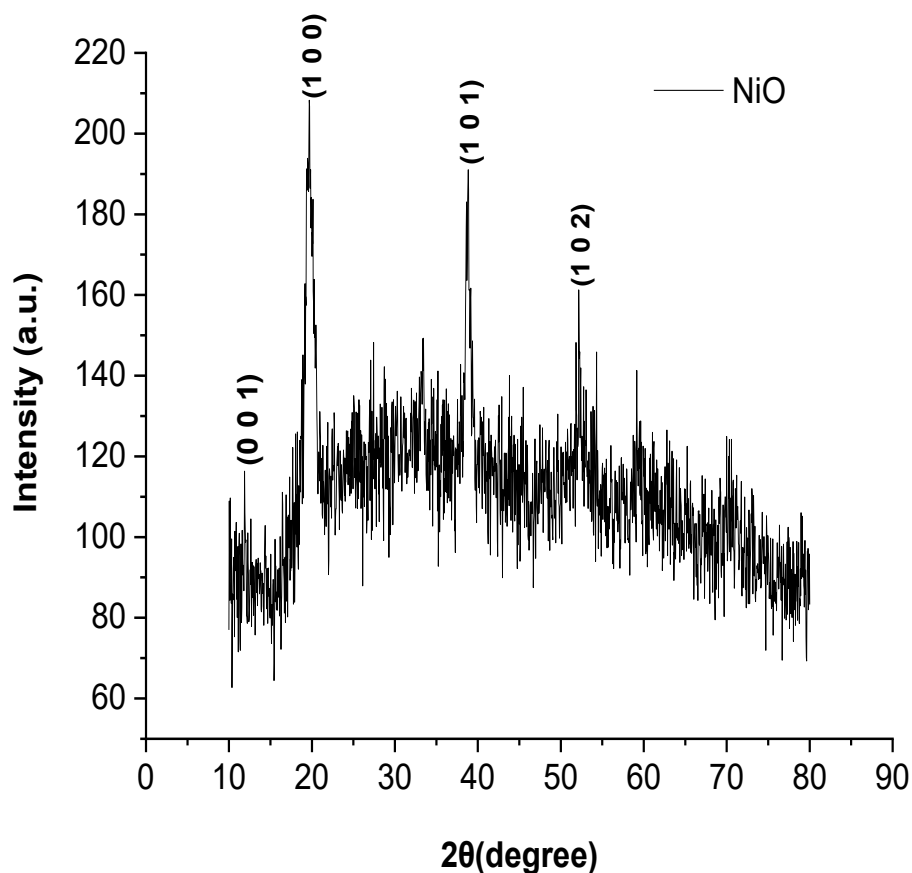


Fig 2. XRD pattern for NiO thin film deposited by Silar method

To study the structural properties of the deposited NiO thin films X-ray diffraction (XRD) study was carried out. Fig 1 show that XRD pattern of NiO deposited by SILAR Method for different deposition cycles of 80 respectively. The observed XRD pattern show the prominent peaks (001), (100), (101), (102) plane orientation for all the films prepared by different deposition cycles. However film deposited with 80 cycles show well defined peak with high intensitcompared to films prepared at 40 and 60 deposition cycles. All diffraction Peaks of the NiO thin film correspond to the characteristic cubic structure of NiO thin films. The observed ‘d’ values were compared with standard ‘d’ values using joint Committee on Powder Diffraction Standards (JCPDS card no 47-1049).

The crystallite size of thin film were calculated from XRD patterns by using Scherer’s formula given below

$$D = k\lambda / \beta \cos \theta$$

Where,

D = Crystallite size

$K = \text{Constant}$

$\beta = \text{Corrected FWHM of the most intense peak}$

$\theta = \text{Braggs angle}$ Using these formula grain sizes can be determined.

The dislocation density has been calculated using crystallite size, by the equation

$$\text{Dislocation} = \frac{1}{D^2}$$

The micro strain has been calculated by the given formula,

$$\text{Micro strain} = \beta \cos \theta / 4$$

The lattice parameter calculated for NiO by the given formula

$$a = d_{hkl} \sqrt{h^2 + k^2 + l^2}$$

The lattice parameter has been calculated and reported. The grain size, dislocation density, micro strain and lattice spacing of NiO thin film for 80 deposition cycles have been given below.

The particle size is found to be 19.07nm.

Deposition cycle	h k l	2 θ (Deg)	Grain size (10 ⁻⁹ m)	Dislocation density (line/cm ²)	Micro strain (10 ⁻⁴)	Lattice constant
80	0 0 1	11.5778	7.3765	0.01837	0.469916	7.6370
	1 0 0	19.6482	25.5390	0.001533	0.13573	4.51460
	1 0 1	38.7503	31.118	0.0013270	0.11388	3.283
	1 0 2	52.2802	12.2626	0.0003684	0.28266	3.90959

Table 1 Structural parameters of NiO for 80 deposition Cycles

RESULT OF SEM ANALYSIS OF NiO PREPARED BY SILAR METHOD

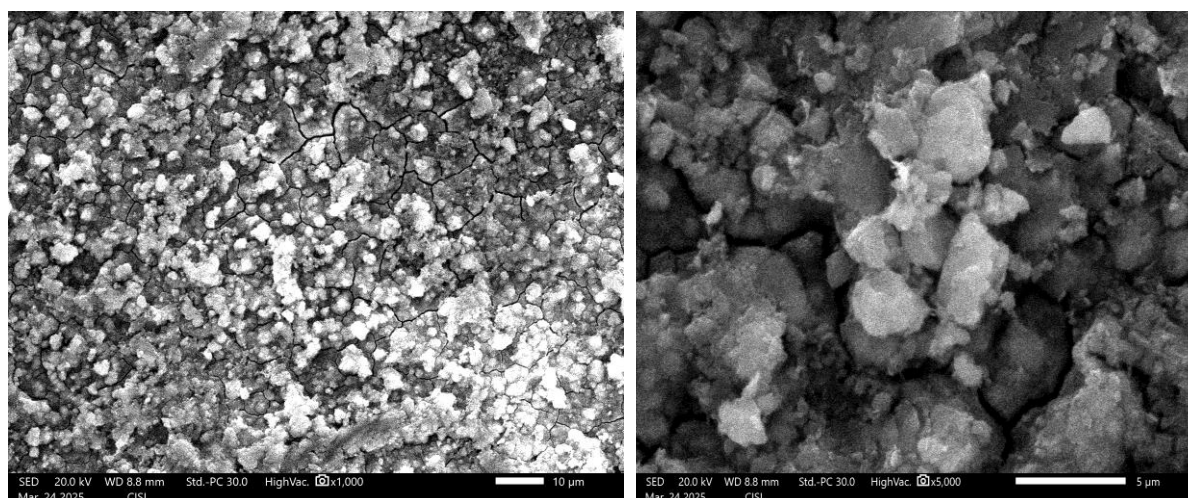


Fig 3 SEM Images of NiO

The SEM images confirms that the NiO thin film exhibits a rough, porous and polycrystalline structure with agglomeration. This morphology can influence its electrochemical, catalytic and antibacterial properties

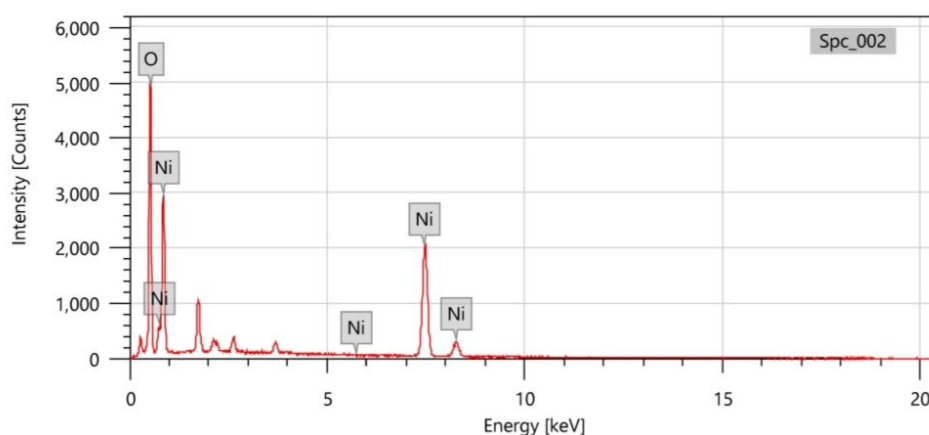


Fig 4 EDAX image of NiO

The morphological features of NiO was examined by the Scanning Electron Microscope. The SEM images exhibits inhomogeneous distribution of rock salt structure. The prepared sample was examined by EDAX analysis and expected elements of Ni and O were present in the atomic ratio 33.45% and 66.55%.

THICKNESS MEASUREMENT

In the present study thickness measurement were done by the weight gain method for different deposition cycles.

$$t = m / A\rho$$

Where,

m – Mass of difference of the substrate before and after deposition gives the mass of thin film

A – Area of the film coated

ρ – Density of film (Nickel oxide)

Thickness was calculated for the NiO thin films for 80 deposition cycle and the value was found to be 186nm.

RESULT OF ANTIMICROBIAL ACTIVITY OF NiO THINFILM PREPARED BY SILAR METHOD



Fig 3. Antimicrobial Activity of NiO

The antimicrobial activity of the synthesized NiO thinfilms was tested using the agar well diffusion method towards two microorganisms including *Escherichia coli* and *Enterobacter* sp. The lack of observable microbial inhibition suggests that NiO under the given conditions does not exhibit strong antibacterial properties against *Escherichia coli* and *Enterobacter* sp. Further investigation into film composition, surface characteristics and environmental conditions to help determine whether modification can enhance its antibacterial potential.

CONCLUSION

In summary, this study demonstrates the NiO thin film has the grain size varies from 7-31nm and it has rough, porous and polycrystalline structure with agglomeration. The antimicrobial studies suggests that NiO under the given conditions does not exhibit strong antibacterial properties. Future studies will focus on optimizing the synthesis conditions and exploring the scalability of the NiO thin films for practical applications. The findings of this study provide a foundation for the development of high-performance NiO-based supercapacitors and antimicrobial coatings.

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EXPLORING THE STRUCTURAL AND OPTICAL PROPERTIES OF GREEN SYNTHESIZED ZnO NANOPARTICLES FROM POMEGRANATE PEEL

M. Sindhu, J. Kethzy Agnes

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

This study explores the eco-friendly synthesis of ZnO nanoparticles using pomegranate peel extract as a natural reducing and stabilizing agent. X-ray diffraction (XRD) analysis confirms the formation of highly crystalline ZnO with a crystallite size of 35 nm. Fourier-transform infrared (FTIR) spectroscopy detects functional groups from the pomegranate peel, suggesting improved stability and bioactivity. The resulting ZnO nanoparticles exhibit significant potential for applications in photocatalysis for environmental purification, antibacterial coatings, and solar energy conversion. This sustainable method underscores the versatility and promise of ZnO nanoparticles for various green and multifunctional uses.

KEYWORDS: ZnO Nanoparticles, Pomegranate Peel, Green Synthesis, XRD, FTIR.

INTRODUCTION

Zinc oxide (ZnO) nanoparticles are a class of metal oxide nanomaterials with unique structural, optical, and antimicrobial properties. Due to their high surface area, biocompatibility, and multifunctionality, they have gained significant attention in biomedical, environmental, and industrial applications. While green synthesis of ZnO nanoparticles has been widely explored using plant extracts such as Aloe vera, neem, and Moringa, very few studies have specifically investigated the use of pomegranate peel extract [1]. Pomegranate peel is often overlooked despite its rich phytochemical profile, making it a novel and underexplored biosource for ZnO nanoparticle synthesis. Most ZnO synthesis studies focus on leaves, flowers, or fruit extracts, while peels—which are often discarded as waste—have been less frequently utilized [3].

MATERIALS AND METHODS

To prepare the plant extract, fresh pomegranate peels were taken. To remove the dust particles and unwanted particles, the pomegranate peels were washed with tap water twice and then were cleaned with distilled water and cut into small pieces. 12.5g of pomegranate peel and 100 ml of distilled water were mixed for extraction process. This solution covered with aluminium foil and boiled at 70°C hot plate for 15 min and stirred at 400 rpm. Light brown solution was

obtained and this solution was cooled at room temperature. This solution was filtered using Whatmann filter paper. 21.949 g of zinc acetate dihydrate mixed with 100 ml of distilled water. It was then stirred at room temperature about 30 min at 400 rpm. 10 ml of extract mixed with 90 ml of zinc acetate dihydrate. The pH value of the solution is maintained at 12 by dropwise addition of NaOH (Sodium hydroxide). The solution is then stirred at room temperature about 2 hours at 700 rpm. The white-coloured solution with precipitate was obtained. The precipitate was filtered and dried in hot air oven at 100°C for 3 hours. White coloured ZnO nanoparticle was thus obtained.

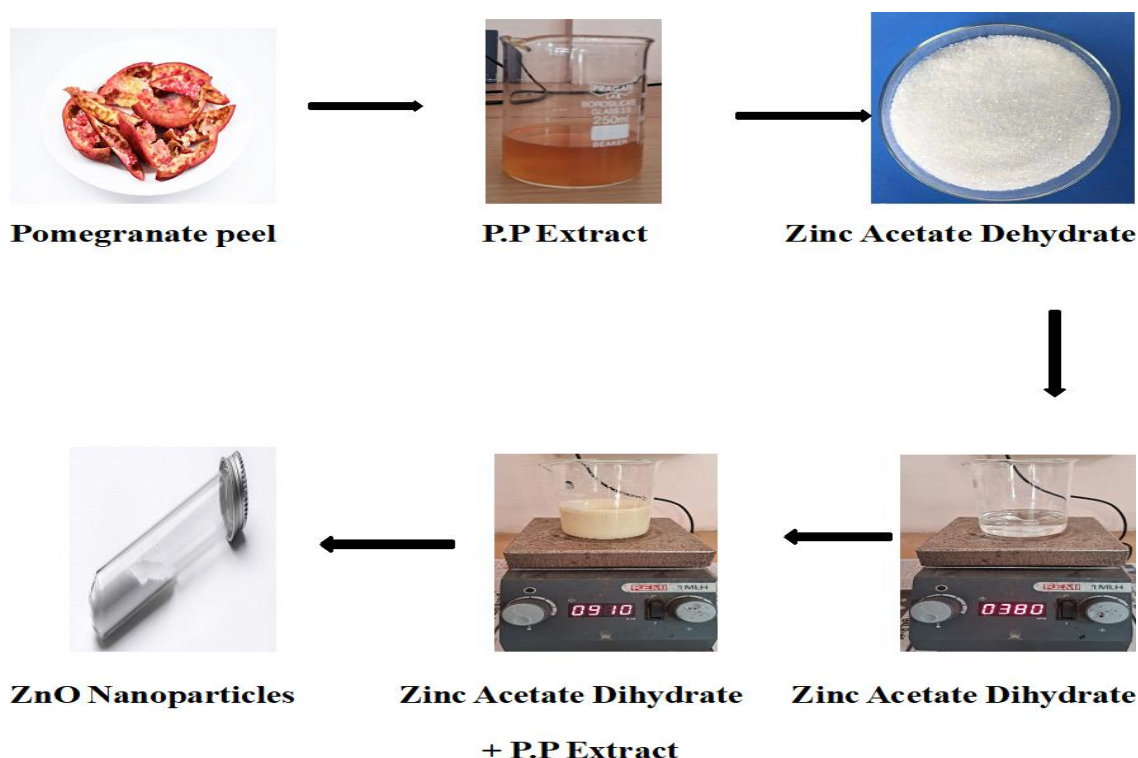


Fig: 1 Synthesis of ZnO Nanoparticles using Pomegranate peel

RESULT AND DISCUSSION

The structural characterization of ZnO nanoparticle are carried out by XRD method. Figure shows that X Ray diffraction spectrum of the synthesized ZnO nanoparticles using the pomegranate extract. The indexed diffraction peaks shown in the figure 2 represent the hexagonal wurtzite structure of ZnO with lattice constants of $a = b = 3.242 \text{ \AA}$ and $c = 5.205 \text{ \AA}$ _[2]. The average crystallite size D is 35 nm was calculated by using the Debye Scherer equation.

The XRD results for the ZnO nanoparticle exhibit strong peaks around 2 theta are 31.72, 34.42, 36.24, 47.49, 56.53, 62.81, 66.28, 67.86, and 68.99 corresponding to the reflection from (100), (002), (101), (102), (110), (103), (200), (112), and (201) crystal planes, respectively^[3]. The strong intensity and narrow width of ZnO diffraction peaks indicate that the resulting products were of high crystalline. No diffraction peaks from other species could be detected in the XRD pattern.

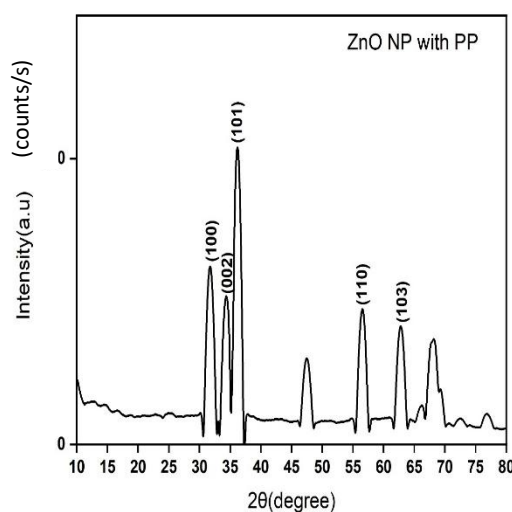


Fig: 2 XRD pattern of ZnO Nanoparticles

Sample	2 Theta (degree)	FWHM	d spacing	hkl planes	Crystalline size (D) nm	Average crystalline size (D) nm
ZnO	31.7230	0.1968	2.82071	100	39.77349	35.90543
	34.3668	0.1968	2.60953	002	39.77357	
	36.1980	0.2362	2.48161	101	33.13908	
	47.4834	0.3149	1.91483	102	24.85721	
	56.5205	0.2362	1.62825	110	33.13980	
	62.7674	0.1968	1.48039	103	39.77485	
	66.2818	0.1968	1.41017	200	39.77505	
	67.8664	0.2362	1.38105	112	33.14035	
	68.9738	0.1968	1.36155	201	39.77522	

Table: 1 Average crystalline size of ZnO Nanoparticles

The Fourier Transform Infrared Spectroscopy was used to identify the functional groups of the active components. In figure 3 X-axis represents the frequency of infrared light absorbed by the sample, ranging from 500 cm^{-1} to 4000 cm^{-1} . Y-axis indicates how much IR radiation passes through the sample without being absorbed. The spectrum confirms the presence of ZnO nanoparticles, as indicated by the Zn-O vibration peaks. The peak $455.20 - 594.08\text{ cm}^{-1}$ represent the Zn-O bond stretching vibrations, which confirm the presence of ZnO nanoparticles. The peak 725.23 cm^{-1} represent C-H out-of-plane bending, common in polymer structures. The peak 1411.89 cm^{-1} & 1558.48 cm^{-1} represent C=C stretching or aromatic ring vibration. The peak 3417.86 cm^{-1} & 3618.46 cm^{-1} represent the O-H stretching vibrations, indicating the presence of hydroxyl (-OH) groups, possibly from adsorbed water or surface hydroxyl groups on ZnO nanoparticle_[4].

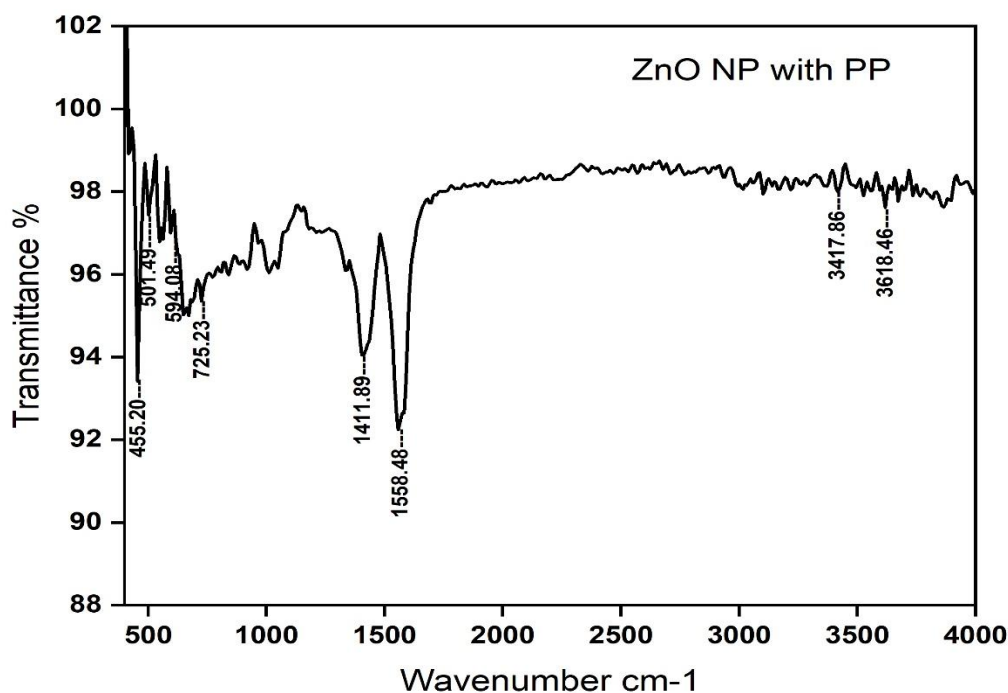


Fig:3 FTIR spectra of ZnO Nanoparticles

CONCLUSION

XRD confirms the crystalline nature of ZnO nanoparticles with a crystallite size of 35 nm. FTIR spectroscopy identifies the functional groups present, indicating interactions between ZnO and bioactive compounds from pomegranate peel, which may enhance its stability and functionality. These are effective for potential application, biomedical uses, renewable energy.

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UNLOCKING THE POTENTIAL OF TWO FOILAGE ASSISTED SILVER NANO PARTICLES: BIO SYNTHESIS, CHARACTRISATION, BIO POTENTIAL ACTIVITY

N. Sinthuja, S. Irudhaya Sahaya Lancy

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

In this study Silver nanoparticles have gained significant attention due to their unique physiochemical properties and broad-spectrum of antimicrobial activity. Ag nanoparticles were synthesized using aqueous extracts of papaya (*Carica papaya*) and guava (*Psidium guajava*) leaves as natural reducing and stabilizing agents. The bioactive compounds present in these extracts facilitated the reduction of silver nitrate (AgNO_3) to Ag nanoparticles under controlled conditions. The synthesized nanoparticles were characterized using UV-Vis spectroscopy to measure the absorption and transmission of ultraviolet(UV) and visible light by a substance.

KEY WORDS :AgO, Nanoparticles, UV-Vis, Absorbance, *Psidium guajava*, *Carica Papaya*

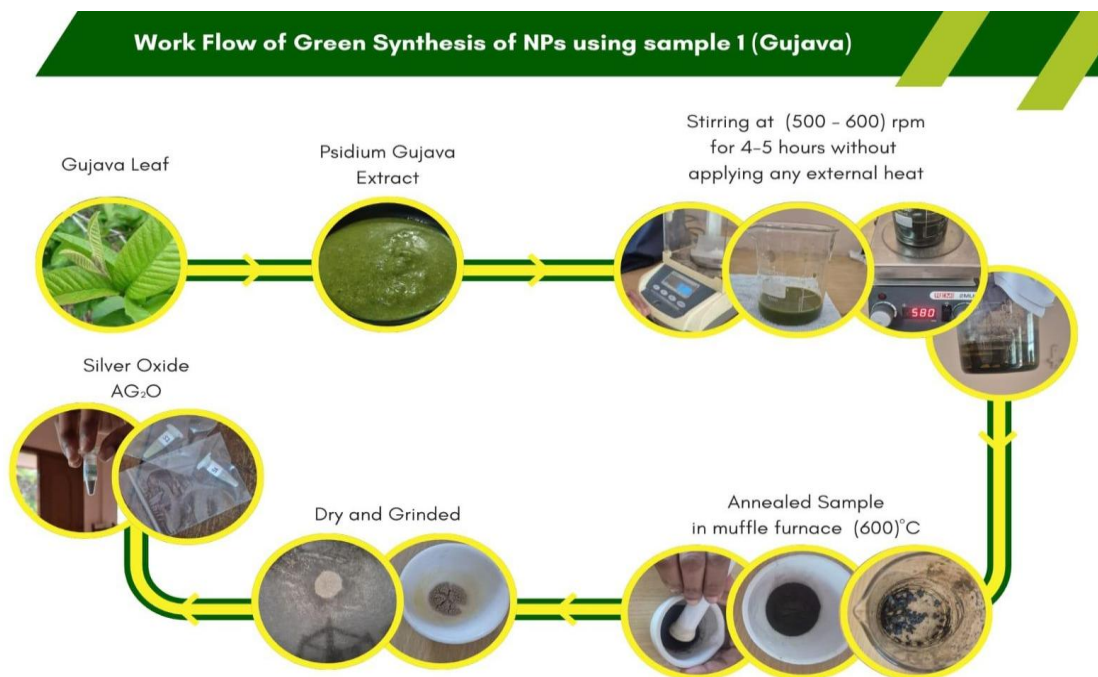
INTRODUCTION

Ag/AgO nanoparticles (AgNPs) are gaining attention due to their unique properties and diverse applications, ranging from antimicrobial and anticancer therapies to wound healing and biosensors. They are characterized by their small size (1-100 nm), large surface area, and high reactivity, leading to enhanced physical, chemical, and biological characteristics. Their aim is to

- ❖ To synthesis silver nanoparticles mediated by the leaves of *Psidium guajava*.
- ❖ To find the absorption and emission of the material.

METERIALS AND METHODS

The beaker is first carefully cleansed with an ethanol, 100ml leaf extract of *Psidium guajava* is added to 1mol of silver nitrate (AgNO_3) and kept in a magnetic stirrer. Until the precipitate is produced, the mixture is then agitated at a speed of 700 rpm. The sample is filtered and dried to 120° C in a hot air oven. Again the sample is made to put in a muffle furnace at 600°C. The resulting precipitate is finely powdered. As a result, Grey silver nanoparticles are produced. Prepared nanoparticles are characterized by EDAX, XRD, SEM FTIR, UV-VIS spectrometer analysis and Antibacterial activity



RESULT AND DISCUSSION

Fig 1, 2 shows the UV-Vis spectra of *Psidium guajava* and *Carica papaya* nanoparticles, synthesized via eco-friendly methods using two different leaf extracts. *Psidium guajava* exhibited ultraviolet absorption peaks at $\sim 200\text{--}450\text{ nm}$, while *Carica papaya* showed peaks at $\sim 200\text{--}300\text{ nm}$. The spectra exhibit a broad absorption band in the UV-Vis region, attributed to valence band to conduction band and electronic transitions within the nanoparticles. Particle size mainly affects the absorption of synthesized AgO nanoparticles [54].

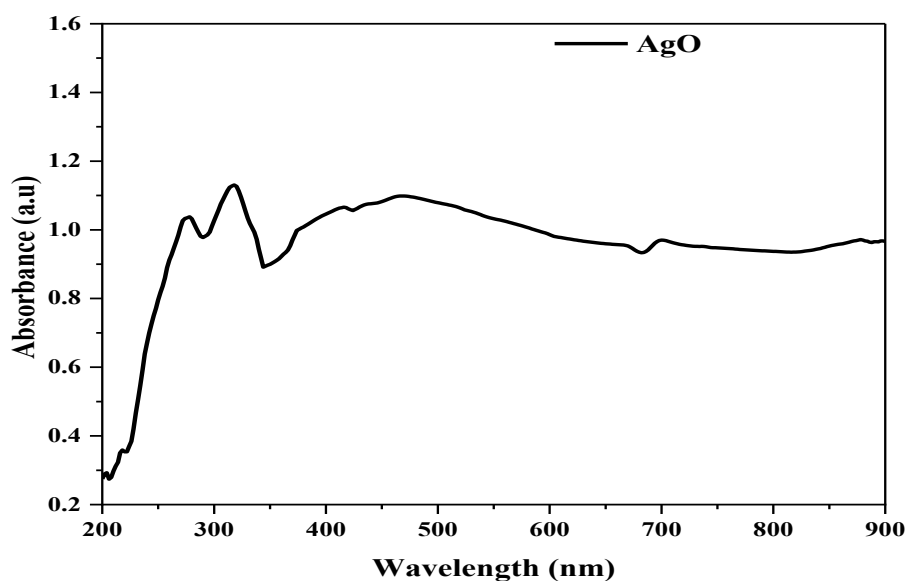


Figure 1 UV-vis spectra of AgO prepared by *Psidium guajava*

The band gap energy represents the minimum energy for electron excitation across the band gap [1]. The optical band gap energy (E_g) of the AgO using *Psidium guajava* and *Carica papaya* were determined by Tauc plot using the formula

$$(\alpha h\nu)^n = A(h\nu - E_g),$$

where α is the absorption coefficient, $h\nu$ is the photon energy, A is a constant, and n depends on the transition type. By plotting $(\alpha h\nu)^2$ against $h\nu$ (Fig. 4.3) and extrapolating the linear portion to $(\alpha h\nu)^2 = 0$, the band gap energies for *Psidium guajava* were found to be 2.57 eV

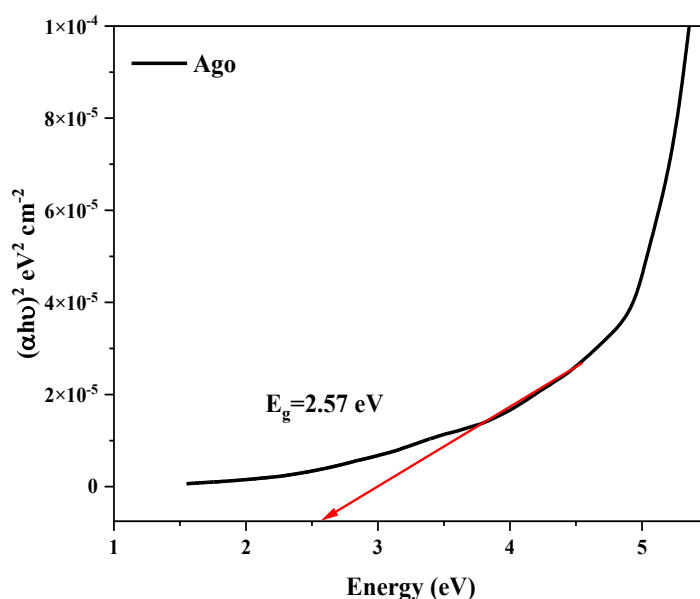


Figure 2 Energy Bandgap of AgO using *Psidium guajava*

CONCLUSION

The study of silver nanoparticles synthesized from *Psidium guajava* extracts reveals superior physiochemical properties [2]. The obtained spectra from UV-Vis spectroscopy reveals a sharper SPR peak (~400 nm) in AgO prepared by *Psidium guajava* confirming well-formed nanoparticles.

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ENVIRONMENTALLY FRIENDLY SYNTHESIS OF C-NiCu₂O₄ via CAMELLIA SINENSIS EXTRACT: STRUCTURAL AND OPTICAL PROPERTIES

P. Sreemathi , C. Infant Francita Fonseka

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Transition metal oxides play vital role in energy storage and environmental remediation. This study explores the synthesis and characterization of C-NiCu₂O₄ nanocomposites for potential applications in structural and optical properties. The material was successfully synthesised and characterized using X-ray Diffraction, UV-Visible spectroscopy. XRD confirms the crystalline structure of the C-NiCu₂O₄. UV-Visible spectroscopic study reveals the direct band gap energy of C-NiCu₂O₄ to be 1.29 eV. These findings suggest that C-NiCu₂O₄ nanocomposites are promising candidates for both energy storage and environmental remediation.

KEYWORDS C-NiCu₂O₄, X-ray Diffraction, UV- visible spectroscopy, Bandgap, Energy Storage, optical properties

INTRODUCTION

Technology and materials for electrochemical energy storage have drawn remarkable attention due to their high energy efficiency and potential for clean power generation. In the field of electrochemical energy storage systems, supercapacitors are the most attractive option due to their mechanism, which exploits conventional electrochemical capacitors and ionic batteries and bridges the energy gap between two. Hence, supercapacitors have been utilized in salient energy storage platforms such as electronic communications, aerospace, electric transportation.

Transition metal oxides, particularly nickel and copper oxides, are well known for their excellent electrochemical properties, environmental friendliness and low cost. The formation of NiCu₂O₄ spinel structure offers synergistic advantages by combining the redox behavior of both Ni and Cu ions, enhancing charge storage capabilities and catalytic efficiency. Furthermore, the doping of carbon into metal oxides has emerged as an effective strategy to improve their conductivity, surface area and stability.

The novelty of this work lies in the green synthesis of carbon doped NiCu₂O₄ nanocomposites using environmentally benign method, avoiding toxic solvents or high-

temperature pyrolysis. This project also explores the dual functionality of the synthesized nanocomposites in both energy storage and photocatalytic applications, making it a multifunctional material with practical relevance in clean energy technologies [1].

MATERIALS AND METHODS

Synthesis of carbon from coconut coir

High quality coconut coir is purchased from the local market. The coir was rinsed thoroughly with deionized water to remove any impurities, dust and residual minerals or contaminants. The coir is then sun-dried until all moisture is evaporated, ensuring it is completely dry before proceeding. Once dried, cut the coconut coir into small pieces, and 20g of coir is weighed. Place the coir in a muffle furnace and set the furnace temperature to 600°C and allow the coir to undergo the decarboxylation process for 3 hours. During this period, the coconut coir will undergo pyrolysis, resulting in the formation of carbon. After the 3-hour heating period, remove the sample from the furnace and allow it to cool. The resulting product will be a fine, powdered form of carbon, which can be collected and used for further analysis or applications.

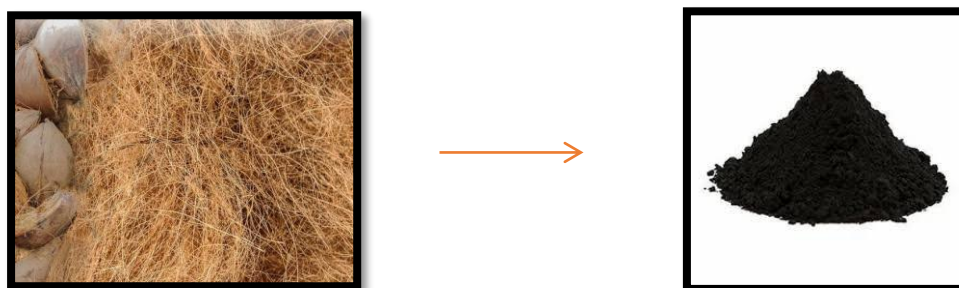


Fig 1 Synthesis of Carbon

Preparation of camellia sinensis extract

High quality tea leaves are used for the preparation. 15g of tea leaves is weighed. Heat the deionized water. Steep the tea leaves for about 5 min. After steeping time is completed allow the liquid to cool, and filter it with Wattman's Filter paper no.1. Now the filtered liquid is used for further synthesis.

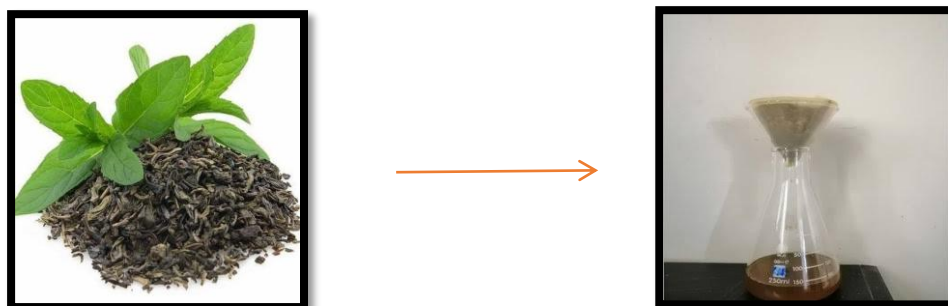


Fig 2 Extraction of *Camellia sinensis* extract

Synthesis of NiCu_2O_4 nanocomposite

The process starts by taking nickel nitrate and copper II sulphate in the ratio of 1:2, having concentration of 0.2M of Molar mass. The green extract for reduction is prepared by mixing *camellia sinensis* extract and deionized water in the ratio of 1:1. Then 0.1g of carbon synthesized from the coconut coir is taken along with 5.8g of nickel nitrate and 9.9g of copper II sulphate which is mixed with the *camellia sinensis* extract. The sample is kept in the magnetic stirrer for about 3 hrs maintaining a constant temperature of 80°C to ensure the constant dispersion of particles. The sample is allowed to cool. The cooled sample is centrifuged at 1000rpm for 5 mins to collect the sedimented particles. The collected sample is then washed with ethanol and deionized water and kept in magnetic stirrer for about 30-40 mins. The sample is kept at rest overnight. The settled particles is collected and dried at 110°C for 4 hrs using hot air oven. The dried sample is powdered and calcinated at 600°C for about 4 hrs in the muffle furnace. Finally, the calcinated sample will be C- NiCu_2O_4 which is then used for the characterization study.

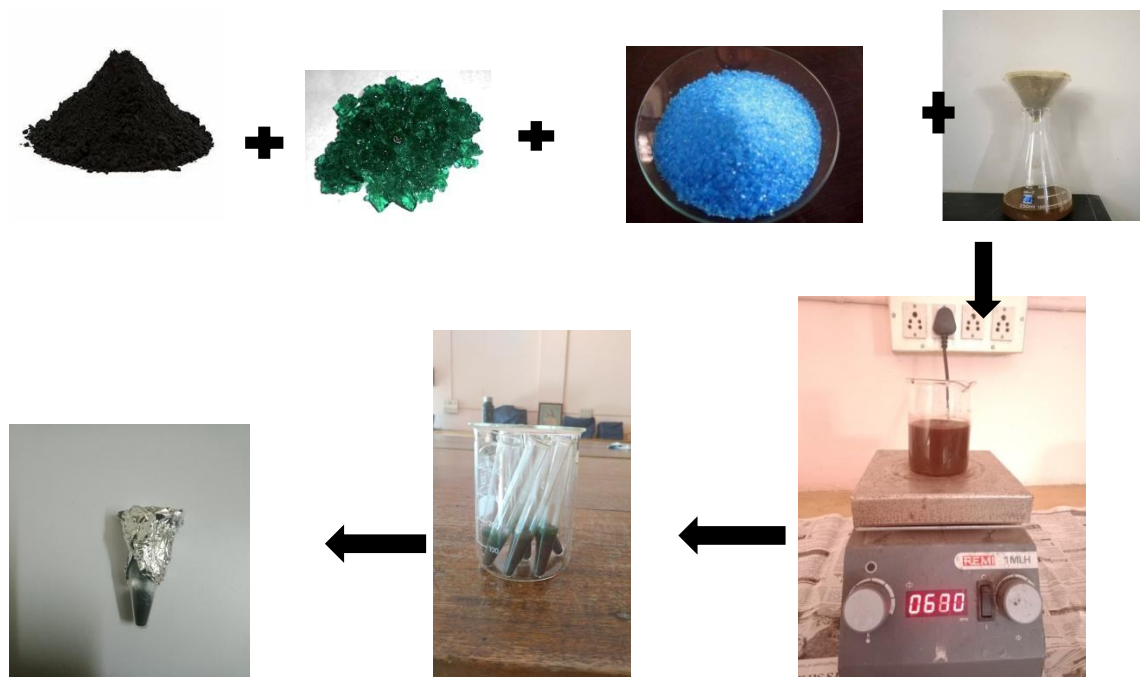


Fig 3 Synthesis of C- NiCu_2O_4

RESULT AND DISCUSSION

X-RAY DIFFRACTION ANALYSIS

The structural characterization of C- NiCu_2O_4 is performed by XRD analysis. The X-rays produced are in the wavelength of $1.5406\text{\AA}$. The scan type is continuous ranging from 10° - 80° . The graph shows the intensity of diffracted X-rays as a function of 2θ . Peak in the

pattern corresponds to constructive interference of X-rays from specific crystallographic planes.

The average particle size is found by the Debye-Scherer formula,

$$D = \frac{k\lambda}{\beta \cos \theta}$$

where, D is the particle size, β is the Full Width Half Maximum[FWHM], λ is the wavelength, k is the shape factor, θ is the Bragg's angle

The microstrain is found out using the following formula

$$\epsilon = \frac{\beta}{4 \tan \theta}$$

ϵ is the microstrain.

According to JCPDS reference card (006-0720), eight characteristics peak was absorbed for C-NiCu₂O₄ at $2\theta=37.010, 41.345, 43.805, 61.799, 64.17, 72.545, 76.012, 78.845$ corresponding to the Miller indices (111), (002), (200), (202), (220), (310), (311), (222). The estimated crystal system of C-NiCu₂O₄ is tetragonal. The XRD graph shows the maximum peak is obtained at 35.4232° .

Table1 Structural Parameters

Crystallite size (nm)	41.19nm
Dislocation density(lines/nm ²)	0.392148083
Micro stain($e \times 10^{-3}$)	2.231598
Lattice parameter a($^\circ$)	4.1170
Lattice parameter b ($^\circ$)	4.1170
Lattice parameter c($^\circ$)	4.3680
Volume of unit cell	74.04

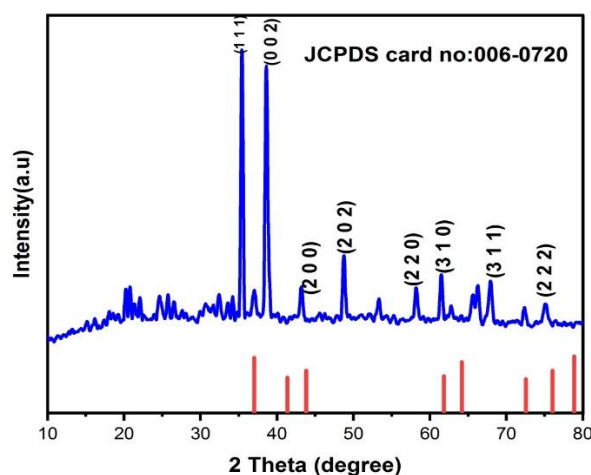
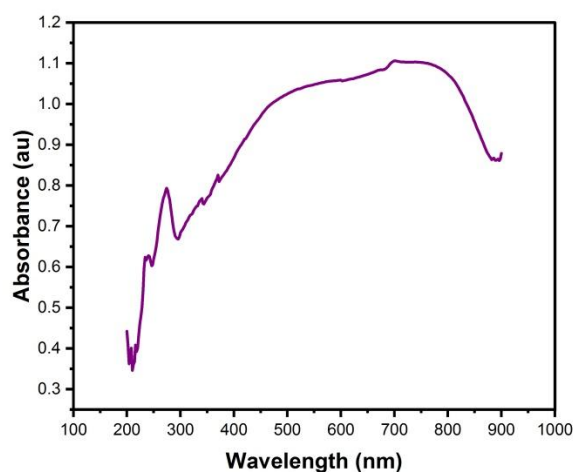


Fig 4 XRD pattern of C-NiCu₂O₄ Nanocomposites**UV-VISIBLE ANALYSIS**

The UV- visible analysis shows several peaks and absorption bands, which indicate the sample absorb light strongly at specific wavelengths. The overall shape of the curve provides information about the electronic transitions occurring within the sample. The band gap is found by using the following formula,

$$E_g = (\alpha h\nu)^{1/2}$$

α - Absorption coefficient, $h\nu$ - photon energy

**Fig 5 Absorbance spectra of C-NiCu₂O₄ Nanocomposites**

The graph displays the absorbance of C-NiCu₂O₄ Nanocomposite as a function of wavelength in the UV-Visible range (100 nm to 1000 nm). There is a significant increase in absorbance in the UV region particularly below 400 nm. This indicates strong absorption of UV light by the C-NiCu₂O₄ nanocomposite. The strong absorption in the UV region is due to the electronic transitions within the C-NiCu₂O₄ nanocomposite. The carbon can introduce defects which can change the band gap and absorption properties. The strong UV absorption suggests that C-NiCu₂O₄ could be useful in applications where UV light absorption is desired, such as UV Shielding or as a component in photocatalytic process that utilise UV light.

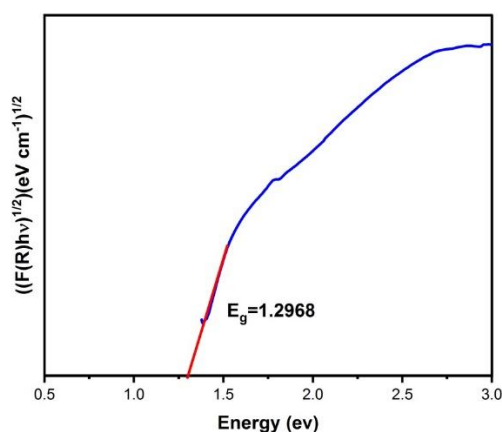


Fig6 Band gap of C-NiCu₂O₄ Nanocomposites

The Direct band gap of C-NiCu₂O₄ is found to be 1.2968 eV. This means that at least 1.2968 eV of energy is required to excite an electron from the valence band to the conduction band in the prepared C-NiCu₂O₄.

CONCLUSION

This study focused on the synthesis and characterization of C-NiCu₂O₄ as a potential electrode material for supercapacitors. The synthesis method is carried out via green and eco-friendly route which is a good alternative to the conventional methods. The carbon used in the process is derived from coconut coir by decarboxylation process. Camellia Sinensis extract is used as a reducing agent. The XRD characterization revealed the crystalline nature of the prepared C-NiCu₂O₄, indicating tetragonal structure. The average particle size is found out to be 41.19 nm. From the UV analysis provides direct band gap energy about 1.29 eV. The carbon doped can affect the band gap and absorption properties.

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GREEN FABRICATION OF IRON OXIDE NANORODS FROM APRICOT HIBISCUS: STRUCTURAL, OPTICAL AND MORPHOLOGICAL ANALYSIS

S. Sundharammal @ Gayathiri, J. Kethzy Agnes

Department of Physics, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

This study presents the eco-friendly synthesis of Fe_2O_3 nanoparticles using Apricot Hibiscus as a natural reducing and stabilizing agent. X-ray diffraction (XRD) analysis confirms the formation of a highly crystalline cubic iron oxide structure with a crystallite size of 8 nm. Fourier-transform infrared (FTIR) spectroscopy identifies functional groups in Apricot Hibiscus that contribute to the stability of the nanoparticles. These Fe_2O_3 nanoparticles demonstrate promising properties for applications such as photocatalytic degradation of pollutants, antibacterial coatings, and solar energy conversion. The green synthesis method underscores the potential of Fe_2O_3 nanoparticles for sustainable and multifunctional applications in both environmental and biomedical fields.

KEYWORDS

FeO Nanoparticles, Apricot Hibiscus, Nanotechnology, Green Synthesis, XRD, FTIR.

INTRODUCTION

Iron oxide nanoparticles are particles with diameters between about 1 and 100 nm. The two main forms are composed of magnetite and its oxidized form maghemite ($\gamma\text{-Fe}_2\text{O}_3$). Application of iron oxide nanoparticles including high-sensitivity biomolecular, magnetic particle imaging, magnetic fluid hyperthermia, separation of biomolecules, and targeted drug and gene delivery for medical diagnosis and therapeutics. These applications require coating of the nanoparticles by agents such as long-chain, fatty acids, alkyl substituted amines, and diols^[1]. They have been used in formulations for supplementation. Iron oxide nanoparticles (IONPs) are widely studied due to their magnetic, catalytic, and biomedical properties. Apricot Hibiscus contains higher levels of flavonoids, polyphenols, and carotenoids, which serve as stronger reducing and stabilizing agents for iron oxide nanoparticle. The enhanced antioxidant activity leads to better control over nanoparticle size and crystallinity^[2]. The Apricot coloured petals indicate a higher carotenoid concentration, which can act as an additional capping agent. This enhances nanoparticle stability, prevents agglomeration, and improves dispersibility^[3].

MATERIALS AND METHODS

Apricot Hibiscus Flowers were collected from a local garden, washed several times with tap water and rinsed with distilled water to remove dust particles. The apricot hibiscus extract was obtained by cutting the washed flower into 1-inch pieces and mixing it with distilled water by heating 60° C on magnetic stirrer at 200 rpm and leaving it overnight under ambient condition and filtering the extract using Whatman filter paper. 0.1M of Ferric Chloride salt stirred in 100 ml of distilled water on magnetic stirrer at 400 rpm for 30 minutes to form Ferric Chloride solution. 10 ml of apricot hibiscus extract was mixed with 90 ml of Ferric Chloride solution and stirred continuously for two hours at 400 rpm. The pH of the solution was maintained at 12 by dropwise addition of NaCl. The formation of iron oxide nanoparticles was marked by the appearance of intense black precipitate. The precipitate was washed with ethanol and distilled water. After washing, the collected iron oxide nano powder was dried in oven at 60° C for one hours.

RESULT AND DISCUSSION

The X Ray diffraction (XRD) pattern of the prepared iron oxide nanorods was studied by using X Ray Diffractometer. Figure 1 represents Xray Diffraction of Iron Oxide Nanorods. The structural characterization of Iron oxide nanorods were carried out by XRD method, $2\theta=31.6975^\circ$ along (2 3 3) plane, $2\theta=45.4148^\circ$ along (4 0 0) plane, $2\theta=75.2351^\circ$ along (5 3 3) plane which belongs to Iron Oxide Nanorods [4]. The average crystalline was found to be 8 nm using Debye Scherer formula [5]. Table 1 represents Average crystalline size of Iron oxide nanorods. Table 1 represents average crystalline size of Iron Oxide Nanorods.

Sample	2θ (degree)	FWHM (radian)	Crystalline Size D (nm)	Average crystalline size D (nm)
FeO	31.6975	0.1181	12.25772	8.17334
	45.4148	0.1574	9.19717	
	75.2351	0.4723	3.06520	

Table 1: Average crystalline size of Iron Oxide Nanorods

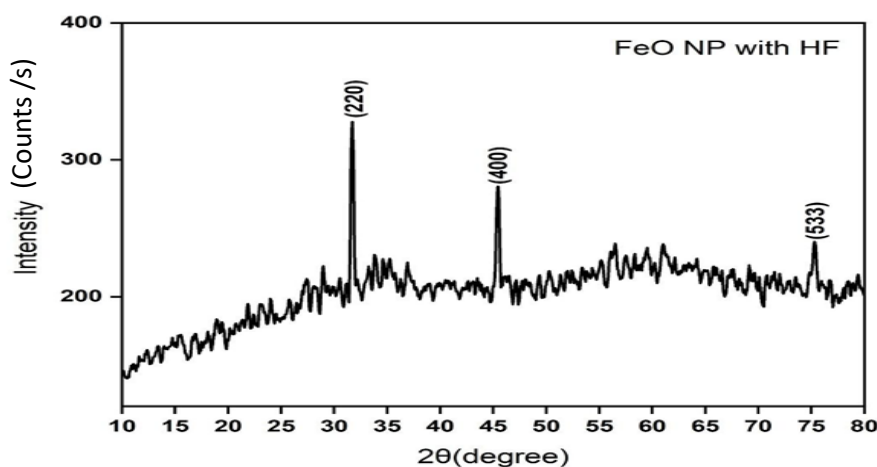


Figure 1 : Xray Diffraction spectrum of Iron Oxide Nanorods

FOURIER TRANSFORM INFRARED SPECTROSCOPY

Sample was scanned in the wavelength ranging between 3000 and 500 cm^{-1} . FTIR spectrum for hibiscus extracts displayed several strong bands around 408.91, 470.63, 516.92, 540.07, 671.23 cm^{-1} . Figure 2 represents analysis of Iron Oxide Nanorods. Strong band position at 408.91 cm^{-1} may be attributed to the stretching mode of Fe and O stretches[6].

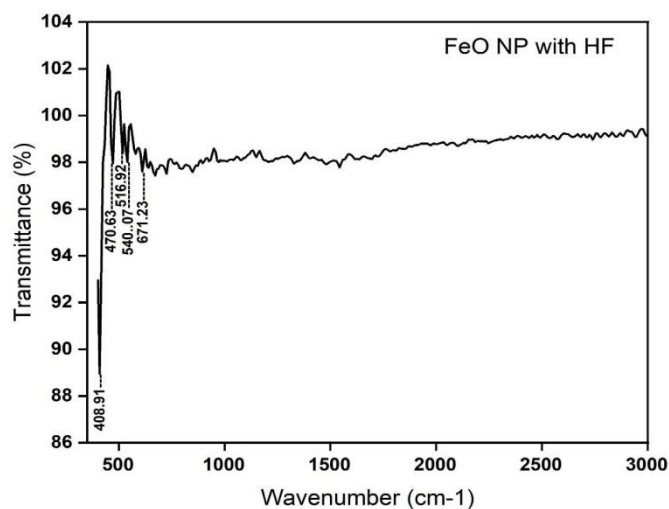


Figure 2: FTIR Analysis of Iron Oxide Nanorods

CONCLUSION

Iron oxide Nanorods was synthesized using Apricot Hibiscus as a sustainable precursor. The XRD Diffraction showed that green synthesis Iron Oxide Nanorods exhibits rod shape and the

average particle size was found to be 46 nm using Scherer formula and the crystalline size was found to be 8 nm. FTIR confirms the absorbed band at 540.07 for the hibiscus extract corresponds to Fe – O stretches. FTIR spectroscopy identifies the functional groups present, indicating interactions between iron oxide and bioactive compounds from Apricot Hibiscus, which may enhance stability and surface properties. The biofunctional properties from Apricot Hibiscus for antibacterial coatings, drug delivery, and biosensing.

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INVESTIGATING PARENTAL SELF-EFFICACY AND PATERNAL ANTENATAL ATTACHMENT AMONG EXPECTANT FATHERS

Aishwarya Durga. S* and Dr. S. Jeya Bharathi

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Parental Self-efficacy refers to the belief in one's own parenting skills and knowledge. Paternal Antenatal Attachment is the love and care that expectant fathers have on their unborn fetus. This forms the base for their future attachment and makes them feel secure. In this patriarchal society, fathers are stigmatized to be the disciplinarian and act emotionally distant, leading to errors in parenting. But now most of the paternal figures are getting involved in child care. The origin for most of the behavioural issues lies in the early developmental period of the child. This study aims to understand the interactions between Parental Self-efficacy and Paternal Antenatal Attachment. The standardized tools employed in this study are Paternal Antenatal Attachment Scale and Parental Self-efficacy scale. A sample of 142 expectant fathers were taken. Results suggested that there is a significant positive correlation between Parental Self-efficacy and Paternal Antenatal Attachment ($r = 0.384$, $**p < 0.01$). Further regression analyses showed 14% of variance was caused by Paternal Self-efficacy on Paternal Antenatal Attachment ($\beta = 0.384$, $**p < 0.01$; $F = 22.830$, $**p < 0.01$). So we can inculcate the required parenting skills like Parenting Self-efficacy through more awareness and training programs. This will pave the way for healthier development of a child.

Key words: Parental Self-efficacy, Paternal Antenatal Attachment, Healthy Development, Expectant Fathers

INTRODUCTION

Aim

This study aims to explore Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers.

Parental Self-Efficacy

According to Bandura, it is a parent's belief in their ability to carry out parenting tasks and behaviours to positively impact their child's health and development. ^[1] Parental efficacy is a product of Bandura's Social Cognitive Theory. This theory states that human behaviour is determined by the interaction of three major entities: Personal Factors, Environmental influences and Behavioural patterns. The parental figure's personality, behavioural pattern and their family influences their Parental Self-efficacy. If both the parent anticipate good outcomes from their parental behaviour then their parental efficacy is likely to be good. Self-Efficacy being the centre force of determining parental efficacy acts as a forerunner of it.

Paternal Antenatal Attachment

Paternal fetal attachment is a subjective feeling of love for the unborn child, rather than an attitude or belief, and is at the heart of a man's experience. ^[2] McCall and Simons developed the identity theory. Among the available roles the most predominant role will be acted out by the individual. If the expectant fathers give more significance to their paternal role then they will start exhibiting father-related behaviour. Expected first time fathers are prone to have increased father status prominence as they are preoccupied with thoughts about their manifestation towards fatherhood. But the fatherhood content is more complex to predict. ^[3]

Condon developed the Paternal Antenatal Attachment Scale. He mentioned two major dimensions that helped to assess paternal prenatal attachment: Quality of attachment and Time spent in attachment. Quality of attachment mainly intends on understanding the expected father's emotional and empathetic investment on the fetus. This highlights the significance of the baby on the father's life. Time spent in attention mainly focuses on the time invested for the baby and its relating activities. This dimension has cognitive involvement of the father as the core. So this assesses how the father is imagining the baby to look like, thinking of potential names for the baby and mental representations of the baby in the womb.

MATERIALS AND METHODS

Hypothesis

H₁ - There will not be a significant relationship between Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers.

H2 - There will not be predictive relationship between Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers.

Variables

Dependant variable: Paternal Antenatal Attachment

Independent variable: Parental Self-efficacy

Sample

The study's sample comprised of 140 expectant fathers. The participants belonged to the places in Thoothukudi district. This study relied on primary data.

Measures

In this research, the following standardized tools were used:

- Paternal Antenatal Attachment Scale by Condon (2015).
- Parental Self-efficacy scale by Woolgar. M ,et.al (2023).

Procedure

The expectant fathers were the participants of the research and the responses were collected from them. After obtaining the participant's consent to take part in the study, they were requested to fill in their response to a set of questionnaires, which included demographic data. This self-reported measure intends to measure the variables: Parental Self-efficacy and Paternal Antenatal Attachment. The participants were instructed to read the items carefully and respond to each questions by selecting the option that comes first to their mind without over thinking it and they were informed that their responses will be kept confidential. The participants took 15 to 20 minutes to complete the questionnaires.

Statistical analysis

The collected data was analysed statistically using Karl Pearson's correlation coefficient to determine the relationship among the research variables. Linear regression was used to determine the predictive relations among the research variables. The analyses was carried out with the statistical package for the social sciences software 23 (SPSS).

Review of Literature

Some of the most relevant researches are explained below.

Donithen, R., & Schoppe-Sullivan, S. (2022) conducted a study to investigate the “Correlates and predictors of parenting self-efficacy in new fathers”. Data was collected from one hundred and eighty two expected fathers. Lower parental efficacy was found if the

fathers had higher attachment anxiety and neuroticism. New fathers parenting efficacy depended on the relationship with the co-parent. [4]

Knappe, S., Petzoldt, J., Garthus-Niegel, S., Wittich, J., Puls, H. C., Huttarsch, I., & Martini, J. (2021) conducted a study on “Associations of partnership quality and father-to-child attachment during the peripartum period. A prospective-longitudinal study in expectant fathers”. The sample included one hundred and nine expected fathers whose partners were in their mid-pregnancy. Results portrayed that the quality of relationship between partners determined the quality of the relationship between the fetus and the expected father. Anxiety symptoms seemed to lower the paternal attachment. [5]

Pinto, T. M., Figueiredo, B., Pinheiro, L. L., & Canário, C (2016) conducted a study on “Fathers’ parenting self-efficacy during the transition to parenthood”. Eighty six expected fathers whose spouse have completed the first trimester of pregnancy were taken as the participants. Result showed that father’s parenting efficacy was influenced by the co-parents support. Expected fathers who displayed more anxious symptoms reported lower levels of parenting efficacy. [6]

Türkmen, H., & Güler, S. (2021) conducted a study on “Factors Affecting Intrauterine Paternal-Foetal Attachment and the Responsibility Status of Fathers Concerning Mothers and Babies”. This was a cross sectional study where the expected fathers whose partner were above the 24th week of pregnancy were taken as the sample. The study proved that if the father has a good sense of responsibility on the mother and baby then they are prone to have higher level of attachment with their fetus. [7]

Vance, A. J., & Brandon, D. H. (2017) conducted a study on “Delineating among parenting confidence, parenting self-efficacy, and competence”. A literature review was done to understand in-depth about parenting efficacy. Parenting confidence and competence. Results portrayed that parenting efficacy and parenting confidence reflected the internal attribution of the parent on their parenting behaviour. They also had similar antecedents and consequences. While they stated that competence should be measured objectively. [8]

RESULTS AND DISCUSSION

This chapter summarizes the findings of the current study. It examines the link between Parental Self-efficacy and Paternal Antenatal Attachment. The hypothesis was tested using statistical analysis such as Pearson’s correlation coefficient.

Table 1: *Descriptive Statistics of the study variables*

Variables	N	Mean	Standard Deviation	Skewness	Kurtosis
Parental Self-efficacy	142	67.34	4.993	-.471	.238
Paternal Antenatal Attachment	142	21.72	2.064	-.200	-.085

Table 1 shows the descriptive statistics of Parental self-efficacy and Paternal Antenatal Attachment. The sample records a mean value of 67.34 and standard deviation of 4.993 in the variable Paternal Self-efficacy. In Paternal Antenatal Attachment the sample has a mean value of 21.72 and 2.064 in standard deviation. Skewness value between -2 to +2 and Kurtosis value within -7 to +7 is considered to be normal distribution. So we can assert that the data is normally distributed from the skewness and kurtosis value from table 4.2. Boxplots were used to identify outliers and they were removed. From this observation, the study variables are therefore amenable for hypotheses testing using parametric tests.

Table 2: The correlation between Parental Self-efficacy and Paternal Antenatal Attachment

Variables	‘r’ value
Parental Self-efficacy	
Paternal Antenatal Attachment	0.384**

* $p < 0.05$, ** $p < 0.01$

Table 2 reveals the relationship between Parental Self-efficacy and Paternal Antenatal Attachment. This table shows that there exists a highly significant positive correlation between Parental Self-efficacy and Paternal Antenatal Attachment with a value of .384 which is significant at $p < 0.01$. Therefore the null hypothesis (H1) stating ‘There will not be a significant relationship between Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers’ is rejected, as there is a strong correlation between the two variables.

Table 3: Regression analyses for Parental Self-Efficacy as predictor of Paternal Antenatal Attachment

Predictor Variable	Standard Coefficient Beta	‘t’ value	R	R ²	Adjusted R ²	F-value

Parental						
Self-	.384	4.778	.384 ^a	.147	.141	22.830
Efficacy						

Table 3 shows the result of regression analyses for Parental Self-efficacy as predictor of Paternal Antenatal Attachment. F – value (1, 22.830) at $p \leq 0.001$ shows that the regression model has a good fit. The adjusted R^2 value indicates that the Paternal Self-efficacy accounted for 14 percentage of the variance in Paternal Antenatal Attachment in expectant fathers. No variables have been excluded from the regression model. The Beta value implies that for every one unit increase in Parental Self-efficacy there is an increase of .384 in Paternal Antenatal Attachment. Therefore from the above obtained result we can reject the null hypothesis (H2) stating, ‘There will not be predictive relationship between Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers’.

Discussion

Table 1 gives the descriptive statistics. Parental Self-efficacy is seen to be higher in most of the expectant fathers as the mean value is higher. This strong belief might have originated from the harmonious partnership that they share with their partner. ^[4] Paternal Antenatal Attachment records a lower mean value which means the majority of the sample do not have high levels of attachment. Anxiety is a common reaction that can arise in the paternal figure during the antenatal period because of its risks and responsibilities. So this might act as a contributory factor. ^[5]

From Table 2, we have rejected the null hypothesis stating ‘There will not be a significant relationship between Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers’. So as the Parental Efficacy increases Paternal Antenatal Attachment also increases. The increase in these two can lead to the healthy development of the baby. Providing antenatal education to the expectant fathers is necessary. This may in turn promote their level of attachment and parental efficacy. If the father believes in his own parenting skills, he might be more confident. This can positively influence the bond he shares with the baby. ^[8] As the time spent with the baby increases the parental efficacy also increases. Interacting with the baby, feeling the baby and involving the paternal figures in antenatal care might increase the beliefs on their own abilities. ^[9]

From Table 3, we can explore the null hypothesis stating ‘There will not be predictive relationship between Parental Self-efficacy and Paternal Antenatal Attachment among

expectant fathers'. Parental Self-efficacy promotes Paternal Antenatal Attachment in mild level. So Parental efficacy is only a moderate predictor. This reveals the notion that there may be other predictors of Paternal Antenatal Attachment like marital satisfaction, social support, antenatal education and mental health. [2]

CONCLUSION

The purpose of the study was to explore Parental Self-efficacy and Paternal Antenatal Attachment among expectant fathers. The independent variable of the study was Parental Self-efficacy and Paternal Antenatal Attachment was the dependent variable. The sample was obtained through Purposive sampling method. The participants of the study were 140 Expectant fathers from the district of Thoothukudi, Tamil Nadu. Data was collected both by using Google forms and by collecting in person. In this research the following standardized tools were used: Paternal Antenatal Attachment Scale and Parental Self-efficacy scale. The collected data was analysed statistically using Karl Pearson's correlation coefficient to determine the relationship among the research variables. The analyses were carried out with the Statistical Package for the Social Sciences (SPSS) version 23.

The following conclusions were drawn from this study:

- There is a significant relationship between Parental Self-efficacy and Paternal Antenatal Attachment.
- There exists a predictive relationship between Parental Self-efficacy and Paternal Antenatal Attachment.

Implications

- This study has proved that fathers with higher Parental Self-efficacy report to be more attached with their unborn child. So this can ensure proper development of the baby by meeting all its needs.
- Counsellors, medical professionals can become aware about the significance of Parental-efficacy in promoting paternal care.
- This study highlights the role of fathers in prenatal period. So inclusion of the paternal figure in pregnancy and prenatal procedures are needed.

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A STUDY ON THE RELATIONSHIP BETWEEN PSYCHOLOGICAL FLEXIBILITY AND MEANING IN LIFE AMONG NURSES

S. Muthusundari Sathiya* and Dr. S. Jeya Bharathi

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

Nurses often face demanding work environments that challenge their emotional and psychological well-being. Psychological flexibility, the ability to adapt to difficult situations while staying committed to personal values, may significantly shape their sense of meaning in life. Meaning in life consists of three dimensions: coherence (a sense of comprehensibility), purpose (having direction and goals), and significance (the perceived value of one's existence). This study examines the relationship between psychological flexibility and meaning in life among nurses. Using the Psychological Flexibility Questionnaire (PFQ) to assess psychological flexibility and the Three-Dimensional Meaning in Life scale (3DM) to measure meaning in life, data were collected and analyzed through correlation analysis. Results revealed a significant positive correlation between psychological flexibility and all three dimensions of meaning in life. Nurses with higher psychological flexibility reported greater coherence, purpose, and significance in their lives. These findings suggest that psychological flexibility plays a crucial role in how nurses perceive meaning in life, influencing their overall well-being and professional fulfillment.

Keywords: Psychological flexibility, Meaning in life, Coherence, Purpose, Significance, Nurses

INTRODUCTION

Aim:

- This study aims to determine the relationship between psychological flexibility and meaning in life among nurses.

Psychological Flexibility

Definition

Kashdan and Rotterburg (2010) defined psychological flexibility as the measure of how a person: 1) adapts to fluctuating situational demands, 2) reconfigures mental resources, 3) shifts perspective, and 4) balances competing desires, needs, and life domains.^[1]

Domains of psychological flexibility

The psychological flexibility questionnaire used in this study measures five domains. They are,

- Positive Perception of Change – Psychological flexibility enables individuals to see change as a growth opportunity rather than a threat, helping them adapt and remain resilient.
- Characterization of Self as Flexible – Identifying one as a flexible person encourages adaptive coping strategies, allowing individuals to adjust their thoughts and behaviours in challenging situations.
- Characterization of Self as Open and Flexible – Openness to new ideas and experiences fosters psychological flexibility by promoting creativity, adaptability, and a willingness to embrace different perspectives.
- Perception of Reality as Dynamic and Changing – Recognizing that reality is ever-changing helps individuals remain adaptable, reducing resistance to uncertainty and enhancing their ability to cope with evolving situations.
- Perception of Reality as Multifaceted – Understanding that multiple perspectives exist encourages flexible thinking, problem-solving, and the ability to adjust approaches based on different circumstances.

Meaning in life

Definition

Steger (2009) defined meaning in life as comprised of two pillars: comprehension and purpose. Comprehension refers to an individual ability to recognize patterns, consistency and significance in life events, integrating key experiences into coherent understanding of themselves and the world. Purpose involves the pursuit of highly-motivating, long term goals that individuals are passionate about and committed to, often aligning with their comprehension of life.^[2]

Dimensions of Meaning in Life

The three-Dimensional Meaning in Life scale measures three dimensions. It includes,

- Coherence – The ability to understand life events and perceive life as structured and meaningful, helping individuals navigate experiences with clarity.
- Purpose – Having core goals and direction that provide motivation, connecting past experiences with future aspirations to create a meaningful and fulfilling life.

- Significance – The perceived value and worth of one's life, reflecting the belief that one's existence matters and has an impact beyond oneself.^[3]

MATERIALS AND METHOD

Hypothesis:

H1 - There will be a significant relationship between Psychological Flexibility and Meaning in Life among nurses.

Variables

- Independent variable - Psychological Flexibility
- Dependent variable - Meaning in Life

Sample size

A total of 150 nurses from Thoothukudi district participated through the purposive sampling method.

Procedure

All participants were provided information about the purpose of the study before getting their informed consent. The participants were instructed to fill out a series of questionnaires. It included self-reported assessments of psychological Flexibility and meaning in Life as well as demographic information following their consent to take part in the study. Participants were assured that their responses would be kept confidential and asked to complete each item according to the instructions that were provided. The scores were evaluated according to the scoring key and were interpreted using the author's norms.

Tool Description

The following tools were used in the study:

- Psychological Flexibility Questionnaire (PFQ) - Bluvstein and Maya Maor in 2014
- Three-Dimensional Meaning in Life scale (3DM) - Martela and Steger in 2022

Statistical Analysis

Descriptive statistics viz., mean and standard deviation was performed for all the variables. To test the relationship between the variables, Correlation analysis (Pearson) was conducted. The analysis was performed with a statistical package for the social sciences software version 23 (SPSS).

Review Of Literature

Modzelewska, K. (2025) conducted a study on the topic “Psychological Flexibility, Meaning in Life, Spirituality, and Age” This study aimed to evaluate two new measures namely the Personalized Psychological Flexibility Index (PPFI) and Comprehensive Measure

of Meaning (CMM), and also offer psychometric information on those concepts. About seventy-three participants completed the online survey. They found that the two new measures, the PPFi and CMM, revealed a significant positive relationship between psychological flexibility and life meaning. The study found no significant correlation between psychological flexibility, spirituality, or age.^[4]

Dlfard, S. S., Toosi, M. R. S., and Jafari, F. (2024) analyzed the effectiveness of positive cognitive behavioural therapy on psychological flexibility and the meaning of life among single women. The study employed a quasi-experimental design with pre-test and post-test assessments, incorporating a control group and a follow-up phase. Researchers purposively sampled forty participants, split into an experimental group and a control group. The experimental group underwent eight bi-weekly sessions, guided by Bannink's protocol. The findings indicated that positive cognitive behavioural therapy significantly increased psychological flexibility and enhanced the meaning of life among the participants, and these effects were maintained during the follow-up phase. ^[5]

Li, X., Han, J., and Lin, H. (2024) conducted a study to assess the mental health and well-being of Chinese nurses, as well as investigate the impact of psychological flexibility and night shifts on this relationship in the later stages of COVID-19. A total of four hundred and twenty-two Chinese nurses were chosen using multistage stratified cluster random sampling. The high night shifts, being youth, and limited psychological flexibility, were found to directly impact mental health. Additionally, the combination of low psychological flexibility and deteriorating mental health contributed directly to reduced well-being. Furthermore, psychological flexibility influenced wellbeing indirectly by mediating the effects of mental health. ^[6]

Aydın, L., and Yıldız, E. (2024) investigated the association between psychological flexibility and the professional quality of life of nurses working in a mental clinic. One hundred and fifty-one nurses working in an eastern Turkish mental health facility participated in this study. The results showed that there was a significant positive correlation between empathy, fatigue, psychological flexibility, and professional satisfaction. Burnout, however, did not show a significant correlation. They concluded that the psychological flexibility of psychiatric nurses positively affected their professional quality of life. ^[7]

Arslan, G., and Allen, K. A. (2022) explored the association between coronavirus stress, meaning in life, psychological flexibility, and subjective well-being. About four hundred and seventeen students from public university participated in this study with ages

ranging from 18 to 40 years. The study's findings revealed that meaning in life and psychological flexibility moderated the effect of coronavirus stress on student well-being and that psychological flexibility also reduced the effect of stress on meaning in life. [8]

RESULTS AND DISCUSSION

Table 1

Descriptive statistics of the variables

Variables	N	Minimum	Maximum	Mean	Standard Deviation
Psychological Flexibility	145	79	120	101.9	9.438
Coherence	145	7	28	19.39	5.204
Purpose	145	8	28	21.01	4.871
Significance	145	5	21	16.86	4.257

Table 1 shows the descriptive statistics of the measured variables. The total number of samples was 145.

The mean and standard deviation values for psychological flexibility were 101.9 and 9.438 respectively, with 79 as the minimum score and 120 as the maximum score. The mean and standard deviation values for coherence were 19.39 and 5.204 respectively, with 7 as the minimum score and 28 as the maximum score. The mean and standard deviation values for purpose were 21.01 and 4.871 respectively, with 8 as the minimum score and 28 as the maximum score. The mean and standard deviation values for significance were 16.86 and 4.257, respectively with 5 as the minimum score and 120 as the maximum score.

Table 2

Relationship between psychological flexibility and meaning in life among Nurses

Variables	Meaning in life		
	Coherence	Purpose	Significance
Psychological Flexibility	0.326**	0.270**	0.219*

** . Correlation is significant at the 0.01 level

* . Correlation is significant at the 0.05 level

Table 1 shows the relationship between psychological flexibility and meaning in life among nurses.

The correlation value (r) for psychological flexibility with coherence, purpose and significance was found to be 0.326 ($p \leq 0.01$), 0.270 ($p \leq 0.01$) and 0.219 ($p \leq 0.05$) respectively. Therefore, the hypothesis (H1) stating that **“There will be a significant relationship between psychological flexibility and meaning in life among nurses”** is accepted. It is important to note that all the variables are positively correlated.

Discussion

Relationship between psychological flexibility and meaning in life:

From Table 2, it is evident that psychological flexibility and meaning in life were significantly correlated. The results suggest a significant positive relationship between psychological flexibility and the three key dimensions of meaning in life—coherence, purpose, and significance—among nurses. This connection helps to understand how the ability to adapt to changing circumstances and manage stress effectively can contribute to a deeper and more structured understanding of life experiences. Nurses who stay open to new experiences, even in tough or uncertain situations, can make better sense of their challenges and find meaning in them. Instead of avoiding difficulties, they face them head-on while staying true to their core values, like providing compassionate care. This helps them stay motivated and find satisfaction in their work, even when things get stressful. When nurses see challenges as chances to learn and grow, they gain a deeper appreciation for their profession and the difference they make in people's lives. Realizing the impact of their care brings a sense of fulfillment and reinforces the value of their work and purpose in life.

Overall, these findings emphasize that psychological flexibility is a fundamental trait that shapes how individuals construct and perceive meaning in their lives.^[4] By fostering adaptability, acceptance, and a values-driven approach to challenges, psychological flexibility enables nurses to develop a coherent understanding of their experiences, maintain a strong sense of purpose, and appreciate the significance of their roles.

CONCLUSION

The objective of the present study was to examine the role of psychological flexibility and meaning in life among nurses. The independent variable used in our study was psychological flexibility and the dependent variable used in our study was meaning in life. A purposive sampling method was used to select 145 nurses from different areas in and around the Thoothukudi District. The standardized tools used in the study are the Psychological Flexibility Questionnaire (PFQ) - Bluvstein and Maya Maor in 2014 and the Three-Dimensional Meaning in Life scale (3DM) - Martela and Steger in 2022. Demographic data

was also collected using the tools given. The following conclusions were drawn from the study.

- There exists a significant relationship between Psychological Flexibility and Meaning in Life among nurses.

Implications

- Enhancing psychological flexibility can help nurses cope with stress and find greater meaning in their work.
- By fostering psychological flexibility, organizations may reduce burnout and turnover rates, ensuring a more engaged and committed nursing workforce.
- Creating support programs based on psychological flexibility can help nurses handle work and emotional challenges better.

Limitations

This study has limitations, including the use of self-report measures, which may introduce social desirability bias. The small sample size (N=145) and limited geographic scope (Thoothukudi District) affect generalizability. Additionally, some findings lack supporting research, requiring further investigation.

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EXPLORING THE RELATIONSHIP BETWEEN PSYCHOLOGICAL HARDINESS, SOCIAL MEDIA USAGE AND BODY IMAGE AMONG YOUNG ADULTS

Naleefa. A K* and Dr. S. Jeya Bharathi

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The present study explores the relationship between psychological hardiness and body image as well as social media usage and body image among young female adults from rural colleges in Thoothukudi district. Psychological hardiness is characterized by commitment, control, and challenge. It has been linked to resilience against negative self-perceptions, while social media usage has been associated with heightened body dissatisfaction. A total of 225 participants were selected through a convenience sampling method, and data were collected through self-reported measures assessing psychological hardiness, social media usage, and body image. Statistical analysis using Pearson's correlation coefficient revealed a significant positive relationship between psychological hardiness and body image ($r = 0.887$, $p < 0.01$), indicating that individuals with higher hardiness perceive their body image more positively. Social media usage exhibited a significant negative correlation with body image ($r = -0.644$, $p < 0.01$), indicating that increased social media contributes to body dissatisfaction. The findings show the role of psychological hardiness against negative body perceptions and highlight the risks of excessive social media use. Promoting resilience and encouraging mindful social media consumption may serve as effective strategies to foster positive body image among young women.

Keywords: Psychological Hardiness, Social Media Usage, Body Image, Body Dissatisfaction, Young Adults.

INTRODUCTION

Aim

The study aims to find the relationship among psychological hardiness, social media usage and body image concerns.

Hardiness

Kobasa introduced the term hardiness. She defined hardiness as a personality trait having the components of commitment, challenge and control. It is associated with strong resistance to negative feelings induced by adverse circumstances. Trait control is the

tendency to think, feel and act as if one is influential, rather than helpless, in the face of the varied contingencies of life. Commitment is the tendency to involve oneself in, rather than experience alienation from, whatever one is doing or encounters in life. The challenge is the tendency to believe that change rather than stability is normal in life ^[1].

Social Media Usage

As technology advances, a wider range of activities are becoming feasible on screen-based devices. Social networking sites have grown in popularity as a result of this increased involvement in the digital world, particularly among younger people. Since they are the first generations to have grown up in a culture that is heavily reliant on technology, adolescents and young adults make up a special demographic when it comes to social media usage ^[2].

The impact of social media is not uniformly positive. Particularly for teenagers, the digital environment can expose them to risks such as cyberbullying, negative social comparisons, and reduced face-to-face interactions, all of which may contribute to heightened anxiety.

Body Image

Body image can be seen as the perceptions and attitudes one holds toward one's own body, especially, but not exclusively, one's physical appearance. It is a multidimensional concept that includes: 1. Beliefs about appearance. 2. Beliefs about the body size and shape. 3. Perception of the body ^[3].

MATERIALS AND METHODS

Review of the literature

In 2024, Saputri, F. Q., Purwanto, E., & Ahmadi, F. Conducted a study titled “The Relationship between Social Media Addiction, Hardiness, and Emotional Intelligence with Students’ Psychological Well-Being”. The results revealed a significant relationship between social media addiction, hardiness, emotional intelligence, and students’ psychological well-being ^[4].

In 2022, Vandenbosch, Fardouly, and Tiggemann explored social media’s impact on body image, highlighting that visual platforms like Instagram are more harmful than textual ones like Facebook. Taking and editing selfies, without posting them, negatively affected body image, and positive comments amplified the impact of idealized content ^[5].

In 2017, Itisha Nagar and Rukhsana Virk explored the impact of acute media exposure on body image among young Indian women. A mixed-group design was used where one group was shown thin-ideal media images, while the other viewed control images.

Results indicated that exposure to thin-ideal images significantly increased body dissatisfaction and thin-ideal internalization while decreasing self-esteem [6].

In 2015, Nazmiye Civitci and Asim Civitci explored the relationship between social comparison orientation, hardiness, and life satisfaction in Turkish undergraduate students. Their findings showed that students with lower social comparison tendencies had higher levels of hardiness and life satisfaction than those with higher comparison tendencies [7].

In 2012, Carson A. Benowitz-Fredericks, Kaylor Garcia, Meredith Massey, Brintha Vasagar, and Dina L. G. Borzekowski explored the relationship between adolescent media use, body image, and eating disorders. The study emphasized that media exposure plays a crucial role in shaping body image, potentially contributing to disordered eating behaviours [8].

Hypothesis

H1 - There will be no significant relationship between psychological Hardiness and body image.

H2 - There will be no significant relationship between social media usage and body image.

Variables

Psychological hardiness - Independent variable

Social media usage - Independent variable

Body image - Dependent variable

Sample

The study's sample included the 18-25 years young adults, chosen from various rural colleges in Thoothukudi. This study completely relied on primary data.

Tools

Hardy Personality Profile adapted by the work of Suzanne Kobasa in 1979.

The social media use scale by Alison B. Tuck and Renee J in 2024.

The body image state scale by Cash TF et al in 2002.

Procedure

Participants from age group 18 to 25 years were selected for our research and the responses were collected. After obtaining the participants' consent to take part in the study, they were requested to fill in their responses to the set of questionnaires, which included demographic data and self-reported measures intended to measure the variables: Psychological hardiness, social media usage and Body image. The participants were instructed to read the items carefully and respond to each question by selecting the options

that is appropriate for them and they were informed that their responses would be kept confidential. The participants took 15 to 20 minutes to complete the questionnaires.

Statistical analysis

The collected data was analysed statistically using Karl Pearson's correlation coefficient to determine the relationship among the research variables. The analyses were carried out with the Statistical Package for the Social Sciences software 23 (SPSS23).

RESULTS AND DISCUSSION

Table 1

Descriptive statistics

Variables	N	Mean	Standard deviation
Psychological hardiness	225	6.57	3.159
Social media usage	225	51.90	18.618
Body image	225	31.81	13.602

Table 1 presents the descriptive statistics of the study variables. The mean score for Psychological Hardiness is 6.57 with a standard deviation of 3.159, indicating variation in participants' resilience levels. Social Media Usage has a mean of 51.90 and a standard deviation of 18.618, reflecting diverse engagement patterns among respondents. Body Image shows a mean of 31.81 with a standard deviation of 13.602, suggesting differences in self-perception among the participants.

Table 2

Relationship between Psychological Hardiness and Body Image among Young adults

Variables	r value
Psychological Hardiness	0.887**
Body Image	

**p<0.05

*p<0.01

Table 2 presents the relationship between **Psychological Hardiness and Body Image** among young adults. The findings indicate a **significant positive correlation** between the two variables, with an **r value of 0.887**, which is statistically significant at **p < 0.01**. Thus, the

hypothesis (H1) claiming **"There will be no significant relationship between Psychological Hardiness and Body Image"** is rejected, as there is a strong correlation between the two variables.

Table 3

Relationship between Social Media Usage and Body Image among Young adults

Variables	r value
Social Media Usage	
Body Image	-0.644**

**p<0.05

*p<0.01

Table 3 presents the relationship between **Social Media Usage and Body Image** among young adults. The results indicate a **significant negative correlation**, with an **r-value of -0.644**, which is significant at **p < 0.01**. This suggests that higher Social Media Usage is associated with a lower Body Image perception. Therefore, the hypothesis (H3) stating **"There will be no significant relationship between Social Media Usage and Body Image"** is rejected, as a strong negative correlation is observed between the two variables.

Discussion

From Table 2, hypothesis H1 claiming “There will be no significant relationship between psychological hardiness and body image” is rejected. The findings indicate a significant positive correlation between psychological hardiness and body image among young adults. It suggests that individuals who exhibit greater psychological hardiness tend to perceive their body image more positively.

Psychological hardiness acts as a protective factor against negative self-perceptions. It also helps to promote a healthier body image and overall well-being. Research states that individuals with a positive body image experience higher levels of self-esteem, higher levels of life satisfaction, and improved mental health outcomes ^[9]. Conversely, those with a negative body image may struggle with low self-worth, anxiety, and even severe psychological distress, including the development of mental health disorders like eating disorders and depression ^[10]. The increasing exposure of young adults to social media and societal beauty standards can create dissatisfaction about their body image among young

women. Fostering psychological hardiness may act as an effective way to cultivate a positive self-perception and prevent body dissatisfaction.

This implies that those who feel in control of their life, stick to their objectives, and view setbacks as opportunities rather than barriers. These individuals are more likely to have a good body image. These psychological traits may serve as protective factors against the pervasive societal and media-driven pressures that promote unattainable beauty ideals.

From Table 3, hypothesis H2 claiming “There will be no significant relationship between the dimensions of social media usage and body image” is rejected because the results indicate a significant negative correlation between social media usage and body image among young adults. It suggests that increased social media usage is correlated with a more negative perception of one’s body image. These findings align with previous research showing that social media platforms frequently promote unrealistic beauty standards which leads users to engage in harmful social comparisons. These comparisons often result in body dissatisfaction, which has been linked to lower self-esteem. It also causes disordered eating behaviours and increases psychological distress ^[11].

Most of the social media content is heavily edited images and idealized body types. It creates an environment where users internalize unattainable beauty standards. This internalization can lead to increased self-criticism and a distorted perception of one’s own body, particularly among young adults who are in a critical phase of identity development. The widespread use of filters and digital enhancements worsens this issue by setting unrealistic expectations for physical appearance and it also fuels dissatisfaction and negative self-evaluation.

However, it is important to note that not all social media interactions are harmful. Positive engagement like following body-positive influencers, interacting with diverse representations of beauty and engaging in supportive online communities can help to reduce the negative effects of social comparison. Exposure to realistic and inclusive body representations has been found to improve self-acceptance and promote a healthier body image ^[6]. Therefore, while excessive social media use can contribute to body dissatisfaction, mindful and intentional consumption of content that fosters body positivity may serve as a protective factor against its harmful effects.

CONCLUSION

The study aimed to examine the relationship between psychological hardiness, social media usage and body image among young adults. The study's independent variable was

psychological hardiness and social media usage. The dependent variable was body image. The sample was obtained through the convenience sampling method. The participants of the study included 225 young female adults from various rural colleges in Thoothukudi district, Tamil Nadu. Data was collected both by using Google Forms and by collecting in person. The responses were gathered only from girls.

The following conclusions have been drawn

- There is a significant relationship between psychological hardiness and body image.
- There is a significant negative relationship between social media usage and body image.

Implications

A few implications of the current study are:

- The current study is advantageous to young female adults because it can help them become more aware of its psychological consequences and encourage healthier online habits.
- This study benefits mental health professionals by emphasizing the role of psychological hardiness in body image perception. It allows them to create interventions that strengthen hardiness among young women.
- By exploring how social media usage and hardiness predict body image, this study provides insights for social media platforms and influencers to promote body-positive content and reduce the spread of unrealistic beauty standards.

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LOVE ATTITUDES AND CONFLICT STYLES AMONG MARRIED ADULTS

H. Dhasnevis Udhithaa* and Dr. S. Jeya Bharathi

PG Department of Psychology, St. Mary's College (Autonomous), Thoothukudi.

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

This study explores the relationship between love attitudes and conflict styles among married adults. A total of 150 married individuals participated in the study. Descriptive statistics were used to analyze the love attitudes and conflict styles, while Pearson correlation was used to examine their relationships. The results showed that Eros (passionate love) and Agape (selfless love) were the most common love attitudes, while Ludus (playful love) was the least common. For conflict styles, Compromise had the highest mean, indicating it was the most used method for resolving conflicts. The correlation analysis revealed that Eros, Storge (affectionate love), and Agape were positively correlated with Compromise, meaning people with these love attitudes tend to resolve conflicts through compromise. Ludus was linked to Separation, suggesting that people with a playful attitude may avoid or withdraw from conflicts. Pragma (practical love) was associated with Interactional Reactivity, indicating a problem-solving approach to conflicts. Lastly, Mania (obsessive love) was correlated with Submission, meaning people with obsessive love attitudes may tend to give in during conflicts. In conclusion, the study shows that love attitudes play an important role in how married individuals manage conflicts. These findings can help in understanding marital relationships and improving conflict resolution strategies.

Keywords: Love Attitude, Conflict Styles, Married Adults, Marital Relationships

INTRODUCTION

AIM

The aim of this study is to explore the relationship between love attitude and conflict styles among married adults.

American Psychological Association (APA) defines Love is a complex emotion that involves affection towards another individual, a sense of tenderness, sensitivity to their responses, experiencing pleasure due to another individual and devotion.

Love Attitude

Love attitude refers to a person's beliefs and feelings about love. This includes how individual approach and experience love. John Alan Lee, a Canadian Psychologist introduced in his book called *Colours of Love: An exploration of the ways of loving* in 1973, three primary love attitudes, three secondary love attitudes and nine tertiary love attitudes. The three primary love attitudes are Eros, Ludus and Storge. The three secondary love attitudes are Mania, Pragma and Agape. Nine Tertiary love attitude are Manic Eros, Manic Ludus, Manic Storge, Agapic Eros, Agapic Ludus, Agapic Storge, Pragmatic Eros, Pragmatic Ludus and Pragmatic Storge. Adaptive Love attitudes are Eros, Storge, Agape, Pragma and Maladaptive Love attitudes are Ludus and Mania.

Eros is the passionate, romantic love often characterized by intense feelings and a strong physical attraction. Ludus involves a playful, game like approach to love, where relationships are seen as fun and exciting rather than serious. Storge is characterized by calm, stable and committed love, often found in long- term friendships and family relationships. Mania is characterized by a strong need for attention and reassurance, often leading to jealousy and possessiveness. Pragma is a practical and rational approach love. Agape is a selfless, altruistic love where the focus is on the well-being of the partner without expecting anything in return.

Conflict style

The disagreements between individuals known as conflict. The reason for this may be their difference in opinion, experiences and perspectives. Rahim defined Conflict management as designing effective strategies to minimize dysfunction of conflict and enhancing the constructive functions of conflict in order to improve learning and effectiveness in an organization or relationship.

The six types of conflict management styles in romantic relationships include, Compromise, Dominance, Avoidance, Separation, Submission, Interactional Reactivity. These conflict styles may be either destructive or constructive. Destructive conflict styles include dominance, avoidance, separation and submission. Compromise is constructive conflict style. Interactional Reactivity is either constructive or destructive based on the situation. Compromise conflict style indicates a willingness to find a middle ground, balancing individual needs and desires to reach mutually agreeable solutions. Dominance conflict style refers to one partner prioritize their own needs and desires above their partner's, can negatively impact relationship satisfaction and potentially lead to conflict and dissatisfaction. Avoidance conflict style refers to when a person avoids discussing issues with

their partner to avoid confrontation or an argument. Separation conflict style refers to individuals withdrawing or distancing themselves emotionally or physically during conflict, often avoiding direct confrontation or resolution. Submission conflict style is also known as accommodating and this involves prioritizing the partner's needs and desires over one's own, often at the expenses of personal needs and desires. Interactional reactivity as a conflict style is characterized by verbal aggression, emotional volatility and lack of trust often leading to destructive patterns of communication.

This study examines the link between love attitude and conflict styles in relationships, as unresolved conflicts can threaten marital stability. Despite existing research on communication and conflict management, limited attention has been given to the role of love attitudes. Understanding this connection can guide relationship advisors and psychologists in fostering healthier relationships.

MATERIALS AND METHODS

Objectives

To examine the relationship between love attitude and conflict styles among married adults.

Hypotheses

There will be a significant relationship between all dimensions of love attitude and conflict styles among married adults.

Sample

The sample of this study comprised of 150 married adults. This study is relied on primary data.

Variables

- Independent Variable - Love Attitude
- Dependent Variable - Conflict Style

Measures

- The Love Attitude Scale – Short Form by Clyde Hendrick, Susan S, Hendrick and Amy Dicke (1998)
- The Romantic Partner Conflict Scale by Tammy L.Zachchilli (2009)

Procedure

The participants who have been as selected for my research the responses were collected from them. The responses were collected from the individuals after obtaining the participants consent. These questions intended to measure the variables: Love attitude and

Conflict styles. The participants were instructed to read each item carefully and choose appropriate option which comes to their mind first. They were informed that their responses will kept confidential. The participants took 15 to 20 minutes to complete the questions

Statistical Analysis

The collected data was analyzed statistically using Karl Pearson Correlation Coefficient to determine the relationship among research variables. The analyses were carried out with the Statistical Package for Social Sciences (SPSS) windows version 23.0.

Review of Literature

Javdan, M., Bahrapour, T., & Dehghani, M. (2023) conducted a study titled “The role of family relationships and conflict resolution styles in marital burnout of couples seeking divorce”. The sample of this study included 162 people. The result of this study showed that family relationships and conflict resolution style are significantly correlated with marital burnout.^[1]

Barman, J. D., Maheshwari, S., & Varma, P. (2022) conducted a study titled “The conflict and conflict management in stable middle class marriages: An Indian perspective” The sample of this study included 30 long -term married couples through interview. The result of this study showed that conflict management style of Indian middleclass couples has more relationship and partner centric and which contributes their marital stability.^[2]

Taghavi Dinani, P., Samkhaniyan, E., Hamidi, M., & Arkiyan, F. (2014) conducted a study titled “Study on relationship between love attitudes and marital satisfaction among married women”. The sample of this study included 150 married women. The result of this study showed that there was a significant and positive correlation between eros, storge, pragma, agape of love attitude with marital satisfaction and ludus had negative relationship with marital satisfaction.^[3]

Hammock, G., & Richardson, D. S. (2011) conducted a study titled “Love attitude and relationship experience”. The aim of this study was to examine the association of love attitude with the initiation, maintenance and dissolution of relationships. The result of this study showed that Ludus was relevant to all stages of relationship development. Pragma was associated with relationship initiation and agape and mania were associated with maintenance.^[4]

Richardson, D. R., Hammock, G. S., Lubben, T., & Mickler, S. (1989) conducted a study titled “The relationship between love attitudes and conflict responses” The sample of this study included 98 females and 50 males. The result of this study showed that integrating,

obliging and compromising conflict responses were related to eros and agape, both avoiding and dominating conflict responses were related to ludus and compromising is related to mania.^[5]

RESULT AND DISCUSSION

Table 1

Descriptive statistics of study variables

Variables	Mean	Standard Deviation
Eros	17.19	2.66
Ludus	13.44	3.36
Storge	15.94	3.25
Pragma	16.37	3.05
Mania	14.64	2.94
Agape	16.78	2.98
Compromise	56.82	7.63
Dominance	20.88	5.01
Avoidance	11.18	2.50
Separation	18.28	3.58
Submission	19.06	3.90
Interactional Reactivity	21.08	5.0

The table 1 shows the descriptive analysis of the variables. The data displays the mean of dimensions of Love attitude: eros, ludus, storge, pragma, mania, agape are 17.19, 13.44, 15.94, 16.37, 14.64, 16.78 and dimensions of Conflict Styles : compromise, dominance, avoidance, separation, submission and interactional reactivity are 56.82, 20.88, 11.18, 18.28, 19.06 and 21.08 respectively. The standard deviation for dimensions of Love attitude are 2.66, 3.36, 3.25, 3.05, 2.94, 2.98 and the dimensions of Conflict styles are 7.63, 5.01, 2.50, 3.58, 3.90 and 5.07 respectively.

Table 2

The correlation between the dimensions of love attitude and conflict style

Compromise	Dominance	Avoidance	Separation	Submission	Interactional Reactivity
	e				

Eros	.446**	-.104	.237**	.053	.369**	-.074
Ludus	-.062	.228**	-.098	.370**	.366**	.362**
Storge	.364**	.141	.200*	.008	-.061	-.023
Pragma	.300**	.292**	.020	.419*	.442**	.450**
Mania	.180	.178*	.174*	.214**	.274**	.173*
Agape	.323**	-.081	.093	.028	.236**	.054

* $p < 0.05$

* $p < 0.01$

The Table 2 reveals the relationship between the dimensions of Love Attitude and Conflict Styles. This table shows that there exists a highly positive and significant correlation between Eros with compromise; Ludus with separation; Storge with compromise; Pragma with interactional reactivity; Mania with submission; Agape with compromise at the significant level of $p < 0.01$. At $p < 0.05$ significance there exists a positive relationship between Storge and avoidance; Pragma and separation; Mania with dominance. There exists no significant relationship between the other dimensions

Discussion

Table1 shows that descriptive statistics of the study which reveals that the mean scores of love attitudes vary depending on the dimension, with Agape (16.78) and Eros (17.19) being comparatively high. This may indicates that most prevalent love attitude used by participants are passionate love and selfless love. In compared to other love styles Ludus has lower mean (13.44). Ludus refers to game playing love. According to the mean results of dimensions of conflict styles compromise has highest mean 56.82. From the mean we can also infer that majority of the married individuals have compromise as their conflict style in their romantic relationships.

Table 2 shows that relationship between love attitude and conflict styles. According to this some of the variables are highly correlated with conflict styles. Eros is highly positively correlated with Compromise conflict style. This may indicate that people who exhibit passionate, romantic and deeply affectionate love tend to prefer resolving conflicts through compromise. Ludus love attitude is correlated with separation. This may indicate that people with this love style often view love as a game, prioritizing personal freedom and avoiding deep attachment. Consequently, when conflicts arise, they may prefer separation as a conflict resolution style because it allows them to maintain their independence without becoming overly involved in emotional confrontations. Storge and Agape are correlated with Compromise conflict style. People with storge conflict style wants to maintain the harmony

in relationships, when conflict arise, they may approach conflicts and disagreements rationally, aiming for mutually acceptable solutions. Agape love is driven by a desire to nurture and support their partner and they may use compromise this conflict style to preserve their relationships. Agape love is associated with functional strategies to resolve marital conflicts, such as compromise conflict style.^[6] Pragma love attitude is correlated with Interactional reactivity this may indicates that they may respond actively and emotionally during disagreements, especially if their practical expectations are not met. Pragmatic partners emphasize on practical aspects can lead to specific conflict behaviours, potentially involving interactional reactivity.^[7] Mania is correlated with submission. Mania love style is involved with insecurity and fear of losing their partners and this may lead to submission conflict style. In this submission serves as a coping mechanism.

CONCLUSION

The purpose of the study was to examine the relationship between love attitude and conflict styles among married adults. The independent variable of the study was love attitude and conflict style was the dependent variable. The sample was obtained through Purposive sampling method. The participants of the study included 150 married adults. Data was collected both by using google forms and by collecting in person. The responses were gathered from both male and females. In this research the standardized tools used are the Love Attitude Scale – Short Form by Clyde Hendrick, Susan S, Hendrick and Amy Dicke (1998) and the Romantic Partner Conflict Scale by Tammy L. Zachchilli (2009). The collected data was analysed statistically using Karl Pearson's correlation coefficient to determine the relationship among the research variables. The analyses were carried out with the Statistical Package for the Social Sciences software (SPSS) version 23.0. The conclusion drawn from the study is that, there is a significant relationship between various love attitudes and conflict styles among married adults.

Limitations

The study involved 150 participants, which may not fully represent all types of married people, limiting how widely the findings can be applied. Participants answered questions about their own behaviours, which may lead to biased responses or inaccuracies.

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CHITOSAN FROM SHRIMP SHELLS AND TUNIC OF ASCIDIAN: EXTRACTION AND ANTIBACTERIAL POTENTIAL AGAINST PATHOGENS

J. Jaya Abirami, M. Paripooranaselvi

PG and Research Department of Zoology, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Chitosan is a naturally derived biopolymer obtained from chitin, the second most abundant polysaccharide in nature after cellulose and is present in the crustacean exoskeleton (shrimp, crabs, and lobsters), insect cuticles, fungal cell walls, and certain marine organisms such as ascidians (tunicates). The aim of this work was to separate chitosan from shrimp shell and *Phallusia nigra* and to investigate the antibacterial activity of the separated chitosan. Antibacterial activity of both the chitosan were checked against four bacterial strains, namely *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Vibrio cholerae*. The antibacterial activity was measured by disc diffusion method. At the highest concentration of 200 µg/ml, shrimp shell chitosan exhibited zones of inhibition of 4 mm, 5 mm, 6 mm, and 6 mm against *Escherichia coli*, *Vibrio cholerae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* respectively, while *Phallusia nigra* chitosan showed zones of inhibition of 6 mm, 5 mm, 4 mm, and 6 mm against the same bacterial strains. These findings indicate that chitosan derived from both shrimp shells and *Phallusia nigra* exhibits notable antibacterial properties.

Keywords: Chitosan, shrimp shell, *Phallusia nigra*, antibacterial activity etc.

INTRODUCTION

Chitosan is a naturally derived polysaccharide obtained from chitin. Chitin is primarily found in the exoskeletons of crustaceans, insect cuticles, fungal cell walls and certain marine organisms such as ascidians (tunicates). Chitosan is insoluble in water, dissolves in acidic solutions due to protonation of amino groups. It is one of the few natural polycations, allowing it to interact with negatively charged molecules, bacterial membranes, and metal ions. Chitosan is a biodegradable, biocompatible and non-toxic polymer derived from chitin, the second most abundant biopolymer on earth after cellulose. In recent years, alternative sources of chitosan, such as tunicates have been explored due to their chitin-rich tunic structures. Ascidians, or sea squirts, are filter-feeding marine prochordates known for their unique composition, including chitinous tunics that serve as an additional reservoir for chitosan production. Shrimp processing industries generate large amounts of shell waste,

which poses an environmental challenge. These shells are rich in chitin (15-40%), which can be converted into chitosan. The utilization of shrimp shell waste for chitosan extraction aligns with sustainable waste management and provides an economic advantage for commercial applications.

Given the urgent need for eco-friendly, cost-effective, and highly effective antimicrobial agents, chitosan from both shrimp shells and ascidian tunics presents a viable and sustainable solution. Despite extensive research on shrimp-derived chitosan, studies on ascidian-derived chitosan are relatively limited. Additionally, the comparative antibacterial efficacy of chitosan from both sources has not been extensively explored, particularly against clinically relevant human pathogens. This research aims to explore the extraction and antibacterial potential of chitosan derived from these marine sources, assessing its effectiveness against human pathogens responsible for infectious diseases.

MATERIALS AND METHODS

Samples of *Phallusia nigra* Savigny, 1816 were collected from the under surface of the barges of Thoothukudi harbour. Identification upto the species level was carried out based on the key to identification of Indian ascidians by Meenakshi, 1997. Shrimp shell waste materials were collected from Thoothukudi fish market. The samples were washed with sea water to remove sand, mud and then transported to laboratory. The samples were dried and made into powder.

EXTRACTION OF CHITOSAN

Demineralization

The powdered shells were soaked in 1M HCl solution at room temperature for 6-12 hours for the removal of calcium carbonate and other minerals. The mixture was stirred occasionally to ensure uniform demineralization. The suspension was filtered, and the residue was washed with distilled water until the pH became neutral.

Deproteinization:

The demineralized residue was treated with a 3-5% NaOH solution at 80-90°C for 2-4 hours to remove proteins. It was stirred continuously to ensure the complete removal of protein content. The suspension was filtered, and the residue was washed thoroughly with distilled water until the pH became neutral.

Isolation of Chitin:

The residue obtained after deproteinization was chitin, which was the precursor to chitosan. The chitin was dried at 60°C in an oven.

Deacetylation:

The dried chitin was treated with a 40-50% NaOH solution at 100-120°C for 1-4 hours to remove acetyl groups and convert chitin to chitosan. It was stirred periodically during the reaction to ensure uniform deacetylation. The solution was cooled, the chitosan was filtered, and the residue was washed thoroughly with distilled water until the pH became neutral.

Purification:

The chitosan was washed with ethanol to remove residual impurities. It was then dried at 60-70°C until it reached a constant weight. The same procedure was followed for the extraction of *Phallusia nigra* chitosan.



Plate: 1 *Shrimp*



Plate: 3 Chitosan of shrimp shell



Plate: 2 *Phallusia nigra*



Plate: 4 Chitosan of *Phallusia nigra*

Microorganisms

The antibacterial activity of the prepared chitosan from shrimp shell was tested against four bacterial strains, namely *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa*, and *Vibrio cholerae*. *Staphylococcus aureus* is a Gram-positive bacterium, while *Vibrio cholerae*, *Escherichia coli*, and *Pseudomonas aeruginosa* are Gram-negative bacteria.

Determination of antibacterial activity

Bacterial inoculums were prepared according to the Clinical and Laboratory Standards Institute guidelines. Bacterial cultures were emulsified in normal saline and the

turbidity was adjusted to match the 0.5 Mc Farland turbidity standard. The agar cup method was followed to investigate the antibacterial activity of the extracts. 0.1 mL of TSB broth culture of the test organisms was evenly seeded over the Mueller-Hinton Agar plates. Sterile paper discs of 3 mm were dipped into different concentrations of both chitosan samples (200, 100, and 50 µL). Using forceps, the discs were placed on the MHA plates. The plates were then incubated at 37°C for 24 hours. After the incubation period, the formation of zones around the discs confirmed the antibacterial activity of the respective extracts. Tetracycline antibiotic was used as a positive control.

RESULTS

Antibacterial activity of chitosan prepared from shrimp shells and tunic of marine ascidian *P. nigra* were tested against *Escherichia coli*, *Vibrio cholerae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* shown in Table: 1-6, Figure: 1-6 and Plate: 7, 8.

For *Escherichia coli*, a zone of inhibition of 4 mm was observed at the highest concentration (200 µg/ml) of shrimp shell chitosan, while a 4 mm zone was also noted at 100 µg/ml. No zone of inhibition was observed at 50 µg/ml. In contrast, *Phallusia nigra* chitosan exhibited a maximum zone of inhibition of 6 mm at 200 µg/ml, followed by 5 mm at 100 µg/ml, and 4 mm at 50 µg/ml. For *Vibrio cholerae*, the maximum zone of inhibition (5 mm) was observed at 200 µg/ml for both shrimp shell chitosan and *Phallusia nigra* chitosan. At 100 µg/ml, a 4 mm zone of inhibition was noted, while a 3 mm zone was observed at 50 µg/ml.

For *Pseudomonas aeruginosa*, the shrimp shell chitosan showed a maximum zone of inhibition of 6 mm at 200 µg/ml, followed by 5 mm at 100 µg/ml, and 4 mm at 50 µg/ml. *Phallusia nigra* chitosan exhibited a 4 mm zone of inhibition at 200 µg/ml, 3 mm at 100 µg/ml, and no inhibition at 50 µg/ml.

For *Staphylococcus aureus*, a zone of inhibition of 6 mm was observed at both 200 µg/ml and 100 µg/ml concentrations of shrimp shell chitosan, while a 5 mm zone was noted at 50 µg/ml. Similarly, *Phallusia nigra* chitosan exhibited a 6 mm zone of inhibition at 200 µg/ml, and a 5 mm zone at both 100 µg/ml and 50 µg/ml concentrations.

Figure 1: Antibacterial activity of chitosan from shrimp shell against *Bacterial Pathogens*

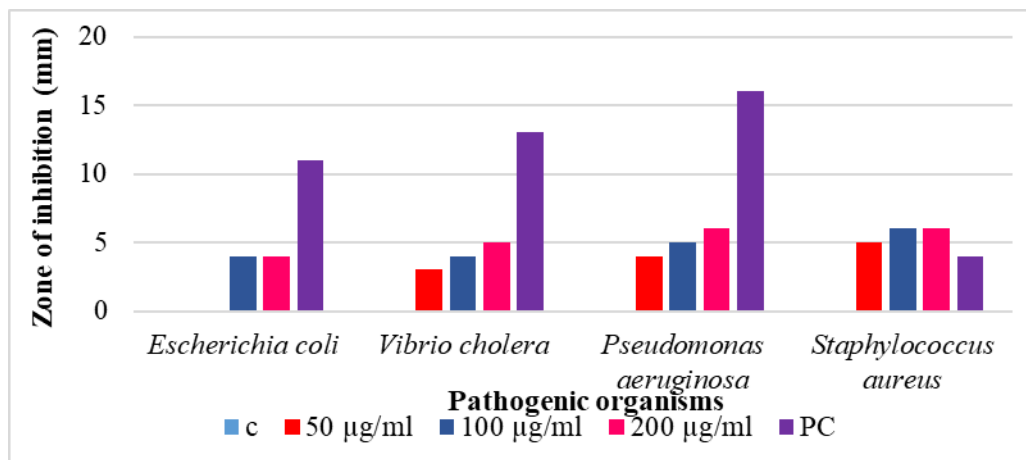


Figure 2: Antibacterial activity of chitosan from *Phallusia nigra* against *Bacterial Pathogens*

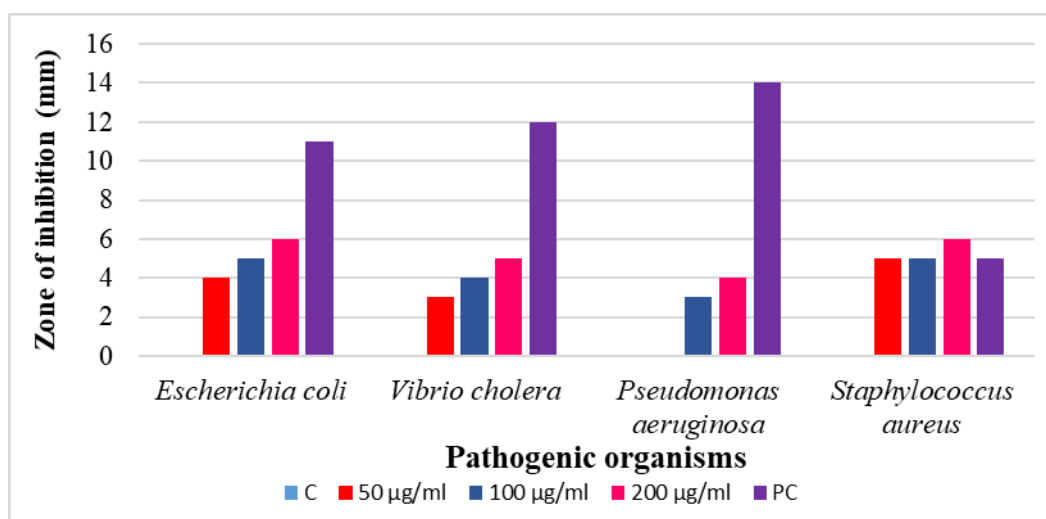


Figure 3: Antibacterial activity of chitosan from shrimp shell and *Phallusia nigra* against *Escherichia coli*

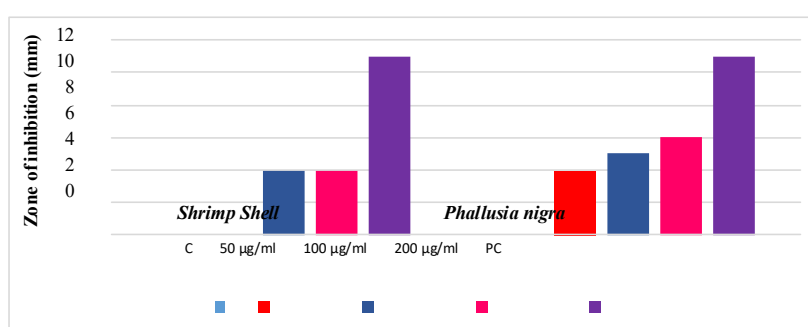


Figure 4: Antibacterial activity of chitosan from shrimp shell and *Phallusia nigra* against *Vibrio cholera*

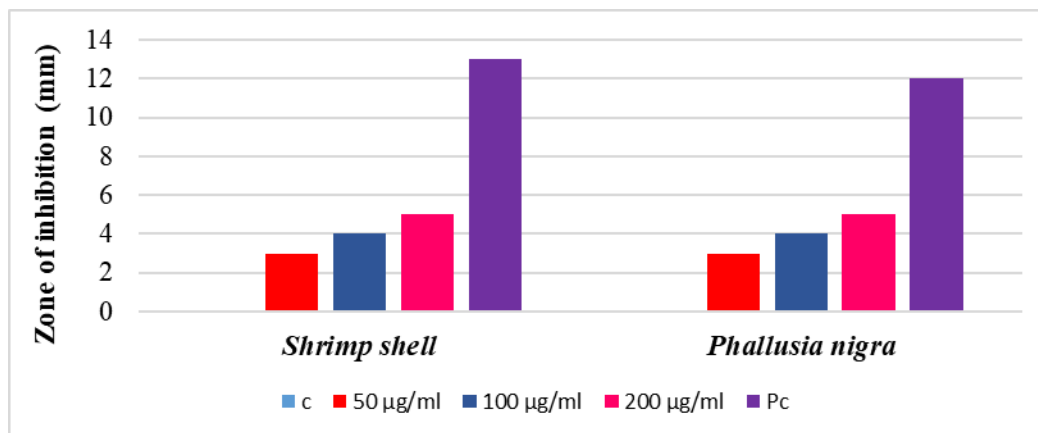


Figure 5: Antibacterial activity of chitosan from shrimp shell and *Phallusia nigra* against *Pseudomonas aeruginosa*

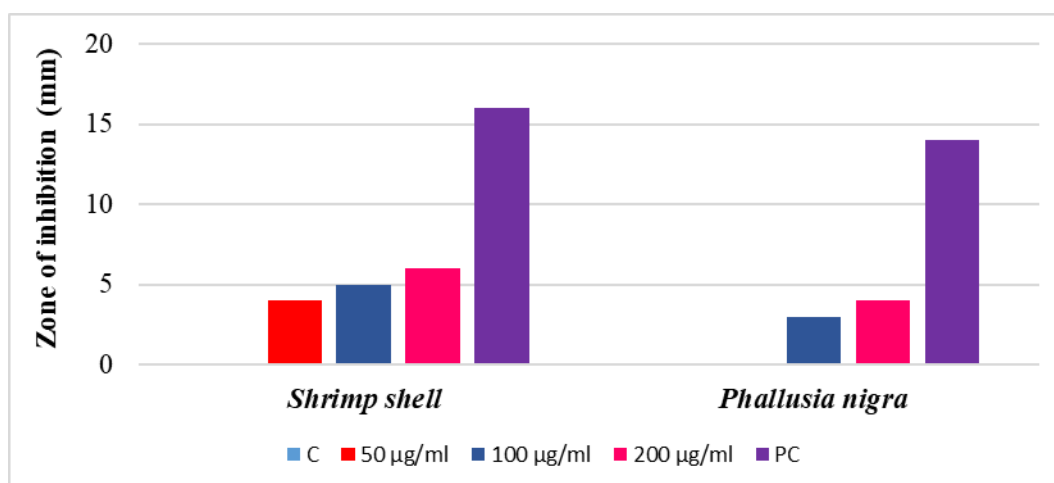
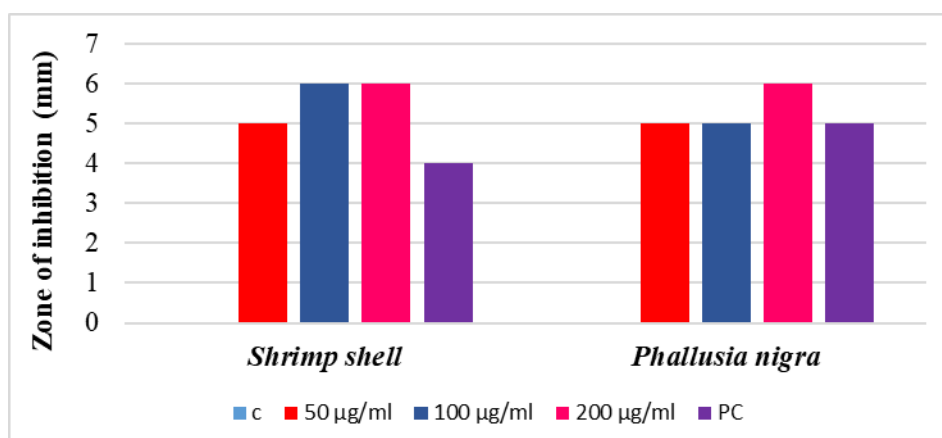


Figure 6: Antibacterial activity of chitosan from shrimp shell and *Phallusia nigra* against *Staphylococcus aureus*

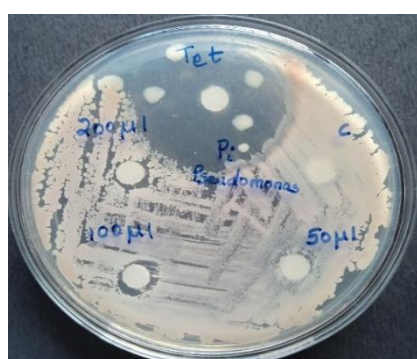




Escherichia coli



Vibrio cholera



Pseudomonas aeruginosa



Staphylococcus aureus

Plate: 7 Antibacterial activity of chitosan of Shrimp shell against *Bacterial Pathogens*



Escherichia coli



Vibrio cholera



Pseudomonas aeruginosa



Staphylococcus aureus

Plate: 8 Antibacterial activity of chitosan of *Phallusia nigra* against Bacterial Pathogens**DISCUSSION**

Chitin has also been reported to exhibit a bacteriostatic effect on Gram-negative bacteria, including *Escherichia coli*, *Vibrio cholerae*, *Shigella dysenteriae*, and *Bacteroides fragilis* (Benhabiles *et al.*, 2012).

Chitosan derived from freshwater lobster exhibited notable antibacterial activity, producing inhibition zones of 8.1 mm, 8.2 mm, and 8.8 mm against *Escherichia coli* and zones of 8 mm, 9.2 mm, and 10 mm against *Staphylococcus aureus* (Rani *et al.*, 2023). Additionally, chitosan was found to be 2.2 times more effective than chitin against *Staphylococcus aureus* and 3.0 times more effective against *Escherichia coli* (Tareq *et al.*, 2013).

Crude chitosan from *Phallusia nigra* demonstrated effective inhibition against clinical strains of *Vibrio cholerae* (9.5 mm) and *Vibrio parahaemolyticus* (8.9 mm) at a concentration of 1 mg/mL (Christomelba *et al.*, 2016).

These findings indicate that chitosan from both shrimp shells and *Phallusia nigra* exhibits notable antibacterial properties, with potential applications in biomedical and pharmaceutical fields.

CONCLUSION

The study successfully demonstrated the extraction and characterization of chitosan from both *Phallusia nigra* and shrimp shells, highlighting the superior antibacterial properties of ascidian-derived chitosan. The differences in antibacterial activity are attributed to factors such as the degree of deacetylation, molecular weight, and purity of the chitosan. These findings indicate that marine tunicates can serve as a promising alternative source for chitosan production, contributing to sustainable and eco-friendly applications in healthcare, agriculture, and water treatment. Additionally, the comparative evaluation underscores the potential of ascidian-derived chitosan as a natural antimicrobial agent, providing an effective solution to combat antibiotic-resistant bacteria. Future research focusing on optimizing the extraction process, scaling up production, and conducting *in vivo* studies will further establish the practical applications of chitosan in various industries.

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PRODUCTION AND CHARACTERIZATIONS OF BIODIESEL USING CaO AS CATALYST FROM SHELL WASTE

Lakshmi, Jemma Hermelin Jesy Diaz

PG and Research Department of Zoology, St. Mary's College (Autonomous), Thoothukudi,

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

The increasing global demand for sustainable materials and the growing awareness of waste management challenges have fuelled the development of innovative strategies for recycling and valorising by-products from various industries. In an era where sustainability and waste reduction are paramount, the conversion of agricultural and marine waste into valuable products has become a focal point in both scientific research and industrial development. Among the many waste streams, crab shells and chicken egg shells are two commonly discarded materials that offer significant potential for upcycling into valuable products. The present study was carried out to prepare CaO nanoparticles from the shells through calcination and synthesize biodiesel from palmolein oil with CaO as a heterogenous catalyst. The synthesized biodiesel was characterized by GC-MS analysis which revealed the presence of eight fatty acid methyl ester (FAME) compounds.

KEY WORDS: crab shell, egg shell, nanoparticle, heterogenous catalyst

INTRODUCTION

Crab shells, primarily composed of chitin and its derivative, chitosan, are a rich source of bioactive compounds that hold tremendous potential in various fields, including medicine, agriculture, and environmental engineering. Chitin, a biopolymer found in the exoskeletons of arthropods, can be converted into chitosan, which has wide-ranging applications. Greater consumption and utilization of chicken eggs worldwide, prompts an expanded amount of disposed egg waste, mainly eggshell and eggshell membrane. The massive generation of waste products, poses a significant environmental challenge, impacting ecosystems and potentially human health through pollution and resource depletion ^[1]. The by-product eggshell weighs approximately 10% of the total mass (*ca.* 60 g) of hen egg.

In recent industrial development, there is gradual increase in the demands for energy and fossil /bio-fuels ^[2]. Biodiesel is a sustainable, non-toxic, and environmental friendly, a renewable alternative source to petroleum. Biodiesel is composed of monoalkyl esters of fatty acids and it has similar physical properties to petroleum diesel but unique advantages

including being renewable, biodegradable, non-toxic and low emissions. Biodiesel is generally produced by transesterification of vegetable oils or animal fats with short-chain alcohols (generally methanol) in the presence of catalysts [3]. CaO was utilized as catalyzed for transesterification, as it is one of the catalysts that shows promise activity^[4].

Calcium oxide (CaO) itself, as cheap, highly active and easily available, is one of the most used solid catalysts for transesterification reaction of different oils and fats to biodiesel. A way to improve its catalytic activity is to increase its specific surface by preparing it in the nano-form^[5]. Calcium carbonate (CaCO₃) is one of the prime constituents of the crab shell, and its amount varies from 40 to 70% according to the species ^[6]. CaCO₃ in the crab shell can be calcinated at higher temperatures (above 800 °C) to prepare CaO, a heterogeneous base catalyst, which can be used for biodiesel production ^[7]. So the present study has been carried out to synthesize biodiesel from palmolein oil with CaO as a heterogenous catalyst and the synthesized biodiesel was characterized by GC-MS analysis

MATERIALS AND METHODS

Collection and preparation of crab and egg shells:

The collected crab and egg shells were rinsed with water to remove dust and impurities. The cleaned shells were dried and crushed using mortar and pestle. The powder was stored in an air tight container for further use.

Preparation of Calcium Oxide from molluscan shells:

The shell powder was placed in a muffle furnace (Labman Scientific instruments) and heated to 900 °C for two hours to convert the CaCO₃ in the shells to CaO. The calcined samples were stored in a closed vessel and kept in a desiccator to prevent reactions with carbon dioxide (CO₂) and humidity in the air.

Transesterification of palmolein oil:

Biodiesel synthesis from palmolein oil and methanol was conducted in the presence of CaO nanoparticles which acts the catalyst in the transesterification reaction. The methanol and oil ratio was 5:1. A known volume, 200ml of cooking oil was taken in a conical flask. It is warmed up to 60° C in a water bath and maintained.

50ml of methanol is taken in another conical flask to which 4g of CaO nanoparticles are added to form methoxide solution. It is an exothermic reaction and generates heat. Magnetic stirrer is used to stir the mixture for 3 minutes.

Then the methoxide solution was added to the preheated oil which is at 60° C. The mixture is stirred for 2 hours at 200rpm using magnetic stirrer. The temperature is maintained at 60° C. Methanol and cooking oil undergo transesterification reaction to produce Fatty Acid Methyl Ester (FAME) and Glycerol. Glycerol is water soluble and it is not soluble in the oily biodiesel and it settles down. The crucial factors for the transesterification reaction are heat, magnetic plate and time. The temperature of the cooking oil should not exceed the boiling point of methanol (64.7° C). The mixing should be stopped after some time. This mixture was transferred to separating funnel and allowed to settle for 24 hours. The yield of biodiesel was calculated by the following formula.

$$\text{Yield \%} = (\text{Volume of finished biodiesel} / \text{Volume of Palmolein oil used}) \times 100.$$

GC-MS analysis:

GC-MS were done for identification of FAME content. It was carried out on a Agilent 7820A GC and Agilent 5977E Series GC/MSD system equipped with a MS Detector and a DB-5 column was used operating in electron impact mode at -70eV; Helium was used as a carrier gas with a flow rate of about 1.2 ml/min. The oven temperature was programmed from 100°V with an increase of 10°C/min to 270° C. Mass Hunter and MSD Chem station softwares were used for data acquisition.

Identification on mass spectrum was conducted using the data base of National Institute Standard and Technology (NIST ver.23), Spectra base and pubchem.

RESULT&DISCUSSION

Transesterification of palmolein oil

Transesterification of palmolein oil with methanol using crab shell's Cao and egg shell's Cao as a catalyst produced two products, Biodiesel and Glycerol. Biodiesel and glycerol separated due to their different densities because glycerol has a greater density than biodiesel. Plate 1a & b shows the two different phases separated in the separating funnel. Biodiesel was decanted and it was then subjected to GC-MS analysis to characterize and identify the compounds present in them.

Identification of compounds in the biodiesel

The synthesized biodiesel composition was determined by GC-MS analysis. (Figure 4 a,b).GC-MS analysis of sample 1 revealed 11 compounds such as Undecanoic acid,10-methyl,methyl ester, Tridecanoic acid, 12-methyl,methyl ester, Octadecanoic acid,3-hydroxy-2-tetradecyl,methyl ester,6-Octadecenoic acid, Glycidyl palmitate, Eicosanoic acid, methyl ester, 9-Octadecenoic acid(Z), oxiranylmethyl ester, Methyl 20-methyl-heneicosanoate,Hexadecenoic acid,2-hydroxy-1-(hydroxymethyl)ethyl ester,9-Octadecenoic acid(Z)-,2,3-dihydroxypropyl ester, C(14a)-Homo-27-nor-14.beta.-gammaceran-3.alpha.-ol. Among the 11 compounds 5 compounds were methyl ester.

The GC-MS analysis of sample 2 (egg shell CaO - biodiesel) revealed the presence of 16 compounds namely Tridecanoic acid,12-methyl-, methyl ester, Octadecanoic acid,3-hydroxy-2-tetradecyl-,methyl ester, n-Hexadecenoic acid, Hexadecanoic acid,14-methyl-, methyl ester, Heptadecanoic acid,14-methyl -,methyl ester, Oleic Acid, Octadecanoic acid, Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl)ethyl ester, Glycidyl palmitate, Methyl 18-methylnonadecanoate,Oleyl chloride,9-Octadecenoic acid(Z), oxiranylmethyl ester, Glycidol stearate, Hexadecanoic acid, 2-hydroxy-1-(hydroxymethyl) ethyl ester,9-Octadecen-1-ol,acetate,(Z)-,9-Octadecenoic acid(Z),2,3-dihydroxypropyl ester. Among the 16 compound identified through GC-MS 5 compounds were methyl ester. Eight Fatty acid methyl esters were found in both samples.

Increase in demand for energy and consciousness about the environment have led to search for an alternative fuel which can supplement or replace fossil fuel. Biodiesel is considered as one of the most alternative fuel for diesel engines and it is nontoxic, renewable and biodegradable^[8]. The utilisation of waste materials as a catalyst source not only lowers the overall cost of producing biodiesel, but it also added benefit of recycling natural mineral sources, making the process eco - friendly and green. When storing the catalyst and carrying out the transesterification reaction, an inert environment must be maintained. The industry that produces biodiesel might be enticed to this approach and it overcome the challenges such as intricate production procedures and the need for an expensive catalyst ^[9]. Thus, it is imperative to look for different sources of CaO catalysts that are both more stable and active and that can carry out the transesterification process under ambient circumstances ^[10].

Plate 1(a&b): Separation of biodiesel and glycerol

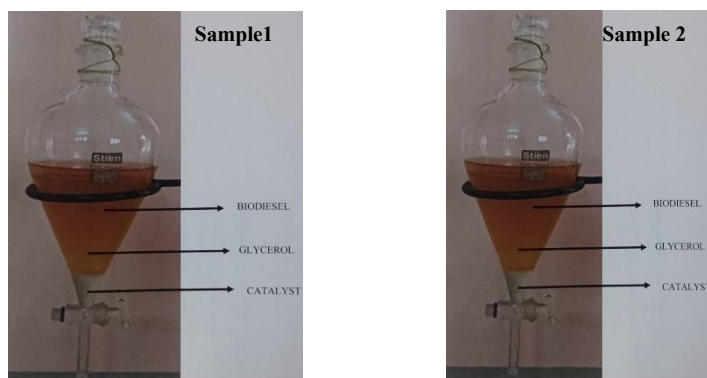


Figure 1: GC-MS Analysis: Chromatogram of sample 1&2

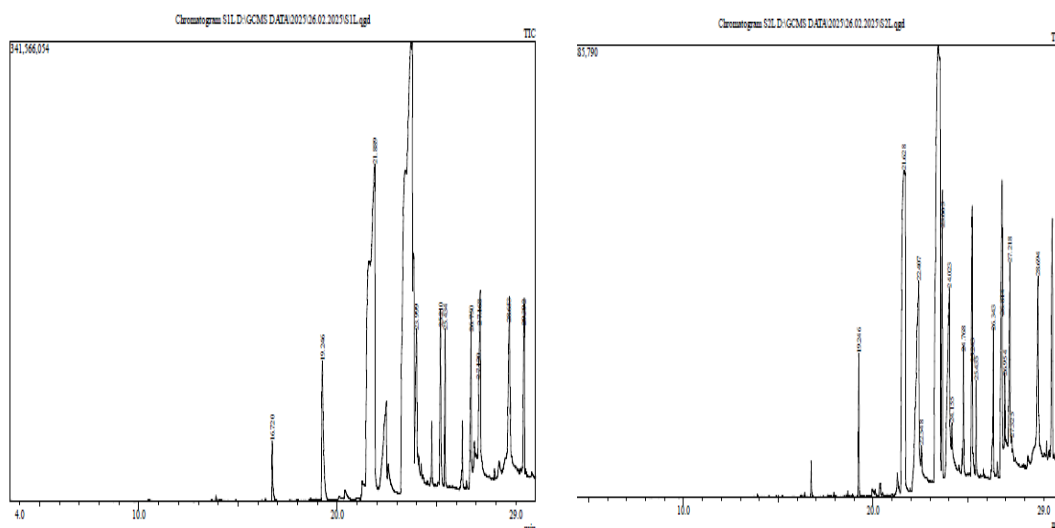


Table 1: Fatty Acid Methyl Esters (FAME) found in samples 1 & 2

S.N o	RT	Name of the compound	Common name	Molecul ar formula	MW g/mo l	Sym bol	Area	Cas No
1	16.7 20	Undecanoic acid, 10- methyl-, methyl ester	Methyl isododec anoate	$C_{13}H_{26}O_2$	214. 34	$C_{12}:0$	81384 226	111- 82-0
2	19.2	Tridecanoic acid, 12- methyl-,	Methyl isomyrist	$C_{15}H_{30}$	242.	C_{15}	15735	5129- 58-8

	46	methyl ester	ate	O ₂	39	:0	0356	
3	21.6 28	Octadecanoic acid, 3-hydroxy-2-tetradecyl-, methyl ester	Methyl 3-hydroxy-2-tetradecyl octadecanoate	C ₃₃ H ₆₆ O ₃	510. 858	C33 :0	21703 89997	17369 -87-8
4.	25.4 34	Eicosanoid acid, methyl ester	Methyl arachidate	C ₂₁ H ₄₂ O ₂	326. 56	C20 :0	28061 8285	1120- 28-1
5	26.8 14	9-Octadecenoic acid (Z)-, oxiranylmethyl ester	Glycidyl oleate	C ₂₁ H ₃₈ O ₃	338. 514	C21 :0	77806 5508	5431- 33-4
6	22.5 48	Hexadecanoic acid, 14-methyl-, methyl ester	Methyl 14-methyl palmitate	C ₁₈ H ₃₆ O ₂	284. 468	C18 :0	54068 533	2490- 49-5
7	26.7 50	9-Octadecenoic acid (Z)-, oxiranylmethyl ester	Glycidyl oleate	C ₂₁ H ₃₈ O ₃	338. 514	C21 :0	39081 1411	5431- 33-4
8.	23.6 63	Heptadecanoic acid, 14-methyl-, methyl ester	Methyl margarate	C ₁₉ H ₃₈ O ₂	284. 48	C17 :0	51154 9892	2490- 23-5

CONCLUSION

Biodiesel is an alternate and renewable energy fuel. CaO was used as a catalyst in the transesterification of the palmolein oil for the production of biodiesel and glycerol. The component present in the synthesized biodiesel was carried out using GC-MS analysis. Eleven compounds were identified in the crab shell sample and sixteen compounds were identified in the egg sample. Eight major FAME (Fatty Acid Methyl Esters) were present in both samples.

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A USER STUDY ON OTT PLATFORM

Mariyam Rameesha . M *P. Bhanumathi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

This study investigates user engagement with OTT platforms, focusing on content consumption habits, subscription models and technological challenges. Findings indicate that content variety, affordability, and accessibility are major factors influencing user satisfaction. While premium subscriptions offer ad-free experiences, many users opt for ad-supported models due to cost considerations. The study highlights the significance of streaming quality, personalized recommendations, and the impact of emerging technologies on user preferences.

KEY WORDS:

OTT platforms, streaming services, user engagement, subscription model, personalized recommendations, device used.

INTRODUCTION

The Over-The-Top (OTT) media streaming services have revolutionized content consumption, replacing traditional television with personalized, on-demand entertainment. With platforms like Amazon mini TV, VOOT etc. users now have the flexibility to watch content across devices. The study aims to explore user behaviour, preferences, and the factors influencing engagement with OTT platforms, considering aspects such as pricing models, content variety, and streaming quality.

As the services are delivered via the Internet without specialised mechanisms these are defined as Over the Top (OTT) services.

This study aims to explore the dynamics of OTT streaming by examining user experiences, behaviours, and trends. As the OTT industry continues to expand, understanding the motivations behind user choices—whether driven by content variety, pricing models, or the platform's interface—is essential for both current providers and new market entrants. Additionally, factors such as technological innovations, personalization features, and the rise of ad-supported models will be explored to identify how these elements influence user engagement and retention.

STATEMENT OF PROBLEM

As OTT streaming platforms continue to proliferate, understanding user behaviour, preferences, and challenges has become crucial for ensuring sustainable growth and improved user satisfaction. Despite the convenience and personalized experiences offered by these platforms, users often face challenges such as content discovery difficulties, subscription fatigue, lack of accessibility features, and inadequate regional or culturally relevant content. Furthermore, the diverse Indian market, with its wide linguistic and demographic variations, adds complexity to designing platforms that meet the expectations of all user segments.

This study aims to investigate the key factors influencing user experiences on OTT platforms, including usability, content preferences, and engagement patterns, while identifying the barriers that hinder optimal satisfaction. By addressing these issues, the research seeks to provide actionable insights to enhance user-centric design and improve overall service delivery in the rapidly evolving OTT ecosystem.

REVIEW OF LITERATURE:

Kailash Kumar, V Rama Krishna, Manoj Govindaraj (2025) “Characteristics determining users’ preferences for OTT video streaming”. The objective of the study is to explicitly identify reason for subscribing or not subscribing to OTT services. The result highlights the significance of comprehending the infection among elements like pricing, quality and demographics in influencing subscription decisions.

Shaile Choudhary, Dr. Rinku Sharma Dixit, Nikhil Govil (2023) “Analysing consumer preferences and patent for OTT platforms”. The objective is to understand the consumer pattern towards OTT platform on the basis of demographics factors where multiple regression tool used via software. The result found that consumer is not too much incline toward OTT because traditional entertainment is still preferred in most of household as their primary source of entertainment. OTT services are mostly recognized by students and employees as they are available at convince with multiple benefits.

OBJECTIVES:

1. To know the pinpoint of common challenges such as buffering or search difficulties.
2. To explore the impact of device usage (eg. mobile, TV, laptop)
3. To assess the appeal and adoption of different subscription models (e.g free, premium, ad-supported)

RESEARCH METHODOLOGY

Sampling design	Convenient sampling method
Period of study	December 2024- April 2025
Data used	Primary and secondary data Gathered via questionnaire from 120 respondents who use OTT application.
Data analysis	Statistical tools like percentage analysis, Garrett's Ranking Method, Likert Scale, ANOVA, and Independent Sample t-test were employed to analyse user preferences and behaviour.

LIMITATIONS OF THE STUDY

In the attempt to make this project authentic and reliable every possible aspect of the topic was kept in mind. The main limitations are:

- ❖ Time is one of the major constraints, which limits the effective data collection.
- ❖ The number of respondents is very less.
- ❖ Some information cannot be accessed due to its confidential nature.
- ❖ Reliability and accuracy of the analysis depend on the respondents, openness and trueness towards each question in the questionnaire.

RESULTS AND DISCUSSIONS:

ISSUES WHILE USING OTT PLATFORM

Issues	No. Of Respondents	Percentage (%)
Buffering	21	17
Poor video quality	28	23
Difficulty searching for content	18	15
Technical issues	38	32
Difficulty in navigating platforms	15	13
TOTAL	120	100

SOURCE: primary data

INFERENCE:

The above table shows that 17 percent of users faced that buffering issues while using the OTT platform, 23 percent of them as poor video quality, 15 percent of them as difficulty searching for content, 32 percent of them as technical issues, 13 percent of them as difficulty in navigating platform. Therefore, majority i.e 32 percent of users faced technical issues while watching the OTT platform.

SUBSCRIPTION MODEL AWARENESS

Subscription Model	No. Of Respondents	Percentage (%)
Free (with limited features or content)	31	26
Premium (ad-free full access with a subscription model)	72	60
Ad-supported (free or discounted with advertisement)	17	14
TOTAL	120	100

SOURCE: PRIMARY DATA

INFERENCE:

The above table shows that user awareness about subscription model 26 percent of user aware about free model, 60 percent of them as premium model and 14 percent of them as ad-supported model.

Therefore majority i.e. 60 percent of users area ware about premium model.

DEVICE USE TO OTT PLATFORMS

Device Usage	No. Of Respondents	Percentage (%)
Smart Phone	63	53
Smart Tv	28	23
Laptop/Desktop	24	20
Tablet	5	4
TOTAL	120	100

SOURCE: PRIMARY DATA

INFERENCE:

The table 3.9 reveals that 53 percent of the users for watching OTT platforms through smartphones, 23 percent of them through smart tv, 20 percent of them through laptop/ desktop and 4 percent of them through tablet for watching OTT.

Therefore, majority i.e., 53 percent of users use smartphone for watching OTT platforms.

GARRETT RANKING

RANKING FACTOR INFLUENCE MORE TO USE OTT PLATFORMS

FACTORS	Rank				
	I	II	III	IV	V
Cost of subscription	33	25	19	21	22
Ad-free content	42	35	27	7	9
Content in free tire	30	27	43	15	5
Ad supported model	15	31	19	25	30
Exclusive features	37	23	25	19	16

Rank	$100 R_{ij}-0.5/N_{ij} $	Percentage position	Garrett value
1	$100 (1-0.5)/5 $	10	75
2	$100 (2-0.5)/5 $	30	60
3	$100 (3-0.5)/5 $	50	50
4	$100 (4-0.5)/5 $	70	39
5	$100 (5-0.5)/5 $	90	25

FACTOR	F1	F2	F3	F4	F5
I	2475	1500	950	819	550
II	3150	2100	1350	273	225
III	2250	1620	2150	585	125
IV	1125	1860	950	975	750
V	2775	1380	1250	741	400

RANK TABLE

Factors	Total Score	Mean	Rank
Cost of subscription	6294	52.45	IV
Ad-free content	7098	59.15	I
Content in free tire	6730	56.08	II
Ad supported model	5660	47.17	V
Exclusive features	6546	54.50	III

INFERENCE:

The above table 3.29 reveals that the majority of the respondents have given top priority to Ad- free content and is ranked as first, followed by content in free-tire, exclusive features, cost of subscription and ad supported model ranked as II, III, IV, V respectively.

LEVEL OF SATISFACTION WITH PORTABLE DEVICES USAGE ON OTT PLATFORMS ACCORDING TO AGE

NULL HYPOTHESIS (H₀): There is no significant relationship with age and satisfaction on using OTT platform

Satisfaction/ Age	Mean	F Value	Significance Value
S1/AGE	2.517	3.037	.032
S2/AGE	.328	.660	.578
S3/AGE	2.364	4.388	.006

S4/AGE	1.990	3.650	.015
S5/AGE	2.383	4.078	.009
S6/AGE	.588	.773	.512
S7/AGE	2.696	3.657	.015
S8/AGE	.370	.591	.622
S9/AGE	2.361	3.985	.010
S10/AGE	1.502	2.104	.104
S11/AGE	.070	.125	.945
S12/AGE	.120	.180	.910
S13/AGE	.360	.489	.691
S14/AGE	.505	.760	.519
S15/AGE	.700	.889	.449

SOURCE: primary data

INFERENCE:

The following are state that there is a significant difference across age groups (P-value < 0.05) hence null hypothesis is rejected, are

- Users had different levels of satisfaction with audio/video quality based on the device used.
- The type of device used affected the type of content watched.
- Overall OTT viewing experience varied across age groups.
- Users' satisfaction with the variety of content offered on OTT platforms was different across age groups.
- Subscription cost satisfaction also showed differences among age groups.

There is no significant difference between age groups (P- value > 0.05) hence the null hypothesis is accepted, are

- Satisfaction with battery life while watching OTT.
- Ease of switching between devices.
- Ease of navigating the platform.
- Frequency of content updates.
- Flexibility of subscription plans.
- Availability of subtitles and audio in multiple languages.
- The ability to share a subscription.
- Users' experience with technical issues.

- Original/exclusive content satisfaction.

SUGGESTIONS:

- ❖ Most people watch on smartphones. Ensuring smooth performance on mobile devices should be a priority.
- ❖ Since most users prefer lower-cost or free subscriptions, OTT platforms can offer budget-friendly plans with good content access.
- ❖ Many users switch between free and premium plans. Offering customized plans, like pay-per-view or short-term subscriptions, can be beneficial.
- ❖ Many users face technical issues like buffering and poor video quality. Platforms should optimize streaming quality and reduce buffering.
- ❖ Focus on better content to attract and retain users. Customize marketing strategies based on demographic preferences.
- ❖ Since some users tolerate ads, offering better-targeted, shorter, and less disruptive ads can improve the viewing experience for non-premium users.

CONCLUSION:

The research underscores that users prioritize content diversity, affordability, and ease of access when selecting an OTT service. While premium subscriptions are preferred for their ad-free experience, price sensitivity and streaming issues remain key concerns. Platforms should focus on enhancing streaming quality, offering flexible pricing models, and leveraging AI-driven recommendations to retain user engagement. The study also suggests that localized content and seamless device integration will play a crucial role in shaping the future of OTT consumption.

The study explores user habits and behaviours regarding content consumption, revealing that movies are the most preferred content type, followed by TV series and live sports. The frequency of OTT usage shows that most users engage with streaming services multiple times a week, reinforcing the growing dependency on digital entertainment. Preferences for dubbed content over subtitles highlight the need for localized content options to cater to diverse audiences.

In conclusion, the study highlights the evolving landscape of OTT consumption, driven by user preferences for convenience, affordability, and content diversity. OTT service providers must continuously innovate to meet user expectations by addressing technical issues, offering localized content, and refining subscription models. By leveraging these insights, platforms can enhance user satisfaction, increase subscriptions, and solidify their position in the competitive digital entertainment market.

JOURNALS:

- "Study on the Consumption Impact of the OTT Platform Among Youth" by Vivek Singh, through the International Journal of Scientific Research in Engineering and Management (IJSREM). The article is published in Volume 8, Issue 4, May 2024.
- "Examining New Media Consumption from the Standpoint of OTT Streaming Services" was conducted by RajaRathi Karunakaran, Selvabaskar S., Karthik Ram M., and Guhan R., affiliated with SASTRA Deemed to be University. Published in June 2023 in the *Petra International Journal of Business Studies*, Volume 6, Issue 1.

WEBSITES:

- <https://www.hulu.com/>
- <https://www.youtube.com/>
- <https://www.sonyliv.com/>
- <https://www.mxplayer.in/>
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IMPACT OF GREEN TEA ON INCREASING METABOLISM AND WEIGHT MANAGEMENT

Mary Sheeba.R,* and P. Maria Sahaya Rossiyana,

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Obesity and weight management are growing public health concerns worldwide, leading to increased interest in natural remedies for metabolic enhancement. Green tea, rich in bioactive compounds such as catechins and caffeine, has been widely studied for its potential role in boosting metabolism and aiding weight loss. This study explores the impact of green tea on metabolism and weight management, focusing on consumer perceptions, benefits, and challenges associated with its consumption.

The research employs a survey-based methodology, gathering primary data from 100 respondents in Thoothukudi to analyze factors influencing green tea consumption, brand preference, and satisfaction levels. Statistical tools such as percentage analysis, ANOVA, and chi-square tests were applied to interpret the data. Findings indicate that green tea is predominantly consumed for weight management, metabolism enhancement, and relaxation. However, consumer preferences vary based on brand, frequency of intake, and taste preferences.

The study concludes that while green tea offers metabolic and weight management benefits, its effectiveness depends on consumption habits, lifestyle factors, and individual metabolic responses. Further research is recommended to determine optimal dosage and long-term impacts.

Keywords :Green tea, metabolism, weight management, catechins, consumer perception, health benefits.

INTRODUCTION

Obesity and overweight remain pressing global health challenges, driving interest in natural remedies for weight management. Green tea, made from the *Camellia sinensis* plant, has been widely recognized for its metabolism-boosting properties, primarily due to its rich content of catechins and caffeine. These compounds enhance thermogenesis, increase fat oxidation, and support energy expenditure, making green tea a popular choice for those looking to

manage their weight naturally.

With a history spanning over 4,000 years, green tea was first cultivated in ancient China and has since gained worldwide recognition for its health benefits. Beyond weight management, it is celebrated for its high antioxidant content, which contributes to overall well-being. This study explores the scientific evidence support in green tea's impact on metabolism and weight loss while also discussing practical considerations for its consumption. By examining its effectiveness and limitations, this research aims to provide valuable insight into how green tea can be incorporated into a healthy lifestyle.

STATEMENT OF PROBLEM:

At present, there are various beverages which consumers prefer, but green tea has become one of the most popular health drinks. People prefer green tea due to health, taste, habit, low calories etc. The purpose of the study is to identify and analysis the factors which influence the consumers" perception and their satisfaction towards green tea. The study also covers the problems faced by the consumers while using green tea. The study aims to evaluate the level of consumer satisfaction regarding green tea in Thoothukudi and to identify the key factors influencing this satisfaction. Although green tea is increasingly recognized as a health-promoting beverage, there is limited research on the specific determinants that drive consumer satisfaction in Thoothukudi.

REVIEW OF LITERATURE

Wang (2022) A study on Green tea and weight loss This systematic review and investigated the effects of green tea on weight loss. The results showed that green tea significantly reduced body weight and body fat. The review included 20 clinical trials and found that green tea resulted in significant weight loss. The authors conclude that green tea may be a useful adjunct to weight loss programs.

Zhang(2022) A study on Green tea catechism and weight loss This systematic review examined the effects of green tea catechism on weight loss. The results showed that green tea catechism significantly reduced body weight and body fat. The review included 15 clinical trials and found that green tea catechism resulted in significant weight loss.

OBJECTIVES

- To identify the brand preference of the green tea users.
- To find out the satisfaction level towards green tea.

RESEARCH METHODOLOGY

Sampling design	Non-probability sampling
Period of study	December2024-March2025
Data used	Primary and Secondary data
Test for analysis	Percentage analysis, Likert5.5scale, Descriptive analysis, One way ANOVA, One Sample T-Test, Independent sample T-Test, Chi-square, Garrett ranking

LIMITATION OF THE STUDY:

- The data collect for the research is fully on primary data given by respondents.
- Respondents could be biased sometimes when information is being extracted.
- Duetolackoftimeasamplesizeonly100 respondents are being included in this study.
- As we had only limited period for the study, we were able to collect only the most relevant information.
- Getting information from the respondents was very difficult because reliability and accuracy of the analysis depends on the respondent's openness and turns towards each question
- The study area is limited only to Thoothukudi District.

RESULT AND DISCUSSION:

Table 1:

TABLESHOWINGTHEPREFEREDGREENTEABRAND

PARTICULAR	NOOF.RESPONDENTS	PERCENTAGE
Lipton Green Tea	64	64
Tetley Green Tea	11	11
Twining's	5	5
Organic India	20	20
Total	100	100

Source: Primary data

INFERENCE

The above table shows that 64% of the respondents are usually consume Lipton green tea, 11% are consume Tetley green tea, 5% are consume twining's, and 20% are consume organic India. therefore, the majority i.e., 65% of the respondents are consuming Lipton green tea.

Table 2:

TABLE SHOWING THE RESPONDENTS OUTCOME AFTER CONSUMING GREEN TEA

PARTICULAR	NO OF RESPONDENTS	PERCENTAGE
Less than 1 month	37	37
1-3 months	34	34
Over 3 months	21	21
No results	8	8
Total	100	100

Source: Primary data

INFERENCE:

The above table shows that 37% of green tea users have noticed the result within 1 month, followed by 34% for 1-3 months, 21% for 3-5 months and 8% did not find any result.

Therefore, the majority i.e., 37% of the respondents are less than 1 month of green tea users.

Table 3:

GARRETT RANKING

The Garrett ranking technique is a method used to analyse and rank the importance of different factors or items based on the frequency of their occurrence or preference, converting these into numerical scores for easier comparison and analysis.

Formula

$$\text{Percent Position} = 100 * (R_{ij} - 0.5) / N_j$$

$$\text{Average Garrett Score} = \text{Total Garrett Score} / \text{Number of respondents}$$

**RANKING FACTORS INFLUENCE MORE TO PURCHASE
GREEN TEA RESPONSE TABLE**

FACTORS	RANK					
	I	II	III	IV	V	VI
Better taste	20	15	20	20	15	10
Lower price	35	26	14	10	8	7
More health benefits	27	33	12	7	6	5
Attracted towards the product	14	27	8	18	13	20
Influence by friends	43	6	23	7	12	9
Influence from social media advertisement	33	27	9	16	9	6

RANK TABLE

FACTORS	TOTAL	MEAN SCORE	RANK
Better taste	5270	52.70	V
Lower price	6006	60.06	I
More health benefits	5465	54.65	IV
Attracted towards the product	4980	49.80	VI
Influence by friends	5904	59.04	III
Influence from social media advertisement	5935	59.35	II

Source: Primary data

INFERENCE:

From this data 60.6mean score is ranked first as a most influential factor, followed by social media advertisement 59.35 mean score and it is ranked second, 59.04 as third for influencing Factors by friends,54.65is ranked fourth for health benefits to hold moderate importance ,52.70 is ranked fifth for better taste to reduce fat and finally49.80 is ranked sixth as it is less attracted towards the product.

This suggests that affordability, social influence, and health concerns drive consumer decisions more than taste or product appeal.

CHI-SQUARETEST:

A Chi-square test is a statistical test used to determine if there's a significant difference between observed results and expected results, especially when dealing with categorical data, helping to assess if observed frequencies differ significantly from expected frequencies. The χ^2 test is used to understand the accuracy of the variables used and to find out whether they are independent or dependent. It is applied to validate the result of the study.

$$X^2 = \sum (O-E)^2 / E$$

O- Observed frequency
E- Expected frequency

Expected frequency = Row total * Column total / Grand total

Null hypothesis(H₀): There is no significant relationship between locality and brand preferred for buying green tea.

Alternative hypothesis(H₁): There is a significant relationship between locality and brand preferred for buying green tea.

Table 4:

Preferred brand Locality	Lipton	Tetley	Twining	Organic	Total
Urban	46	9	3	11	69
Rural	10	1	0	7	18
Semi-urban	8	1	2	2	13
Total	64	11	5	20	100

Rows/columns	O	E	(O-E)	(O-E) ²	(O-E) ² /E
R1C1	46	44.16	2.16	4.66	0.10
R2C1	10	11.52	1.52	2.31	0.20
R3C1	8	8.32	0.32	0.10	0.01
R1C2	9	7.59	1.41	1.98	0.26
R2C2	1	1.98	0.98	0.96	0.48
R3C2	1	1.43	0.43	0.18	0.12
R1C3	3	3.45	0.45	0.20	0.05
R2C3	0	0.90	0.90	0.81	0.9
R3C3	2	0.65	1.35	1.82	2.8
R1C4	11	13.80	2.80	7.84	0.56
R2C4	7	3.60	3.40	11.56	3.21
R3C4	2	2.60	0.60	0.36	0.13
Total	100				8.84

Degree of freedom =(r-1)(c-1)

$$=(3-1)*(4-1)$$

$$=2* 3$$

$$=6$$

The above table indicates that 6 degrees of freedom is 12.5 the calculated value is 8.84, which is Greater than the calculated value thus the result is independent. Hence it is concluded that There is a significant relationship between locality and brand preferred for buying green tea. Therefore, the null hypothesis (H₀) is accepted.

SATISFACTION LEVEL OF GREEN TEA USERS

Null hypothesis(H₀):There is no significant difference between satisfaction level with the factors associated.

Alternative hypothesis(H1):There is a significant difference between satisfaction level with the factors associated.

Table 5:

Satisfaction level	Very satisfied	Satisfied	Neutral	Dis-satisfied	Very dissatisfied	Mean	Std. Deviation
Satisfied in the packing of green tea products.	30	48	20	2	-	4.0600	3.7600
Satisfied with the price of Green tea	24	42	24	6	4	.76303	1.01623
satisfied are you with the quality of green tea	24	38	27	8	3	4.0600	3.7600
I feel satisfied with a promotion of green tea product	28	32	31	8	1	.76303	1.01623
Satisfied with The taste of green tea.	28	39	28	5	-	4.0600	3.7600

Source: Primary data

INFERENCE

The table shows the satisfaction levels for different factors related to green tea products. The highest mean satisfaction scores are for packaging, quality, and taste, each with a mean of

4.06 and a standard deviation of 3.76, indicating higher satisfaction but also more variation in responses. Satisfaction with the price and promotion of green

tea has a lower mean of 3.76 with a standard deviation of 1.016, suggesting a slightly lower satisfaction level but more consistency in responses.

SUGGESTION:

- ✚ Increase awareness campaigns about the health benefits of green tea, particularly in rural areas where brand awareness is lower.
- ✚ Introduce more affordable options to attract price-sensitive consumers, as price is a major influencing factor in purchasing decisions.
- ✚ Promote organic green tea since 79% of respondents are willing to pay more for it.
- ✚ Target young adults (18-24) in marketing efforts, as they form the largest consumer group. ✚ Offer discounts and promotions on Lipton green tea, as it is the most preferred brand(64%).
- ✚ Expand the availability of tea bags since 68% of respondents prefer this form over loose leaf or bottled options.
- ✚ Introduce more flavored varieties of green tea, as 51% of consumers prefer flavored options over unflavored.
- ✚ Educate consumers on the best times to drink green tea for maximum benefits, as most(47%) prefer consuming it in the morning.
- ✚ Leverage social media and influencers to promote green tea, as social influence is a key factor in purchasing decisions.
- ✚ Improve product packaging and presentation, as packaging ranks highest in customer satisfaction.
- ✚ Develop trial packs for new consumers to sample different green tea flavours and brands before committing to a purchase.
- ✚ Enhance marketing strategies by emphasizing green tea's role in weight management, as 37% consume it for this reason.

CONCLUSION

A study on green tea consumption reveals that it's predominantly consumed by 18-24- year-old females for weight management, metabolism boosting, and relaxation. While most consumers prefer tea bags and flavoured variants, price is the most influential factor in purchasing decisions. The study suggests that green tea brands should focus on competitive pricing, product innovation, and enhanced marketing to attract more consumers and leverage the growing awareness of health and wellness.

To further capitalize on the growing demand for green tea, brands can

emphasize the scientifically-backed benefits of green tea, such as its high antioxidant content and ability to aid in weight loss. Utilizing social media influencers, customer testimonials ,and educational content can also help increase brand awareness and drive sales. Moreover, offering organic and sustainable options can appeal to the growing number of environmentally-conscious consumers. By adapting to these trends and preferences, green tea brands can stay competitive and continue to thrive in the health and wellness market.

CONSUMERS PREFERENCE TOWARDS ZUDIO@TATA APP IN THOOTHUKUDI

Mazy.V * and P. Maria Sahaya Rossiyana,

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

Consumer perception towards Zudio on the Tata Neu app is shaped by several factors, including the quality of products, ease of access, user experience, and the benefits provided through the app's features. As a brand known for its affordable fashion, Zudio attracts a wide range of consumers looking for stylish yet budget-friendly options. The rapid growth of e-commerce and digital retail platforms has reshaped consumer behaviour, influencing purchasing decisions, brand loyalty, and shopping experiences. This study examines consumer preferences towards **Zudio**, a fashion and lifestyle brand, within the **Tata Neu App** ecosystem. The research explores factors such as affordability, product variety, ease of navigation, discounts, personalized recommendations, and overall user satisfaction. Using a combination of surveys and secondary data analysis, the study identifies key drivers that impact consumer engagement with Zudio on Tata Neu. It also highlights challenges such as app usability, competition from other e-commerce platforms, and evolving consumer expectations. The findings provide insights for brands looking to optimize their presence on super apps like Tata Neu, enhancing customer experience and retention strategies.

Keywords: Consumer Preferences, Zudio, Tata Neu App, E-commerce, Digital Retail, Shopping Behaviour.

INTRODUCTION:

In today's digital era, e-commerce has revolutionized the retail industry, offering consumers convenience, affordability, and a wide range of product choices. With the rise of super apps, consumers now have access to multiple brands and services within a single platform. One such emerging super app is Tata Neu, developed by the Tata Group, which integrates various brands across categories like fashion, electronics, groceries, and travel. Among the brands featured on Tata Neu, Zudio has gained significant attention for its affordable fashion and trendy apparel.

Zudio, a part of **Trent Ltd. (a Tata Group company)**, is known for its budget-friendly clothing that caters primarily to young and price-conscious consumers. The brand has expanded rapidly through its offline stores, and its presence on **Tata Neu** has further

enhanced its reach. However, understanding consumer preferences towards Zudio on the Tata Neu App is crucial to assessing its digital performance, customer satisfaction, and potential growth opportunities.

This study aims to explore key factors that influence consumer behaviour while shopping for Zudio products on Tata Neu. These factors include **pricing, product variety, user interface, discounts, loyalty rewards (Neu Coins), and overall shopping experience**. Additionally, the study examines how Zudio competes with other fashion brands within the app and in the broader online retail market.

By analyzing consumer preferences and expectations, this research provides insights into how **Zudio can enhance its digital presence** and improve customer engagement through the Tata Neu App. The findings will be valuable for retailers, app developers, and marketing strategists looking to optimize brand performance within super apps.

STATEMENT OF THE PROBLEM:

With the rapid growth of e-commerce platforms, brands like Zudio have expanded their presence through digital applications such as the Tata Neu app to cater to modern consumer needs. However, understanding consumer perception and satisfaction remains a challenge, especially in regional markets like Tuticorin, where shopping behavior and preferences may differ from urban areas. Despite the convenience and accessibility offered by the app, factors such as product quality, pricing, app usability, delivery services, and promotional offers play a critical role in shaping consumer experiences. Additionally, technical issues, lack of personalization, and limited awareness of digital services could hinder the adoption and satisfaction levels among users. This study aims to address these challenges by analyzing consumer perceptions of Zudio services through the Tata Neu app. It seeks to identify gaps in service quality, explore consumer behavior, and provide actionable insights, to enhance the overall shopping experience for users in Tuticorin.

OBJECTIVES:

1. To study the demographic profile of consumers.
2. To determine the factors influencing the choice of consumers towards ZUDIO
3. To study the most widely used products from ZUDIO.
4. To study the purchasing behavior towards TATA Neu products.

RESEARCH METHODOLOGY:

Sampling design	Convenient sampling method
Period of Study	December 2024 - March 2025
Data used	Primary and Secondary Data
Test for analysis	Percentage Analysis, Descriptive Statistics, Anova , Chi-square, T test, Correlation, Regression, Linear Model

LIMITATIONS OF THE STUDY:

In attempt to make this project authentic and reliable, every possible aspect of the topic was kept in mind. The main limitations of the study are:

- Time is one of the major constraints, which limits the effectiveness of data collection.
- The number of respondents is limited to 100.
- Some information cannot be accessed due to its confidential nature.
- Reliability & accuracy of the analysis depends on the respondent's openness and trueness towards each question in the questionnaire.

RESULTS AND DISCUSSION:**PERCENTAGE ANALYSIS:****BENEFICIARY FEATURES CLASSIFICATION**

Particulars	Frequency	Percentage
Ease of use	13	13
Discount	37	37
Loyalty	18	18
Brands	32	32
TOTAL	100	100

Source: Primary Data

Inference:

The above table depicts that out of 100 respondents i.e., 13% of Ease of use, 37% of Discount, 18% of Loyalty and 32% of Brands. Thus, the majority of respondents i.e., 37% are Discount.

TABLE: 1
PROMOTIONAL CLASSIFICATION

Particular	Frequency	Percentage
Always	61	61
Sometimes	28	28
Rarely	04	04
Never	07	07
TOTAL	100	100

Source: Primary Data

Inference:

The above table depicts that out of 100 respondents i.e., 61% of Always, 28% of Sometimes, 4% of Rarely and 7% of Never. Thus, the majority of respondents i.e., 61% are Always.

TABLE: 2
ZUDIO'S PRODUCTS PRICE CLASSIFICATION

Particulars	Respondents	Frequency
More Affordability	64	64
Similar	25	25
More Expensive	11	11
TOTAL	100	100

Source: Primary Data

Inference:

The above table depicts that out of 100 respondents i.e., 64% of More Affordability, 25% of Similar, and 11% of More Expensive. Thus, the majority of respondents i.e., 64% are More Affordability.

TABLE:3

Descriptive Statistics		
	Mean	Std. Deviation
Age	2.9000	1.24316
Gender	1.3100	.46482
Marital Status	1.6300	.48524
Educational Qualification	2.8200	1.07666
Shopping Mode	1.3200	.46883
Employment Status	2.0300	.83430
Monthly income	2.4300	.98734
Shopping Years	2.9700	.90403
Family Members	1.5000	.50252
Shop Online	3.2200	.94900
Know about TATA Neu	1.6300	.69129
Offers and Discount	1.5600	.86830
Online purchase	2.2700	.87450
Category People	2.1700	.75284
Motivates to purchase in Zudio	1.5900	.77973
Seasonal or Festive	1.0900	.28762
Zudio's product prices	1.5400	.78393
Challenges	1.3200	.46883
Influences to purchase	2.8600	1.23926
Save Items	1.5100	.50242
UPI	1.4800	.50212
Delivery services	2.8200	1.10444
Frequently Purchase	2.2500	.99874
Handling Complaints	2.6100	1.24637
Payment method	2.8300	1.06415
Encouragement	1.9500	.85723

Inference:

The table presents descriptive statistics and frequencies for demographic and shopping-related factors, with 100 valid responses and no missing values, ensuring data completeness. It covers key attributes such as age, marital status, educational qualification, employment status, and monthly income, along with shopping behaviors like mode of shopping, years of experience, and online shopping habits. Factors influencing purchases include offers, discounts, UPI payments, delivery services, and complaint handling, while motivators for purchasing in Zudio, such as seasonal offers, product prices, and challenges, are also analyzed. The uniform response count across all categories suggests a well-distributed dataset, providing a solid foundation for further statistical analysis.

TABLE:4

ONE SAMPLE T TEST

		Significance		Mean Difference	Std.
		One-Sided p	Two-Sided p		
Payment method	Equal variances assumed	.323	.647	-.10612	.23101
	Equal variances not assumed	.322	.643	-.10612	.22813

Independent Samples Effect Sizes

		Standardizer	Point Estimate	Lower	Upper
Payment method	Cohen's d	1.06842	-.099	-.523	.325
	Hedges' correction	1.07668	-.099	-.519	.322
	Glass's delta	1.04419	-.102	-.525	.324

Inference:

The denominator used in estimating the effect sizes. Cohen's d uses the pooled standard deviation. Hedges' correction uses the pooled standard deviation, plus a correction factor. Glass's delta uses the sample standard deviation of the control (i.e., the second) group.

TABLE:5

ANOVA

	Sum of Squares	Mean Square	F	Sig.
Between Groups	5.404	1.351	1.854	.125
Within Groups	69.236	.729		
Total	74.640			

		Point Estimate	Lower	Upper
Offers and Discount	Eta-squared	.072	.000	.155
	Epsilon-squared	.033	.042	.119
	Omega-squared Fixed-effect	.033	.042	.118
	Omega-squared Random-effect	.008	.010	.032
a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.				

Inference:

The ANOVA table examines differences in "Offers and Discount" across groups. The F-statistic (1.854, $p = 0.125$) indicates that there is no statistically significant difference between groups at the 0.05 significance level. The Sum of Squares shows that variability between groups (5.404) is much smaller compared to within-group variance (69.236), suggesting that most variation is within individual groups rather than between them. The effect sizes (Eta-squared = 0.072, Omega-squared = 0.008) indicate a small effect, meaning the independent variable has a minimal impact on the dependent variable. Overall, the results suggest that offers and discounts do not significantly differ across groups in this dataset.

TABLE :6

Regression

ANOVA					
Model		Sum of Squares		Mean Square	Sig.
1	Regression	.166		.166	.744 ^b
	Residual	151.874		1.550	
	Total	152.040			
a. Dependent Variable: Influences to purchase					
b. Predictors: (Constant), Delivery services					

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.755	.343		8.037	<.001
	Delivery services	.037	.113	.033	.327	.744
a. Dependent Variable: Influences to purchase						

TABLE:7CORRELATIONS

		Motivates to purchase in Zudio	Seasonal or Festive
Motivates to purchase in Zudio	Pearson Correlation	1	.031
	Sig. (2-tailed)		.759
	N	100	100
Seasonal or Festive	Pearson Correlation	.031	1
	Sig. (2-tailed)	.759	
	N	100	100

Inference:

The correlation analysis reveals a very weak positive relationship (Pearson correlation = 0.031) between "Motivates to purchase in Zudio" and "Seasonal or Festive" factors, with a significance value of 0.759, indicating that the correlation is not statistically significant. This suggests that seasonal or festive occasions do not have a meaningful impact on customers' motivation to purchase at Zudio based on the data collected from 100 respondents.

TABLE:8

Chi-Square Tests				
Save Items		Value	df	Asymptotic Significance (2-sided)
Yes	Pearson Chi-Square	1.220 ^b	3	.748
	Likelihood Ratio	1.302	3	.729
	Linear-by-Linear Association	.556	1	.456
	N of Valid Cases	49		
No	Pearson Chi-Square	.822 ^c	3	.844
	Likelihood Ratio	.798	3	.850
	Linear-by-Linear Association	.010	1	.919
	N of Valid Cases	51		
Total	Pearson Chi-Square	.305 ^a	3	.959
	Likelihood Ratio	.312	3	.958
	Linear-by-Linear Association	.213	1	.645
	N of Valid Cases	100		
a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 3.72.				
b. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.96.				
c. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.76.				

Inference:

The Chi-Square test results indicate no significant association between the variables analyzed across all categories—those who save items ("Yes"), those who do not ("No"), and the total sample. For the total group (N = 100), the Pearson Chi-Square value is 0.305 with a

significance level of 0.959, which is much higher than the standard threshold of 0.05, suggesting no statistically significant relationship. Similar outcomes are observed in the subgroups: "Yes" ($\chi^2 = 1.220$, $p = 0.748$) and "No" ($\chi^2 = 0.822$, $p = 0.844$). Additionally, a notable portion of cells have expected counts less than 5, which may affect the validity of the test, but overall, the data suggests there is no meaningful association between the variables considered in this Chi-Square analysis.

FINDINGS:

- Most of the respondents belong to the age group 18-25.
- Majority of the respondents belong to Female.
- Most of the respondents belong to Married.
- 39% of respondents are professionals.
- Majority of the respondents belong to Self employed.
- Most of the respondents all within monthly income Rs. 50001-100000.
- Most of the respondents belong to above 6 years.
- 77% of respondent's high family usage members.
- 54% of respondents shopping behavior occasionally.
- 45% of respondents gained knowledge from social media.
- Majority of the respondents belong to discount likers
- Most of the respondents belong to promotional offers always.
- Most of the respondent's style/trend of Zudio Products.
- Most of the respondents belong to seasonal offerings.
- Majority of the respondents belong to high affordability.
- Most of the respondents belong to Accurate size.
- 72% of respondents are Facing tracking challenges.
- Majority of the respondents belong to brand name.
- Most of the respondent's delivery services.
- Most of the respondents belong to festival seasons.

SUGGESTIONS:

- To analyze and enhance consumer preferences for Zudio on the Tata Neu app, focus on affordability by offering exclusive discounts, Neu Coins rewards, and budget-friendly collections. Highlight trendy,

- Youth-centric styles through AI-driven recommendations and ensure a seamless shopping experience with smooth navigation, quick browsing, easy checkout, and hassle-free returns. Leverage Tata Neu's ecosystem by providing app-only deals, cashback incentives, and cross-promotions with brands like Westside,
- Starbucks, and Croma for a holistic shopping experience. Build engagement and trust through user reviews, influencer testimonials, AR-based try-on features, and eco-friendly, sustainable fashion initiatives. Enhance convenience with express delivery, Buy Now Pay Later (BNPL), offline-online integration, interactive size guides, and a "shop the look" feature for curated outfit suggestions.
- Strengthen customer loyalty with premium membership perks, birthday and anniversary discounts, referral rewards, and wish list alerts for restocked items. Implement personalized marketing strategies with push notifications, email recommendations, geo-targeted promotions, AI-driven dynamic pricing, and chatbot-based fashion assistants. Boost engagement through gamification, introducing shopping challenges, live shopping events, mystery discounts, and exclusive flash sales.
- To create a comprehensive and compelling consumer reference, consider incorporating specific details about the products, features, or services that impressed the consumer, as well as highlighting the emotional benefits or connections they experienced with Zudio @ Tata Neu app.
- Encourage the reader to take action with a clear call-to-action, and use storytelling techniques to make the reference more memorable, while aligning with key messaging and branding guidelines.

CONCLUSION:

The analysis of consumer preferences for Zudio on the Tata Neu App highlights key factors influencing customer engagement and satisfaction. Zudio's affordability, fast-fashion model, and effective marketing strategies, including social media campaigns and influencer collaborations, play a crucial role in attracting budget-conscious consumers. The frequent introduction of new collections and competitive pricing further enhance its appeal, making it a strong contender in the fashion retail market.

However, challenges remain, particularly regarding user experience on the Tata Neu App. Reports indicate that initial technical issues, such as slow loading times, navigation difficulties, and payment processing errors, have impacted customer satisfaction and

retention. Although recent updates to the app have improved functionality and personalization, further enhancements are needed to create a seamless shopping experience.

The integration with Tata Neu enhances the overall experience by providing seamless access to Zudio's collections, along with the added benefits of loyalty rewards through Neu Coins and easy payment options via Tata Pay. Customers in Thoothukudi value the convenience of browsing, purchasing, and accessing customer service from their smartphones, making the Tata Neu app a preferred platform for fashion shopping.

By focusing on enhancing customer engagement and delivering value-driven experiences, Zudio can strengthen its position within the Tata Neu App and foster greater customer loyalty and repeat purchases and customer support will be essential to sustaining and growing this positive consumer perception.

In conclusion, the dynamic landscape of modern retail and digital commerce has been significantly shaped by innovative brands and platforms that prioritize customer experience, convenience, and sustainability.

BOOK REFERENCE:

- ◆ "Consumer Behavior" by Schiffman & Kanuk – Covers factors influencing consumer preferences.
- ◆ "Retail Management: A Strategic Approach" by Barry Berman & Joel Evans – Discusses modern retail strategies, including fast fashion.
- ◆ "Marketing Management" by Philip Kotler – Provides insights into brand positioning and consumer decision-making.
- ◆ Consumer Behavior in Fashion by Michael R. Solomon and Nancy J. Rabolt
- ◆ Fashion Marketing by Tony Hines and Margaret Bruce
- ◆ Digital Marketing: Strategy, Implementation and Practice by Dave Chaffey and Fiona Ellis-Chadwick
- ◆ Consumer Behavior: Buying, Having, and Being by Michael R. Solomon
- ◆ Fashion Marketing and Merchandising by Mary G. Wolfe
- ◆ Digital Marketing Excellence: Planning, Optimizing and Integrating Online Marketing by Dave Chaffey and PR Smith

WEBSITES SURFING:

- ◆ Zudio's Official Website (www.zudio.com) – For brand insights, product offerings, and consumer engagement.



- ◆ Tata Trent Website (www.mywestside.com) – Parent company details and strategy.
- ◆ Market Research Reports (www.ibef.org, www.statista.com) – Consumer behavior insights and retail trends.
- ◆ Commerce & Review Platforms (Amazon, Flipkart, Quora, Mouth Shut) – Consumer reviews on Zudio products.

CUSTOMER SATISFACTION INFLUENCES REPEAT PURCHASES ON MEESHO, A STUDY AT THOOTHUKUDI TOWN

Mekrin.W, * P.Jayamary

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

The rapid growth of e-commerce has transformed consumer shopping behavior, driven by technological advancements and changing market dynamics. This study examines key factors influencing online shopping trends, including consumer preferences, purchasing behavior, and the role of digital marketing strategies. It explores how convenience, product variety, price competitiveness, and security concerns shape consumer decision-making. Additionally, the research highlights the impact of social media, personalized recommendations, and mobile commerce in enhancing the online shopping experience. The study also analyzes challenges faced by e-commerce businesses, such as cybersecurity threats, logistics, and customer trust. Through a comprehensive review of existing literature and empirical data, the study identifies emerging patterns and future prospects in the online retail sector. The findings emphasize the growing reliance on artificial intelligence, big data analytics, and automation in optimizing customer engagement and supply chain efficiency. The research concludes that businesses must continuously adapt to evolving consumer expectations and technological innovations to maintain a competitive edge. By providing insights into these trends, the study aims to assist retailers, policymakers, and stakeholders in making informed decisions that drive sustainable growth in the digital marketplace.

KEY WORDS:

Repeat purchase, meesho, customer satisfaction

INTRODUCTION:

In today's competitive business landscape, customer satisfaction plays a crucial role in driving customer loyalty and retention. Repeated customer satisfaction is essential for building long-term relationships with customers and fostering a loyal customer. When customers are consistently satisfied with online shopping, they are more likely to become repeat customers, recommend the application (meesho) to others, and resist switching to competitors. This study aims to investigate the relationship between repeated customer

satisfaction and impacts exploring how consistent satisfaction influences customer retention, repurchase intentions, and overall loyalty. By examining this relationship, businesses can gain valuable insights into the importance of delivering consistent, high-quality experiences that drive customer satisfaction and loyalty.

Repurchase customer satisfaction refers to the level of contentment and positive experience that a customer has with a product or service, which influences their decision to make repeat purchases. It's a critical metric for businesses as it helps gauge customer loyalty, trust, and the likelihood of customers returning for future transactions. High repurchase satisfaction often reflects a positive overall customer experience, from product quality to customer service, and leads to long-term relationships, improved retention, and sustainable business growth.

STATEMENT OF THE PROBLEM:

Repurchase customer satisfaction refers to the consistent delivery of high-quality products or services that meet or exceed customer expectations, resulting in a positive experience that fosters loyalty and retention. This study aims to examine the relationship between customer satisfaction and repurchase intention. It involves creating a seamless and satisfying experience across multiple interactions, transactions, and touch points, thereby building trust, confidence, and a long-term relationship with the customer. When customers experience repeated satisfaction, they are more likely to become loyal advocates, providing positive word-of-mouth, online reviews, and recommendations that drive business growth and profitability.

OBJECTIVES OF STUDY:

- ❖ To investigate the effect of Repurchase customer satisfaction on customer lifetime value.
- ❖ To know the customer satisfaction level on repeat purchase.
- ❖ To identify the factor influence for repurchase.

RESEARCH METHODOLOGY:

Sampling design	Simple random sampling
Period of study	December 2024-March 2025
Data used	Primary and secondary data
Test for analysis	Percentage analysis, Likert scale, independent t-test, Correlation.

LIMITATIONS OF THE STUDY:

- The study is made with the help of 104 customers of Repurchase in online
- The period of the study for 3 months.
- This covers Thoothukudi area people repurchase satisfaction only. It may differ from other district people opinion.
- The data collect for the research is fully on primary data given by respondents.
- Respondents could be biased sometimes when information is being extracted

TABLE SHOWING SIGNIFICANT LIKERT SCALE RANKING

Satisfaction Level	LIKERT SCALE					No.Of Response	Weighted score	Average score	Ranking
	Strongly Agree (5)	Agree (4)	Neutral	Disagree	Strongly Disagree				
Customer service team is responsive to my needs	10 50	48 192	36 108	8 16	2 2	104	368	3.54	V
I feel that I am a valued customer of meesho	13 65	36 144	47 141	7 14	1 1	104	365	3.51	VI
I plan to increase my spending with meesho in the next year	14 70	51 204	29 87	9 18	1 1	104	380	3.65	II
The product/ service are worth paying.	10 50	20 80	33 99	22 44	19 19	104	292	2.81	VIII



The quality of the product has consistently met the expectations	12 60	51 204	32 96	9 18	0	104	378	3.63	III
I feel that the product offers good value for money	18 90	43 172	32 96	8 16	3 3	104	377	3.62	IV
The price of the product is a major factor in my decision to make repeated purchase	21 105	44 176	29 87	7 14	3 3	104	385	3.70	I
I have never experienced and issues with our company 's product and services	9 45	41 164	36 108	15 30	3 3	104	350	3.36	VII

Inference :

From the likert scale calculation it is evident that respondents are giving

- I Rank with a score of 3.70 given to the price the product is a major factor in decision to make repeated purchase

- II Rank with a score of 3.65 is plan to increase spending with meesho in the next year
- III Rank with a score of 3.63 the quality of the product met expectations.
- IV Rank with a score of 3.62 product offers good value for money
- V Rank with a score of 3.54 responding of customer service team
- VI Rank with a score of 3.51for feel value as a customer of meesho
- VI Rank with a score of 3.36 never experienced and issues with the company ‘s product and services
- VIII Rank with a score of 2.81 the product/ service are worth paying a premium for.

TABLE SHOWING SIGNIFICANT ANOVA

NULL HYPOTHESIS (H_0): There is no significant relationship between customer satisfaction and factors encouraging on repurchase.

ALTERNATIVE HYPOTHESIS (H_1): There is significant relationship between customer satisfaction and factors encouraging on repurchase

VARIABLE		Mean square	F-Value	Signification value
satisfaction on repurchase	Between Groups Within Groups	7.705 9.940	.775	.463

	MEAN	F	Signification value
S11/ Factor encourage on repurchase	.660	1.048	.354
S12/ Factor encourage on repurchase	.358	.337	.715
S13/ Factor encourage on repurchase	.420	.717	.490
S14/ Factor encourage on repurchase	.142	.166	.847
S15/ Factor encourage on repurchase	1.110	1.542	.219

Inference :

The above table ANOVA shows, F-value for satisfaction on repurchase is 0.775 and significant value is 0.463. Since the significant value is greater than 0.05. Hence I accept the null hypothesis and concluded by accepting that there is no significant difference between customer satisfaction and factors encouraging on repurchase.

TABLE SHOWING INDEPENDENT T-TEST

CUSTOMER SATISFACTION	MALE MEAN RANK	FEMALE MEAN RANK	S.D MALE	S.D FEMALE	T VALUE MALE/ FEMALE	P VALUE
I am very satisfied with the product/service offered by Meesho	3.9394	4.0704	.60927	.86724	-.782 -.887	.019
I would recommend to the product to my friends and family	3.5455	3.4930	.90453	1.08065	.242 .259	.363
I am a loyal customer to meesho	3.6364	3.4225	.69903	.78671	1.335 1.394	.366
I will continue to purchase in the future	3.6667	3.6761	.77728	.98234	-.048 -.053	.183
I am extremely satisfied with my frequent purchase experience	3.6667	3.7465	.77728	.88992	-.442 -.465	.724

Inference:

- Female customers(4.0704) are more satisfied than male customers(3.9394). The p-value(0.019) indicates satisfically significant difference meaning female are significantly More satisfied than male .
- Female customer(3.4930) and males(3.5455) have similar score. The p-value(0.363) suggest no significance difference between the gender are equally likely to recommend meesho.
- Female customer(3.4225) slightly less loyal than males(3.6364). The p value(.366) indicates no significance difference in loyalty between gender.
- Male(3.6667) and female(3.6761) have almost identical mean ranks. The p value suggest no significance, indicating both genders have similar intent to countinue purchasing from meesho
- Female(3.7465) report slightly higher satisfaction than males(3.6667) the p value indicates no significance difference in satisfaction regarding frequent purchases.

CORRELATION

		satisfaction on repurchase	impact on repurchase
satisfaction on repurchase	Pearson Correlation	1	.787
	Sig. (2-tailed)		.000
	N	104	104
impact on repurchase	Pearson Correlation	.787	1
	Sig. (2-tailed)	.000	
	N	104	104

(Source: Primary Data)

Inference:

Positive Correlation: The Pearson correlation coefficient between "satisfaction on repurchase" and "impact on repurchase" is 0.787. This indicates a strong positive correlation, suggesting that as customer satisfaction increases, the likelihood of repurchase also increases significantly.

Significance Level: The p-value (Sig. 2-tailed) is 0.000, which is less than 0.01. This means the correlation is statistically significant at the 1% level, confirming a meaningful relationship between satisfaction and repurchase behavior.

FINDINGS:

- T-test result, female customer are more satisfied than the male customers.
- ANOVA result, there is no significant difference between age and impact on repurchase.

SUGGESTIONS:

- Meesho invest in personalized email campaigns and AI-driven recommendations to increase repeat purchase.
- It should maintain competitive pricing and introduce loyalty discounts to retain customers.
- It should improve customer support response time and problem resolution efficiency.
- Ensure product quality align with customer expectation.

CONCLUSION:

The findings of this study underscore the significance of delivering quality products, providing competitive pricing, and fostering a positive overall experience to drive customer satisfaction. When customers are satisfied, they are more likely to repurchase, become loyal advocates, and provide positive word-of-mouth.

The study highlights that price, product quality, and personalized offers are keydrivers of repurchase on Meesho. Most customers are satisfied with their shopping experience, but improvements in product quality and customer service can further enhance satisfaction. While demographics do not significantly impact repurchase behavior, competitive pricing remains a major influence on customer retention. The findings suggest that customer satisfaction is a strong predictor of repurchase intention, with positive experiences and perceived value significantly influencing satisfaction.

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AN EMPIRICAL STUDY ABOUT SOCIO-ECONOMIC CONDITIONS AND MARKETING STRATEGY OF HOMEPRENEURS IN THOOTHUKUDI CITY

Muthurathi.H *, and A. Saleth Mary Vetrisevi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

An Empirical study about socio-economic conditions and marketing strategy of homepreneurs in thoothukudi city is the topic taken for research. The objectives of the study are to examine the socio-economic profile of homepreneurs in Thoothukudi, including their demographic characteristics, education, income and occupation, to identify the marketing strategies adopted by homepreneurs in Thoothukudi, including their product offering, pricing, promotion and distribution channels, to investigate the challenges faced by homepreneurs in Thoothukudi, including access to finance market competition and regulatory hurdles, to examine the role of technology in enabling homepreneurs in Thoothukudi to market their products and services effectively, to identify the support systems available to homepreneurs in Thoothukudi, including government initiatives, training program and mentorship schemes, to provide recommendations for policymakers, support organizations and homepreneurs themselves to improve the marketing strategic and socio economic conditions of homepreneurs in Thoothukudi. Primary and Secondary data was used in this study to collect data. The purposive sampling technique is adopted to select 120 respondents who are homepreneurs in city. The research highlights the importance of targeted financial support, training programs, and policy interventions to sustain and scale home- based businesses. Addressing gender disparities and enhancing resource accessibility will further empower homepreneurs, fostering inclusive economic growth. The findings serve as a foundation for future research on sustainable entrepreneurship model tailored to evolving socio-economic landscape.

KEYWORDS

Homepreneurs, Socio-economic conditions, Marketing strategy, Income levels and Social media marketing.

INTRODUCTION

The rise of entrepreneurship has transformed the economic landscape of India, with a growing number of individuals opting to start their own businesses. Homepreneurship, in

particular, has emerged as a significant trend, with many entrepreneurs operating small-scale businesses from the comfort to their own homes. Thoothukudi city, a coastal urban center in Tamilnadu, India, has witnessed a surge in homepreneurial activity in recent years, driven by factors such as increasing internet penetration, growing demand for local products and services, and the need for supplemental income.

In recent years, home-based entrepreneurship, popularly known as "homepreneurship," has emerged as a significant economic contributor, particularly in developing nations like India. This trend has been driven by various factors, including advancements in technology, the growth of e-commerce platforms, and the desire for flexible working conditions. Thoothukudi, often referred to as the "Pearl City" of Tamil Nadu, is known for its vibrant entrepreneurial culture, with many individuals turning to home-based businesses as a means of livelihood. This study aims to bridge this knowledge gap by exploring the socio-economic conditions and marketing strategies of homepreneurs in Thoothukudi city.

REVIEW OF LTERATURE

Dr. Manisha Sandip Shirsath (2022)¹Women Homepreneurship: Emergence of New Opportunities to become own boss in the business entrepreneur who operates from home is called as Homepreneur. Every person who is willing to work but cannot go outside and started his/her business from home itself is known as homepreneur. Nowadays, most of the women have become financially independent because of work from home concept. During Covid-19 period many of the women have lost their only support of the family is that the financial supporter of the family due

¹ Dr.Manisha Sandip Shirsath (2022) Women Homepreneurship:

Emergence of New Opportunities to become own boss ISSN 2277-7067
to which they were helpless at the start but later on they paced up themselves and used their skills as their strengths and started working and giving services from home.

Nair, Salini B and Aithal, P. S. (2023)²Impact of Digital Transformation Marketing Strategies on Homepreneur Business Practices in Kerala in this study the Home-based businesses are now recognized and valued as an important aspect of the microscale

business sector, resulting in an increased proportion of business start-ups. Technological advancements, particularly digitalization in the business world, have reimagined the term "homepreneur" in India. The researcher endeavors to analyze awareness about the concept of homepreneurs, the interrelationships between and factors contributing towards the effectiveness of digital transformation marketing strategies in homepreneur business in the districts of Mid – Kerala.

Ashlin Dsouza, & Niyaz Panakaje (2023)³ Factors Affecting Women Entrepreneurs' Success: A Study of Small and Medium-Sized Enterprises – A Review About the economy has been booming drastically. Multiple studies stand as shreds of evidence for the incompetent level of entrepreneurs in modern times amongst the chauvinistic group of people showing affection towards 9 to 5 job dominance and upbringing. The study focuses on analyzing different factors contributing to the booming of business performances and studying the research gap in this context.

Mohd Noor, Nurul Hidayana and Omar (2024)⁴ Analyzing training need of women homepreneurs: a pre-development of business workshop/ Nurul Hidayana Mohd Noor the women have played a significant role in the country's economic development. The objectives of the business workshop are to provide understanding and knowledge of starting and managing a business. The training development process is adapted from the ADDIE Model, which contains five phases: analysis, design, development, implementation, and evaluation. This study aims to analyze the training needs required by women homepreneurs. This study uses a qualitative approach, using interview techniques through purposive sampling. The study results deliver new

²Nair,SaliniBandAithal,P.S.(2023)Impact of Digital Transformation Marketing Strategies on Homepreneur Business Practices in Kerala ISSN: 2581-6012

³Ashlin Dsouza, & Niyaz Panakaje (2023) Factors Affecting Women Entrepreneurs' Success: A Study of Small and Medium-Sized Enterprises - A Review IJCSBE.2581.6942.0260

⁴Mohd Noor, Nurul Hidayana and Omar (2024) Analyzing training need of women homepreneurs: a pre-development of business workshop / Nurul Hidayana Mohd Noor ISSN 2550-1429

insights for training providers and organizers to plan appropriate training workshops to ensure the program's objective could be achieved.

Md. Ashikur Rahman and Md. Shahareyar Emon(2024)⁵Impact of Covid-19 on Socio- Economic Conditions of Paba Upazilla, Rajshahi, Bangladesh this study aims to assess the social and economic conditions of these areas, focusing on the impact of the COVID-19 pandemic. It also explores the region's physiography, weather, climate, water supply, sanitation, and land use patterns. In addition, the research examines the local education system, economic activities, and infrastructure, including transportation and rural marketing systems. The role of microcredit institutions and NGOs is also considered in the context of these socio-economic changes. Both government and non-government organizations, in collaboration with local authorities, have implemented various interventions to mitigate the effects of the pandemic and support the region's recovery and development.

STATEMENT OF PROBLEM

The era of homepreneur has transformed the entrepreneurial landscape in Thoothukudi, with many individuals opting to start and operate businesses from their homes. However, despite their growing presence, homepreneurs in Thoothukudi face numerous challenges in sustaining and growing their businesses, particularly in relation to their socio-economic conditions and marketing strategies. One of the primary concerns is the limited access to finance, which hinders their ability to grow and sustain their businesses. Additionally, inadequate infrastructure, such as poor transportation links, unreliable electricity supply and also a financial problem, can impede the operations of homepreneurs in Thoothukudi. Socio-cultural barriers, such as limited social networks and cultural expectations, can also restrict their ability to start and grow their businesses.

In terms of marketing, homepreneurs in Thoothukudi struggle to reach a wider market due to limited marketing resources and lack of access to digital marketing channels. Intense competition from established businesses and other homepreneurs makes it challenging to differentiate their products and services. Furthermore, homepreneurs in Thoothukudi

often lack the marketing expertise and knowledge required to develop effective marketing strategies and reach their target markets.

OBJECTIVES

- ❖ To examine the socio-economic profile of homepreneurs in Thoothukudi, including their demographic characteristics, education, income and occupation.
- ❖ To identify the marketing strategies adopted by homepreneurs in Thoothukudi, including their product offering, pricing, promotion and distribution channels.
- ❖ To investigate the challenges faced by homepreneurs in Thoothukudi, including access to finance market competition and regulatory hurdles.
- ❖ To examine the role of technology in enabling homepreneurs in Thoothukudi to market their products and services effectively.
- ❖ To provide recommendations for policymakers, support organizations and homepreneurs themselves to improve the marketing strategic and socio-economic conditions of homepreneurs in Thoothukudi.

SCOPE OF THE STUDY

The study focuses on homepreneurs operating in Thoothukudi city across various industries, including food production, crafts, and service-oriented businesses. It aims to provide insights into the socio-economic dynamics of these entrepreneurs and evaluate how their marketing strategies influence their business performance. The findings of this study will be beneficial for policymakers, development agencies, and aspiring homepreneurs. By addressing these aspects, the study seeks to contribute to the growing body of knowledge on entrepreneurship while providing actionable insights to support the growth of home-based businesses in Thoothukudi city.

Md.Ashikur Rahman and Md. Shahareyar Emon(2024)Impact of Covid-19onSocio-EconomicConditionsofPaba Upazilla, Rajshahi, Bangladesh

NEED OF THE STUDY

The socio-economic conditions and marketing strategies of homepreneurs is crucial for promoting entrepreneurship, empowerment, and economic growth. Understanding the demographics, challenges, and experiences of homepreneurs can help identify patterns and trends, recognizes socio-economic problems, and assess the impact of homepreneurship on livelihoods and empowerment. Analyzing marketing strategies can provide insights into effective promotion and sales techniques, informing support strategies and policy decisions. By examining the socio- economic conditions and marketing strategies of homepreneurs, researchers and policy makers can develop targeted interventions, promote entrepreneurship, and improve livelihoods, ultimately contributing to sustainable economic growth and development.

PERIOD OF THE STUDY

The study was carried out over from November 2024 to March 2025 and the study was carried in Thoothukudi city only.

METHODOLOGY

This section attempts to describe methodology of the present study. It is a systematic approach to solve research problem. A good research work requires a class scientific methodology it includes the research design collection of data analysis of data, sampling design and processing.

PRIMARY DATA

Primary data were collected by framing a questionnaire. A set of questionnaires was prepared and was given to selected Homepreneurs to know their views.

SECONDARYDATA

It is the information that already exists for another purpose. This refers to all those data which are collected through for some earlier research works, books, magazines, newspapers, journal, websites, internet etc.,

SAMPLE DESIGN

The data collected are original in nature. A sample of some respondents residing in various parts of Thoothukudi city was selected by convenient sampling techniques. The Questionnaire was used for collecting a great source of information.

LIMITATION

- Due to time constraint the most essential information has been taken for the study.

- The sample size in only 120 questionnaires were distributed.
- This study restricted only to Thoothukudi city. So the result cannot be generalized.

TOOLS APPLIED IN THE STUDY:

- Percentage Analysis
- Likert Scale
- Descriptive Analysis
- Independent Sample t-test

TABLE 4.1 DEMOGRAPHIC PROFILE

VARIABLES	NO.OF.RESPONSES	PERCENTAGE(%)
18-25	57	48
26-35	28	24
35-45	24	20
Above 46	11	10
Total	120	100
Male	46	41
Female	71	60
Total	120	100
High school	17	14
Undergraduate	64	53
Postgraduate	36	30
Professional course	3	3
Total	120	100
Unmarried	70	58
Married	47	39
Widowed	3	3
Total	120	100
Below 10,000	17	14
10,000-20,000	26	22
20,000-30,000	51	41
Above 60,000	26	22
Total	120	100

Source: Primary data

INFERENCE:

- The above table 4.1 depicts that 47.5% of the respondents are in the age group of 18- 25, 23.3% are of the age between 26-35, 20% of the respondents are of the age between 36-45, 9.2% of the respondents are of the age between above 46. Therefore, the majority i.e., 47.5% of the respondents are in the age group 18-25.
- The above table 4.2 shows that 59.2% of the respondents are female and 40.8% are male. Therefore, the majority i.e., 59.2% of the respondents are Female.
- The above table 4.3 shows that 14.2% of the respondents have completed their High school, 53.3% Undergraduate, 30% Postgraduate, and 2.5% Professional course. Therefore, the majority, i.e., 53.3% of the respondents have completed their Undergraduate.
- The above table 4.4 shows that 58.3% of the respondents are Married, 39.2% are Unmarried and 2.5% are Widowed. Therefore, the majority i.e., 58.3% of the respondents are Married.
- The above table 4.14 shows that 14.2% of the respondents are earning below Rs.10,000 per month, 21.7% of the respondents are earning Rs.10,000-20,000, 42.5% of the respondents are earning Rs.20,000-30,000, and another 21.7% of the respondents are earning above Rs. 60,000. Therefore, the majority of the respondents i.e., 42.5% of the respondents are earning Rs. 20,000-30,000 for per month. Therefore, It is evident that 42.5% of the respondents i.e., homepreneurs getting Rs. 20,000-30,000 as monthly revenue.

TABLE 4.

**TABLE SHOWING THE SOCIO ECONOMIC CONDITIONS ABOUT THE
HOMEPRENEURS**

VARIABLES	SD (1)	D (2)	N (3)	A (4)	SA (5)	NO.OF. RESPONDENTS	TOTAL WEIGHTED SCORE	AVERAGE TOTAL WEIGHTED SCORE	RANK
S1	1 (1)	3 (6)	28 (84)	60 (240)	28 (140)	120	471	3.925	II
S2	0 (0)	6 (12)	29 (87)	62 (248)	23 (115)	120	467	3.891	III
S3	1 (1)	6 (12)	37 (111)	51 (204)	25 (125)	120	453	3.775	V
S4	0 (0)	10 (20)	26 (78)	58 (116)	26 (130)	120	344	2.866	X
S5	6 (6)	9 (18)	19 (38)	61 (183)	25 (125)	120	370	3.083	IX
S6	4 (4)	16 (32)	22 (66)	54 (216)	24 (120)	120	438	3.65	VII
S7	4 (4)	14 (28)	26 (78)	45 (180)	31 (155)	120	445	3.708	VI
S8	2 (2)	10 (20)	15 (45)	70 (280)	23 (115)	120	462	3.85	IV
S9	0 (0)	10 (10)	21 (42)	56 (168)	33 (165)	120	385	3.208	VIII
S10	1 (1)	11 (22)	18 (54)	53 (212)	37 (185)	120	474	3.95	I

Computed source : Primary data

INFERENCE:

From the above table, majority 3.95 weighted score is the highest rank for managing the financial aspects of the business is ranked first, followed by 3.925 is the next level rated for satisfaction of their current monthly household income, 3.891 is ranked third a family support their decision to run a home based business, the average total weighted score 3.208 is ranked in eighth being an homepreneurs has improved socioeconomic status, 3.083 is ranked in ninth, and 2.866 is ranked in tenth that confident managing the financial aspects of business.

S1	I am satisfied with my current monthly household income?
S2	My family supports my decision to run a home-based business.
S3	The income from my business meet my personal and professional needs.
S4	Running a home-based business has improved my standard of living.
S5	I am able to save a portion of my income from my business.
S6	Running a business has boosted my confidence and self-esteem.
S7	The income generated from my business is stable throughout the year.
S8	Being a homepreneur has improved my socio-economic status.
S9	My business has allowed me to achieve financial independence.
S10	I feel confident managing the financial aspects of my business.

TABLE 4.3
TABLESHOWINGTHEMARKETINGSTRATEGYOFHOMEPRENEURS

Null Hypothesis H_0 -There is no significant difference between among Marketing strategy to develop the homepreneurs in order to enhance promotion for business.

Alternative Hypothesis H_1 -There is a significant difference between among Marketing strategy to develop the homepreneurs in order to enhance promotion for business.

Variable	SD	D	N	A	SA	Mean	Significance deviation
M1	2.5%	3.3%	14.2%	52.5%	27.5%	3.9917	.88399
M2	1.7%	8.3%	22.5%	48.3%	19.2%	3.7500	.91899
M3	8%	5.0%	15%	48.3%	30.8%	4.0333	.85929
M4	2.5%	7.5%	20%	46.7%	23.3%	3.8083	.96402
M5	1.7%	6.7%	21.7%	45%	25%	3.8500	.93170
M6	1.7%	14.2%	18.3%	45%	20%	3.6917	1.01083
M7	2.5%	8.3%	26.7%	37.5%	25%	3.7417	1.00833
M8	3.3%	9.2%	15.8%	52.5%	19.2%	3.7500	.98091
M9	4.2%	5.8%	18.3%	48.3%	23.3%	3.8083	.99828
M10	1.7%	6.7%	11.7%	46.7%	33.3%	4.03	.934

Computed source: Primary data

INFERENCE:

The above descriptive analysis reveals a generally positive response toward various marketing strategies for developing homepreneurs, with most respondents falling under the "Agree" and "Strongly Agree" categories across variables M1 to M10. The mean values reflect moderate to high agreement levels, while the significance deviation indicates relatively consistent responses with slight variability in a few variables. This suggests that different marketing strategies are perceived differently in their effectiveness, supporting the alternative hypothesis is that there is a significant difference among strategies to enhance business promotion for homepreneurs.

M1	I actively use social media to promote my business.
M2	My marketing efforts effectively reach my target customers.
M3	I regularly invest time and resource in improving my marketing strategies.
M4	Local markets and fairs are essential for promoting my products/services.
M5	I use innovative methods to attract customers to my business.
M6	Social media marketing has positively impacted my business.
M7	I find it easy to connect with customers through online platforms.
M8	Traditional marketing methods are more effective than digital marketing for my business.
M9	I receive sufficient customer feed back to improve my products/services.
M10	I provide discounts & offers to attract more customers.

TABLE 4.4
**TABLE SHOWING THE SOCIO-
ECONOMIC CONDITIONS OF HOMEpreneurs WITH GENDER**

Null Hypothesis H₀- There is no significant difference between socio economic condition and Gender disparities.

Alternative Hypothesis H₁-There is a significant difference between socio economic conditions and Gender disparities.

Variable	Gender	Mean	Standard Deviation	f	Significance
S1	Male	4.0204	.66112	5.499	.280
	Female	3.8592	.88311		.255
S2	Male	3.9388	.68945	2.930	.305
	Female	3.7887	.84372		.288
S3	Male	4.0000	.79057	3.174	.017
	Female	3.6197	.88425		.015
S4	Male	4.0408	.67575	11.372	.028
	Female	3.6901	.95006		.020
S5	Male	3.9184	.83757	9.055	.138
	Female	3.6338	1.13230		.117
S6	Male	3.8776	.88111	8.039	.048
	Female	3.4930	1.13230		.039
S7	Male	3.7755	1.12297	.098	.574
	Female	3.6620	1.12297		.578
S8	Male	3.9796	1.05483	5.629	.184
	Female	3.7606	.74972		.165
S9	Male	4.0816	.96310	3.112	.128
	Female	3.8310	.75930		.113
S10	Male	4.0408	.81545	4.958	.387
	Female	3.8873	1.03578		.367

Compute-Primary data

The independent sample t-test indicates a significant difference in the socio-economic conditions of homepreneurs based on gender disparities, as reflected by p-values below the standard significance values are 0.021, 0.003, 0.048 for certain variables. These results support the alternative hypothesis, suggesting that male and female homepreneurs experience varying socio-economic outcomes influenced by factors such as resource access, income stability, and societal norms. Addressing these gender-based disparities is essential for promoting equitable economic opportunities among homepreneurs.

It is evident from the above table that Null Hypothesis is rejected. Hence, Alternative hypothesis is accepted. There is a significant difference between Socio-economic conditions and Gender disparities.

S1	I am satisfied with my current monthly household income?
S2	My family supports my decision to run a home-based business.
S3	The income from my business to meet my personal and professional needs.
S4	Running a home-based business has improved my standard of living.
S5	I am able to save a portion of my income from my business.
S6	Running a business has boosted my confidence and self-esteem.
S7	The income generated from my business is stable throughout the year.
S8	Being a homepreneur has improved my socio-economic status.
S9	My business has allowed me to achieve financial independence.
S10	I feel confident managing the financial aspects of my business.

FINDINGS

- ❖ The majority (47.5%) of homepreneurs fall in the 18-25 age range, with 59.2% being female.
- ❖ The majority 60% of homepreneurs are female in Thoothukudi city.
- ❖ Most respondents (53.3%) hold undergraduate degrees.
- ❖ Majority 58% of the homepreneurs married.
- ❖ The majority (42.5%) earn between Rs. 20,000-30,000 per month.
- ❖ The highest-ranked variable (S10) has an average weighted score of 3.95, indicating that it is the most influential socio-economic conditions.
- ❖ Most of the marketing strategies received a mean score above 3.7, indicating that homepreneurs largely agree or strongly agree on their effectiveness in enhancing business promotion.
- ❖ Independent t-test showed significant gender disparities in socio-economic outcomes ($p < 0.05$).

SUGGESTION

- ❖ Government and financial institutions should offer low-interest loans and grants specifically tailored to homepreneurs.
- ❖ Conduct workshops focusing on digital marketing, particularly leveraging Instagram and WhatsApp for business promotion.
- ❖ Encourage participation in entrepreneurship programs that offer business training and networking opportunities to improve business operations.
- ❖ Initiatives like local fairs and exhibitions can help homepreneurs showcase their products, reducing competition pressure.
- ❖ Introduce time management tools and workshops to help entrepreneurs allocate resources effectively.
- ❖ Policymakers should prioritize creating supportive ecosystems that address gender disparities and promote equal opportunities.

CONCLUSION

The study underscores the growing significance of homepreneurship as a viable economic activity, driven by socio-economic needs, entrepreneurial passion, and the flexibility it offers. While social media emerges as a powerful marketing tool, competition and financial constraints remain notable barriers. The research highlights the importance of targeted financial support, training programs, and policy interventions to sustain and scale home-based businesses. Addressing gender disparities and enhancing resource accessibility will further empower homepreneurs, fostering inclusive economic growth. The findings serve as a foundation for future research on sustainable entrepreneurship models tailored to evolving socio-economic landscapes.

References:

1. **"Socio -Economic Background of Women Entrepreneurs in Thoothukudi District"** (ResearchGate): Focuses on how socio-economic factors influence women's entrepreneurial behavior and business policies in the district, relevant to your study's core.
2. **"A STUDY ON WOMEN ENTREPRENEURS IN THOOTHUKUDI DISTRICT"** (JETIR): Explores location preferences (near home for family, etc.) and business types (tailoring) for women entrepreneurs in Thoothukudi, touching on socio-economic factors.
3. **"Impact of Socio-Economic Factors on the Business Performance of Women Homepreneurs in Puducherry State"** (ACR): While Puducherry, its findings on age, marital status, spousal support, and digital access are highly transferable to Thoothukudi homepreneurs.
4. **"A study on Socio economic status of rural women entrepreneurs in micro enterprises with special reference to select districts of southern Tamil Nadu"** (Shodhganga Thesis): A broader thesis from Madurai Kamaraj University covering socio-economic aspects of rural women entrepreneurs in Southern TN, likely including Thoothukudi region.
5. **"A study on the problems encountered by the entrepreneurs in Thoothukudi district"** (ResearchGate): Identifies challenges like marketing, finance, and raw materials for local entrepreneurs, which apply to home-based businesses too.

AN ANALYSIS OF WORKING WOMEN BEHAVIOUR AND ADOPTION OF DIGITAL PAYMENT IN THOOTHUKUDI CITY

M.R.Rebec Benishaa,* and A.Saleth MaryVetriselvi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

An Analysis on working women behaviour and adoption of digital payment system in Thoothukudi city is the topic taken for research. Objectives of the Study is to analyse the demographic profile of working women adopting digital payment in Thoothukudi, to find out the challenges faced by working women in adopting digital payment system, to examine the satisfaction level of digital payment users of working women in Thoothukudi and to recommend a valuable suggestion for the working women in developing self-confidence and status in their life. Primary and Secondary data was used in this study to collect data. The purposive sampling technique is adopted to select 130 respondents who uses digital payments system. While digital payment adoption among working women is growing rapidly, addressing key challenges related to technical reliability, security, and accessibility will be crucial for long-term success. Financial institutions, technology providers, and policymakers must work together to enhance digital infrastructure, promote financial inclusion, and ensure a seamless, secure, and efficient digital payment experience. By implementing these improvements, digital payments can further empower working women, driving both economic growth and greater financial independence.

KEYWORDS:

Working Women, Behaviour, Adoption, Digital Payments, Thoothukudi

INTRODUCTION:

In recent years, the rise of digital payment systems has revolutionized the way financial transactions are conducted worldwide. This transformation is particularly evident in India, where government initiatives like Digital India and the proliferation of smartphones have significantly boosted the adoption of cashless payment methods. Among various user demographics, working women have emerged as a critical segment for understanding the impact and adoption of these technologies.

Thoothukudi, also known as Tuticorin, is a rapidly developing port city in Tamilnadu. With its diverse economy spanning industries such as shipping, manufacturing, and trade, the city is home to a growing population of working professionals. Among them, working women play a crucial role, contributing to household income while managing various professional and domestic responsibilities. This dual role positions them as a significant demographic for understanding behavioral patterns and the adoption of innovative financial technologies such as digital payment systems. The digital payment system has transformed the economic landscape globally, providing greater convenience, efficiency, and security in transactions. This shift is particularly significant in developing regions, where access to formal banking services can be limited. In Thoothukudi district, a coastal region in Tamil Nadu, India, the rise of digital financial services has coincided with an increase in the number of working women entering various sectors, ranging from traditional occupations to modern enterprises.

REVIEW OF LITERATURE:

Dr.K.Sindhura (2024)¹ Knowledge, Perception, Contributing Factors and Practices of Digital Mode of Payments among Working and Non-Working Women Digital payments often known as electronic payments are financial transactions which are cashless payments. This indicates that both the payer and the payee exchange money via electronic means. When compared with traditional payment methods, electronic payment transactions are made quickly. To promote and encourage digital payments in the nation, the Indian government has been implementing a number of actions. Individuals' Practices in adopting digital payment systems are influenced by their knowledge, perception and variety of factors, such as simplicity of use, value received, social impact, risk, and trust. It is important to understand the trends in the use of digital payments in different groups of people. Eighty participants took part in the study. To collect the data, a structured questionnaire was used. SPSS was used to perform both descriptive and inferential statistics. The findings show that working women (mean 4.25) have higher levels of awareness about digital transactions than non-workingwomen(mean3.67). Similarly, working women(mean4.71) have a more favorable perception of digital transactions than non-working women (mean 4.45).

The perception of digital payments is more favorable among working women. When compared to non-working women, the use of the digital mode of transactions is high among working women.

SitiHadijah Zulkifly¹, Wan Marhaini Wan Omar ² and Mohamad Nizam Jaafar

3(2024)² The Author(s) 2024 Integrated Payment Gateway Adoption by Women-Owned Micro, Small and Medium Enterprises (MSMEs) in Apparel Retail Sector: Scale Development and Validation. The digital economy offers a remarkable new opportunity for Malaysia to become a high-income nation when the digital payment landscape is expanding, and the e-commerce market is experiencing growth. It is supported by the advancement of payment gateway (PG) technology that revolutionized the digital payment solution which started with website. integration, progressed to social media, and evolved to just one payment link for entrepreneurs to receive online customer payments. Micro, small and medium enterprises (MSMEs) have shown an increasing interest in adopting PG system for their business. Hence, this study aims to develop an instrument that evaluates the items in the factors that influence the adoption of Integrated PG by woman-owned MSMEs in Malaysia's apparel retail sector. A pilot study was carried out on 108 woman-owned MSMEs in the apparel retail sector. Reliability was tested, and the result suggested an excellent internal consistency of the items. Confirmatory Factor Analysis was applied to assess the scale for validity, which indicated an acceptable model fit for the final scale. All 61 items showed good reliability and validity in examining the factors that influence the intention to adopt integrated PG service in the organizational setting of the apparel sector.

STATEMENT OF THE PROBLEM:

In the era of digital transformation payment system have evolved from traditional cash transaction to digital modes offering speed, convenience and enhanced financial security. Despite this advancement the adoption of the digital payment system is not uniform across demographic groups often influenced by factors like accessibility awareness and societal norms. In Thoothukudi city, working women constitute a significant segment of the workforce, Balancing professional and personal responsibilities. Their financial behaviours and preferences.

¹Dr. K. Sindhura (2024) Knowledge, Perception, Contributing Factors and Practices of Digital Mode of Payments among Working and Non-Working Women Digital payments

²SitiHadijahZulkifly¹,Wan Marhaini Wan Omar ² and Mohamad Nizam Jaafar³(2024)²The Author(s) 2024Integrated Payment Gateway Adoption by Women-Owned Micro, Small and Medium Enterprises play a critical role in household and economic decisions. The barriers influencing working women's behaviour towards digital payment systems. The socio-economic and psychological factors impact their willingness to adopt and use these systems and to overcome the challenges they face and enhance their adoption of digital payment technologies. However, their level of awareness, trust, and adoption of digital payment systems remains underexplored. Understanding the factors that drive or hinder working women in Thoothukudi from embracing digital payments is crucial for promoting inclusive digital financial services.

This study seeks to analyse the behaviour of working women in Thoothukudi city regarding the adoption of digital payment systems, exploring their motivations, challenges, and the impact of digital payments on their financial management practices. The statement of the problem is essential to ensure that digital payment solutions are inclusive and responsive to the needs of working women. Understanding their behaviour and challenges can help bridge the gap, promote financial inclusion, and empower this critical demographic to participate more fully in the digital economy.

OBJECTIVES:

- ❖ To analyse the demographic profile of working women adopting digital payment in Thoothukudi.
- ❖ To find out the challenges faced by working women in adopting digital payment system.
- ❖ To examine the satisfaction level of digital payment users of working women in Thoothukudi.
- ❖ To recommend a valuable suggestion for the working women in developing self-confidence and status in their life.

SCOPE OF THE STUDY:

The study seeks to find out the working women behaviour and adoption of digital payment in analyzing the factors and barriers that has be influenced by the working women's This study specifically focuses on working women across various

professions in Thoothukudi including those in corporate roles, small businesses, government services, and other sectors. The research includes an analysis of popular digital payment methods such as Unified Payments Interface (UPI), mobile wallets (e.g., Paytm, Google Pay, Phone Pe), internet banking, and contactless card payments.

NEED OF THE STUDY:

The need for this study stems from the growing importance of digital payment systems in modern financial transactions and the critical role of working women in both personal and house hold financial management. Despite the rapid adoption of digital payments in India, many working women face barriers such as limited digital literacy, security concerns, and socio- cultural challenges, particularly in semi-urban areas like Thoothukudi. Understanding their behaviour and adoption patterns is essential to bridge the gender gap in technology use, promote financial inclusion, and empower women economically. This study aims to provide localized insights to address these challenges and inform strategies for improving digital payment adoption among working women, ultimately contributing to broader financial and technological empowerment goals.

PERIOD OF THE STUDY:

This study is conducted for various classes of people who are scattered in different area like Lions town, Toovipuram, Therespuram, Millerpuram, State Bank Colony, Shamugapuram etc in Thoothukudi city (December2024- March2025)

METHODOLOGY:

This section attempts to describe methodology of the present study. It is a systematic approach to solve research problem. A good research work requires a class scientific methodology it includes the research design collection of data analysis of data, sampling design and processing.

COLLECTION OF DATA:

PRIMARY DATA:

Primary data is collected from 130 working women behaviour and adoption of digital payment system for collection of primary data and interview schedule was developed. A developed structure questionnaire was developed on the result of pre-testing it was made a sample of working women.

SECONDARY DATA:

It is the information that already exists for another purpose. This refers to all those data which are collected through for some earlier research works, books, magazines, newspapers, journal, website, internet etc.

SAMPLE DESIGN:

The data collected was original in nature. A purposive sampling technique was used to collect the data from 130 respondents residing in specific areas such as Lionstown, Therespuram, State Bank Colony, Millerpuram, Toovipuram and Shamugapuram of Thoothukudi City was selected. They framed a structured questionnaire was used for collecting a great source of information.

LIMITATION:

- ❖ This study focuses only on the behaviour and adoption of digital payment system among working women in specific areas of Thoothukudi city including Lionstown Toovipuram, Therespuram, Millerpuram, State Bank Colony, Shamugapuram etc
- ❖ The result of the study is not applicable to others regions of Thoothukudi.
- ❖ The sample size was restricted to 130 respondents due to time constraints.
- ❖ Data is collected through questionnaires personal bias is involved in the study.
- ❖ Time factor is the major limitation of the study.

TOOLS APPLIED IN THE STUDY:

- Percentage Analysis
- Likert5.5 Scale
- Descriptive Analysis
- Independent Sample t-test

TABLE4.1
DEMOGRAPHICPROFILE

VARIABLES	NO OFRESPONSES	PERCENTAGE
Below25yrs	27	21
25-35yrs	55	42
36-45yrs	32	25
Above45 yrs	16	12
Total	130	100
Single	38	29
Married	76	59
Divorced	7	5
Widowed	9	6.
Total	130	100
Lionstown	45	35
Shamugapuram	20	15
Statebank colony	11	9
Therespuram	35	27
Millerpuram	12	9
Toovipuram	7	5
Total	130	100
Christian	103	79
Hindu	21	16
Muslim	6	5
Total	130	100
Below₹20000	61	47
₹20001-₹40000	33	25
₹40001-₹50000	22	17
Above ₹50000	14	11
Total	130	100
High school	7	5
Undergraduate	23	18
Postgraduate	69	53
Professional	14	11
Phd	17	13
Total	130	100

Source: Primary data

INFERENCE:

- From the above data, majority 42% of the respondents are between the age group 25- 35 years of working women who adopts digital payment followed by 25% of the respondents belong to age group 36-45 years, 21% belong to below 25 years and 12% belong to above 45 years of age group among working women who adopts digital payments.

- Therefore, it is evident from the above table 42% of the respondents i.e. working women belong to the age group of 25-35 years.
- From the above data, majority 59 % of the respondents are married working women who adopts digital payment, followed by 29 % of the respondents are single working women who adopts digital payments, 7 % of the respondents are widowed working women and 5% of the respondents are divorced working women who uses digital payments. Therefore, It is evident from the above table that 59% of the respondents are married.
- From the above data, majority 35% of the respondents are residing in Lionstown area who adopts digital payment, followed by 27% of working women who adopts digital payments are situated at Therespuram area, 15% working women who adopts digital payments are situated at Shamugapuram area, 9% of the respondents adopts digital payments who adopts digital payment are situated at Millerpuram area and 9% of working women adopts digital payments are situated at State Bank Colony and 5% of the working women who adopts digital payments are situated at Toovipuram area. Therefore, the above table portrays that most of 35% of the respondents are residing in Lionstown.
- From the above data, majority of 79% of the respondents are belong to Christian religion who adopts digital payment, followed by 16% of the respondents are Hindu working women who adopts digital payments and 5% of the respondents are Muslim working women who adopts digital payments. Therefore, the above table clearly exhibits 79% of the respondents are belong to Christian religion.
- From the above table, majority 47% of the respondents comes under the income of Below ₹20000 who adopts digital payment, followed by 25% of the working women comes under income the of Rs 20001-40000, 17% of the respondents earn income around Rs 40001-Rs 50000 and 11% of the respondents earn monthly income Above Rs 50000 which leads in higher status.

- From the above table, majority 53% of the respondents are postgraduates who adopts digital payment, followed by 18% of the respondents are undergraduates who adopts digital payments, 13% of the respondents has completed PhD, 11% of the working women possess professional courses who uses digital payments and 5% of the respondents belong to high school who uses digital payment as a rarely required need. Therefore, the above table shows that 53% i.e post graduates are using or adopting digital payment systems.

TABLE4.2

TABLE SHOWING THE SATISFACTION LEVEL OF WORKING WOMEN

Variable	SD (1)	D (2)	N (3)	A (4)	SA (5)	NO OF RESPOND ENTS	TOTAL WEIGHTE DSCORE	AVERAG ETOTAL WEIGHT ED SCORE	RANK
S1	10 (10)	5 (10)	9 (27)	24 (96)	82 (410)	130	553	4.25	II
S2	4 (4)	7 (14)	17 (51)	60 (240)	420 (210)	130	519	3.992	V
S3	8 (8)	7 (14)	18 (54)	42 (168)	55 (275)	130	519	3.992	IV
S4	3 (3)	11 (22)	27 (81)	42 (168)	47 (235)	130	509	3.915	VII
S5	8 (8)	10 (20)	15 (45)	21 (84)	76 (380)	130	537	4.130	III
S6	5 (5)	6 (12)	9 (27)	36 (144)	74 (370)	130	558	4.292	I
S7	5 (5)	12 (24)	13 (39)	50 (200)	50 (250)	130	518	3.984	VI
S8	5 (5)	6 (12)	15 (45)	30 (120)	74 (370)	130	552	3.246	VIII

Computed source–primary data

INFERENCE:

From the above table, majority 4.292 weighted score for the aspect relating to reduce the need to carry cash is ranked first, followed by 4.25 is the next level rated for easy use as the second rank, 4.130 is ranked third for

encouraging discounts, 3.992 weighted score is for both the statement showing that feeling secured and technical issues is ranked as fourth and fifth based on the highest rating, 3.984 is ranked sixth on the aspect of complaints resolved quickly, 3.915 is ranked seventh for safe personal data and lastly 3.245 is ranked eight for the statement payments steps are straightforward and clear.

S1	Digital payments are easy to use
S2	I feel secure using digital payments
S3	Rarely faces technical issues
S4	Personal data is safe
S5	Discounts encourage usage
S6	Digital payments reduce the need to carry cash
S7	Complaints are resolved quickly
S8	Payment steps are straight forward and clear.

TABLE4.3

**TABLESHOWINGPROBLEMSFACEDINDIGITALPAYMENTWITH
COMPLETE KNOWLEDGE**

H0-Null Hypothesis: There is no significant difference between problems faced and complete knowledge in using digital payment.

HA - Alternative Hypothesis: There is a significant difference between problems faced and complete knowledge in using digital payment.

Variable	Complete knowledge	Mean	Standard Deviation	f	Significance value
P1	YES	4.1301	1.10111	.659	.418
	NO	3.4286	1.39728		
P2	YES	3.4791	1.17592	11.167	.001
	NO	3.8571	.37796		
P3	YES	4.1138	1.01790	.002	.969
	NO	4.4286	1.13389		
P4	YES	3.7313	1.02488	.152	.698
	NO	4.1429	.89974		
P5	YES	3.0244	1.46244	5.564	.020
	NO	3.5714	.78680		
P6	YES	3.7967	1.67092	.640	.425
	NO	3.8571	.89974		
P7	YES	3.9919	1.10510	.123	.727
	NO	3.7143	1.38013		
P8	YES	3.1057	1.56715	2.696	.103
	NO	3.7143	1.38013		

Computed source–primary data

INFERENCE:

The above table shows that Significance Value for the statement transaction takes too long & complicate to use with 0.01&0.020 is less than 0.05. Hence, Null Hypothesis is rejected and conclude by accepting that there is a significant difference between satisfaction of working women with complete knowledge in using digital payment. In contrast, the table shows Sig. value as 0.418, 0.969, 0.698, 0.425, 0.727, 0.103 for the statements poor internet affects transaction, additional charges, fear of fraud or hacking, worry about the safety, difficulty in obtaining help from banks, high cost of internet are greater than 0.05. Hence, Null Hypothesis is accepted and

conclude that there is no significant difference in satisfaction level of working women with complete knowledge in using digital payment.

P1	Poor internet connectivity affects transactions
P2	Resolving failed transactions takes too long
P3	Additional charges for some digital payment methods are a concern
P4	Fear of fraud or hacking discourages me from using digital payments
P5	Digital payment systems are complicated to use
P6	I worry about the safety of my financial data
P7	I experience difficulty in obtaining help from banks for digital payment- related issues
P8	High cost of internet plans discourages me from frequent use.

TABLE4.4

TABLE SHOWING SATISFACTION LEVEL INVOLVED IN ADOPTING DIGITAL PAYMENT SYSTEM

H0- Null Hypothesis: There is no significant difference among satisfaction level involved in adopting digital payment system.

HA-Alternative Hypothesis: There is a significant difference among satisfaction level involved in adopting digital payment system.

Variable	SD	D	N	A	SA	Mean	Significance deviation
S1	7.7%	3.8%	6.9%	18.5%	65%	4.2538	1.22197
S2	3.1%	5.4%	13.1%	46.2%	32.3%	3.9923	.9764
S3	6.2%	5.4%	13.8%	32.3%	42.3%	3.9923	1.15803
S4	2.3%	8.5%	20.8%	32.3%	36.2%	3.9154	1.65680
S5	6.2%	7.7%	11.5%	16.2%	58.5%	4.1308	1.24756
S6	3.8%	4.6%	6.9%	27.7%	56.9%	4.2923	1.04508
S7	3.8%	9.2%1	10.0%	38.5%	38.5%	3.9846	1.09957
S8	3.8%	4.6%	11.5%	23.1%	56.9%	4.2462	1.07877

Computed source–primary data

INFERENCE:

The above descriptive analysis table indicates the level of satisfaction among

respondents regarding various statements involved in adopting digital payment systems. The statement "reduces the need to carry cash" has the next highest mean score, 4.2923, with the highest percentage of 56.9%, indicating that this factor plays a crucial role. The statement "easy to use" has the highest mean score, 4.2538, with the highest percentage of 65%, indicating the greatest satisfaction in the appeal of digital payment systems. In contrast, complaints resolved quickly 3.9846 and safe personal data (3.9154), with the highest percentages of 38.5% and 36.2%, indicate the least satisfaction among working women adopting digital payment systems. Hence, I conclude that overall satisfaction levels are relatively high, but certain statements may need further investigation to enhance the digital payment experience.

S1	Digital payments are easy to use
S2	I feel secure using digital payments
S3	Rarely faces technical issues
S4	Personal data is safe
S5	Discounts encourage usage
S6	Digital payments reduce the need to carry cash
S7	Complaints are resolved quickly
S8	Payment steps are straightforward and clear.

FINDINGS

- The majority 42.3% of digital payment users are aged between 25-35 years.
- The majority 58.5% of married women are the largest group adopting digital payments.
- Majority 34.6% of the digital payment users belong to Lions town area.
- Majority 79.2% of the digital payment users belong to Christianity.
- Majority 62.3% of digital payment users work in private organization.
- Majority 53.1% of digital payment users are postgraduates.
- Majority 4.292 weighted score for the aspects relating to reduce the need to carry cash is ranked first. Hence the study finds digital payment system is

- an easy source of budgetary control by women.
- Table showing independent t-test shows significant value for transaction speed 0.01 and complicate to use 0.020 showed a significant difference, compare to those other variables such as, poor internet 0.418, additional charges 0.969 needs better analysis to make it comfortable for the users.
- The most critical factors influencing satisfaction include security confidence (Mean value of 4.29), ease of use (Mean value of 4.25), and reduced need for cash (Mean value of 4.13) with highest rank compared to other variables indicating positive growth among working women.

SUGGESTIONS:

- **Challenges Faced by Working Women in Digital Payment Adoption**

Security and fraud concerns, Lack of access to smartphones and internet connectivity
Technical issues and usability challenges, Socio-cultural barriers and resistance to change.

- **Strategies to Improve Digital Payment Adoption Among Working Women**

Financial and digital literacy programs, enhancing trust through security measures,
Government and banking sector initiatives to promote digital payments,
Customizing digital payment solutions for women.

CONCLUSION:

Digital payment adoption among working women is growing rapidly, addressing key challenges related to technical reliability, security, and accessibility will be crucial for long-term success. Financial institutions, technology providers, and policymakers must work together to enhance digital infrastructure, promote financial inclusion, and ensure a seamless, secure, and efficient digital payment experience. By implementing these improvements, digital payments can further empower working women, driving both economic growth and greater financial independence.



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Challenges Faced by Sports Women in Thoothukudi City

Renuga Devi .M *and T.Priyanka

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Women in sports face numerous challenges globally, and Thoothukudi city is no exception. Despite growing awareness and participation, sportswomen in Thoothukudi encounter various obstacles that hinder their progress. This study explores the key challenges faced by female athletes in the region, including societal stereotypes, lack of infrastructure, financial constraints, inadequate coaching, and limited media coverage. Cultural barriers often discourage women from pursuing sports as a career, while insufficient sponsorship and support reduce opportunities for professional growth.

The primary objective of this study is to identify societal and cultural barriers affecting sportswomen's participation. The methodology followed for collecting the data in simple random sampling from 120 respondents Thoothukudi City through a structured questionnaire distributed via Google Forms. The collected data were analysed using statistical tools, including percentage analysis and graphical methods like, pie charts, Likert scales, and the Chi-square test.

KEY WORDS

Women in sports, gender discrimination, societal barriers, infrastructure challenges, financial constraints,

INTRODUCTION

Women were confined at home to be a full-time housewife and their spouse were the single bread-winner for the family. It Has become a mind frame for the public that women should not be allowed to work as their primary roles were to carry out domestic Role and nurture their children. However, women certainly have their hidden potentials which make them capable as the opposite sex. Women should be allowed to work. This can be proven through intensive research and analysis.

Based on the research that was Conducted, some discoveries were made. Foremost, working women are found to have improvised self-esteem and emotional health Due to their multiple roles in everyday lives. Next, job has secured them financially to sustain life. Last of all, women have their rights to step into labour force for personal satisfaction and social

necessities. People have to perceive in wider context and accept the fact That women should be allowed to work as women can mould their lives with a sense of empowerment. Discrimination and inequality Towards women should be stamped out to preserve their rights for them to unleash their concealed potentials.

The primary objective includes:

- To identify societal and cultural barriers affecting sportswomen's participation.
- To examine the impact of gender stereotypes on sportswomen's careers.
- To investigate the prevalence of sexism and harassment in sports.
- To analyse the effects of unequal pay and sponsorship on sportswomen's livelihoods.
- To explore the role of media representation in shaping public perceptions of sportswomen.

MATERIALS AND METHODS

MATERIALS USED

Baghel, B. K. (2021), "Comparative study of personality among unmarried and married female athletes", the purpose of this study was to compare married and single female athletes' personality attributes. It was predicted that married and single female athletes would differ significantly in their personality features, 400 (200 single and 200 married) female athletes from various sports and Indian states were chosen at random to compete in the Masters Championship (married athletes only) and the Open National Games or All India Intervarsity Games for two years in a row. The individuals' ages ranged from 20 to 35. The 44- item Big Five Personality Inventory was the instrument used to gather the data. The Mann-Whitney U test and the independent t-test were used to analyse the data. It is possible to conclude from the data that married female athletes are more outgoing, while single female athletes are more conscientious, open, agreeable, and neurotic. It should be mentioned that the current study was only a comparison, and more research will be required to determine how athletes truly understand their behaviour in competitive sports settings. Once more, more investigation is required to determine the true cause of the differences and similarities found in this study. To maximize the experience of participation in sports and exercise activities, coaches and players may find it helpful to elaborate on this information.

Armendáriz, M. L. (2023). "Anthropometric characteristic, somatotype, and body composition of Indian Female Combat Sport Athletes: A comparison between Boxers, Judokas, and Wrestlers", this study aimed to discover the anthropometric traits of Indian female combat athletes as well as compare and ascertain the somatotypes of these athletes that are peculiar to their sport (wrestling, judo, and boxing). Ninety-nine female combat sports athletes at the national level-40 boxers, 25 judokas, and 34 wrestlers who participate in regular national and international events were included in the study. Measurements of body mass, stature, seven skinfold locations, three girths, and two breadths were taken using anthropometry. Additionally, somatotypes for each participant were determined. Pairwise comparison analysis was used to statistically analyse all measurements, and group differences were also examined. There were notable variations in the mean BMI between boxing and judo. The unique demands of each sport may be the reason for the notable variations in anthropometric traits found in the somatotypes of Indian female combat athletes. Coaches and practitioners should take into account sport-specific training plans that take into account the anthropometric traits and somatotypes of female athletes who compete in boxing, judo, and wrestling.

METHODOLOGY

Data was collected from both primary and secondary data. Primary data was collected from the respondents by means of questionnaire. Secondary data was collected from the magazines, journals and websites. The collected data were analysed by using the following statistical tools namely percentage analysis and graphical method like pie charts, Likert scale and Chi square test.

TABLE 1 Societal barrier

Societal barrier	Frequency	Percent
Lack of infrastructure	30	25
Traditional gender roles	50	41
Financial constraints	21	19
All the above	19	15
Total	120	100

Source: Primary Data

INFERENCE

The above table infers that 25% of the respondents consider lack of infrastructure as societal barrier , 41% consider traditional gender roles , and remaining 19% consider all the above as societal barrier

Thus, majority of the respondents i.e., 41% consider traditional gender roles as societal barrier

Table 2
Discouraging cultural factor

Discouraging cultural factor	Frequency	Percent
Family support	30	25
Social media influence	50	41
Societal expectations of femineity	21	19
Government initiatives	19	15
Total	120	100

Source: Primary data

INFERENCE

The above table infers that 69% of respondents consider family support as discouraging cultural factor , 41% consider social media influence as discouraging cultural factor, 19% consider Societal expectations of femineity and remaining 15% consider government initiatives

Thus, majority of the respondents i.e., 41% consider social media influence as discouraging cultural factor.

Consequences of unequal sponsorship	Frequency	Percent
Limited career opportunities	44	37
Reduced media coverage	45	38
Decreased financial support	31	25
Total	120	100

Table 3 Consequences of unequal sponsorship

Source: Primary data

INFERENCE

The above table infers 37% of the respondents consider limited career opportunities a consequence of unequal sponsorship, 38% as reduced media coverage and remaining 25% decreased financial support.

Thus, majority of the respondents i.e., 38% as reduced media coverage as consequences of unequal sponsorship.

Table 4

Chi-square test for limiting norms and harassment in sports

Null Hypothesis (H₀):

There is no significant association between limiting norms and harassment in sports.

Alternative Hypothesis (H₁):

There is a significant association between limiting norms and harassment in sports.

Observed Value

Opinion	Yes	No	Total
Yes	73	15	88
No	21	11	32
Total	94	26	120

Expected value

Opinion	Yes	No	Total
Yes	68.9	19.1	88.0
No	25.1	6.9	32.0
Total	94	26	120

	Value	df	Significance
Pearson Chi-Square	4.152 ^a	1	.042

Inference:

Since the p-value (0.042) is less than the commonly used significance level of 0.05, we reject the null hypothesis (H_0). This indicates that there is a statistically significant association between limiting norms and harassment in sports.

RESULTS

- ⇒ The majority of the respondents i.e., 41% consider traditional gender roles as societal barrier.
- ⇒ The majority of the respondents i.e., 41% consider social media influence as discouraging cultural factor.
- ⇒ The majority of the respondents i.e., 38% as reduced media coverage as consequences of unequal sponsorship.
- ⇒ There is a statistically significant association between limiting norms and harassment in sports.

CONCLUSION

This project's primary goal is to address the obstacles that women athletes encounter that prevent them from participating, advancing, and succeeding in the sports world. Inadequate resources, societal preconceptions, lack of representation, gender discrimination, and unequal chances have all been persistent challenges for female athletes. Even with notable advancements in gender equality in sports, these issues still exist, and multiple stakeholders must work together to properly solve them. A diversified strategy is required to address the issues that female athletes encounter. To guarantee fair treatment and opportunities for female athletes, efforts must be made to confront and eliminate gender biases in sports organizations. Education and awareness programs are crucial in combating stereotypes and promoting gender equality in sports. By challenging societal perceptions of women's capabilities in athletics, progress can be made towards creating an environment where female athletes are valued and respected for their athletic abilities rather than their gender.

REFERENCE

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A STUDY ON CONSUMER PREFERENCE FOR HIMALAYA PRODUCTS

Rinisha.E * and P. Bhanumathi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Consumer preference plays a crucial role in purchasing decisions, as it reflects individual choices influenced by factors such as quality, price, branding, and product attributes. This study focuses on understanding consumer preferences for Himalaya products, particularly in Thoothukudi City, Tamil Nadu. The research aims to analyze the satisfaction level of consumers, the factors influencing their choice, and the reasons for switching to Himalaya products from other brands. The study uses a survey-based approach, collecting primary data from 120 respondents through a structured questionnaire. The results highlight that most consumers prefer Himalaya products due to their natural ingredients, affordability, and trust in the brand. The findings provide insights into consumer behavior and offer recommendations for product improvement and marketing strategies.

KEY WORDS: Consumer preference, Himalaya products, purchasing behavior, natural ingredients, affordability.

INTRODUCTION

Consumer preference is defined as the subjective taste of individual consumers, often measured by their satisfaction after purchasing an item. This satisfaction is influenced by multiple factors, including quality, price, branding, product availability, and advertising. Consumer choices are also shaped by social, cultural, and economic factors, which determine their purchasing decisions.

Himalaya, a well-known brand specializing in herbal and ayurvedic products, has gained popularity due to its focus on natural ingredients and consumer-friendly pricing. Various Himalaya products, including skincare, hair care, healthcare, and oral care items, are widely used across India. Understanding the consumer preference for these products can provide valuable insights into market trends, consumer expectations, and factors that influence product selection.

This study aims to analyze consumer preferences for Himalaya products in Thoothukudi City, Tamil Nadu. It explores the factors influencing purchasing decisions, levels of consumer

satisfaction, and reasons for brand loyalty or switching from other brands. The research findings will help manufacturers and marketers develop better strategies to enhance consumer engagement and product offerings.

STATEMENT OF THE PROBLEM

With various brands available in the market, consumers prefer products based on different factors such as quality, pricing, packaging, and promotional offers. Himalaya products have gained a strong consumer base due to their herbal and natural composition. However, consumer preferences and purchasing behaviors vary based on individual expectations and experiences.

This study investigates consumer preferences for Himalaya products in terms of quality, price, and effectiveness compared to other brands. It aims to identify key factors influencing consumer choices and satisfaction levels. Understanding these aspects will help the company strengthen its market position and align its products with consumer expectations.

OBJECTIVES OF THE STUDY

- 1) To assess the satisfaction level of consumers towards Himalaya products.
- 2) To identify the reasons why consumers, switch to Himalaya products from other brands.

RESEARCH METHODOLOGY

The collected information is placed in a logical sequence to study about the consumers preference towards the usage of Himalaya Products. The result is derived with the help of statistical method of collection, computation and analysis. The collected data were analysed by using the following statistical tools namely, percentage analysis and graphical methods like bar diagram, pie charts and ranking method.

LIMITATIONS OF THE STUDY

1. The samples have been taken only from 120 respondents.
2. Accuracy of the study is purely based on the information given by the respondent.
3. Data obtained was dependent on the memory and mood of the respondents; this could bring about a bias in the survey.
4. The respondents views and opinions may hold good for the time being and may vary future.

LIKERT SCALE

Satisfaction	LIKERTSCALE								
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	No. of Respondents	Weighted Score	Average Score	Ranking
I am satisfied with the quality of Himalaya products	41 205	48 192	31 93	0	0	120	490	4.08	I
Himalaya products meet my expectations for natural and herbal ingredient	30 150	67 268	22 66	1 2	0	120	486	4.05	II
Himalaya products are reasonably priced	36 180	47 1888	35 105	2 4	0	120	477	3.97	VII
I find Himalaya products to be effective in addressing my needs	26 130	64 256	26 78	4 8	0	120	472	3.93	VIII
The packaging oh Himalaya products is attractive and user – friendly	32 160	47 188	40 120	1 2	0	120	470	3.92	IX
Himalaya products are easily available in	33 165	57 228	27 81	3 6	0	120	480	4.00	VI



the market									
I trust the Himalaya brand for its natural and safe ingredients	40 200	49 196	20 160	1 2	0	120	458	3.82	X
Himalaya products offer good value for money	30 150	63 252	26 78	1 2	0	120	482	4.02	III
I would recommend Himalaya products to my family and friends	28 140	67 268	24 72	1 2	0	120	482	4.02	III
Overall I am satisfied with Himalaya as a brand .	37 185	59 236	23 69	1 2	0	120	492	4.1	V

SATISFACTION TOWARDS HIMALAYA PRODUCTS

INFERENCE:

The table shows that satisfaction towards Himalaya products. From the above table, it is inherent that majority of the respondents “satisfied with the quality of Himalaya products” and hence first rank was given with the highest average score of 4.08 percent of the brand. packaging Himalaya products meet my expectations, offer good value for money, recommend to my family and friends, satisfied as a brand, easily available in the market, reasonably priced effective in addressing my needs, of products is attractive, trust for its natural safe ingredients ranked as II, III, IV, V, VI, VII, VIII, IX and X respectively.

Hence it is inferred the ranking that the majority of the consumers are “satisfied with the quality of Himalaya products “and it was given 1st rank with the highest average score of 4.08 percent.

INDEPENDENT SAMPLE T TEST

COMPARING THE REASONS FOR SWITCHING HIMALAYA PRODUCTS BETWEEN MALE AND FEMALE

NULL HYPOTHESIS (H0): There is no significant relationship with age and reasons for switching Himalaya products.

ALTERNATIVE HYPOTESIS (H1): There is a significant relationship with age and reasons for switching Himalaya products.

Reasons	Male Mean Rank	Female mean Rank	Male Standard Deviation	Female Standard Deviation	T- Value	P Value
I switched Himalaya products they contain natural and herbal ingredients.	4.2941	4.5362	.60973	.58359	-2.204 -2.190	.804
I found Himalaya products to be safer for my skin and health compared to other brands.	4.1765	4.0145	.81746	.65288	1.206 1.167	.001
The price of Himalaya products is more affordable to other brands.	4.0196	4.1594	.73458	.71995	-1.043 -1.039	.501
I switched because I experienced better results with Himalaya products.	4.1569	4.1159	.75822	.71817	.301 .299	.279
Recommendations from friends and family influenced me to switch to Himalaya.	4.1569	4.2319	.64413	.73053	-.584 -.596	.294



Advertisements and promotions encouraged me to try Himalaya products.	4.2157	4.1884	.75667	.75294	.196 .196	.793
Himalaya's reputation as a trusted and well-established brand influences my decision	4.1600	4.1739	.63809	.72673	-.110 -.112	.185
I switched because Himalaya products are more easily available in stores or online.	4.2549	4.1884	.84482	.67028	.481 .464	.042
I wanted to switch to a brand that aligns with a natural and eco – friendly lifestyle	4.1765	4.1304	.74043	.63969	.364 .356	.203
Dissatisfaction with the previous brand led me to try Himalaya products	4.1373	4.1884	.69339	.77223	-.374 -.381	.125

INFERENCE

- The mean rank for female (4.5362) is slightly higher than that of male (4.2941) T - value: – 2.204, P - value: .804 Since the p – value is greater than 0.05 hence the null hypothesis is accepted. This means there is no significant difference between male and female consumers in their reasons to switched Himalaya products because they contain natural and herbal ingredients
- The mean rank for male (4.1765) is slightly higher than that of female (4.0145) T- value: 1.206, P - value: .001 Since the p – value is less than 0.05, hence the null hypothesis is
-

- rejected, there is no significant difference between male and female in their found Himalaya products to be safer for my skin and health compared to others
- The mean rank for female (4.1594) is slightly higher than that of male (4.0196) T- value: - 1.206, P value: .501 Since the p- value is greater than 0.05 hence the null hypothesis is accepted. This means there is no significant difference between male and female consumers the price of Himalaya products is more affordable than other brands.
- The mean rank for male (4.1569) is slightly higher than that of female (4.1159) T- value: .301, P - value: .279 Since the p – value is less than 0.05, hence the null hypothesis is rejected, there is no significant difference between male and female experienced better results with Himalaya products.
- The mean rank for female (4.2319) is slightly higher than that of male (4.1569) T- value: .584, P - value: .274. Since the p -value is greater than 0.05 hence the null hypothesis is accepted. This means there is no significant difference between male and female consumers recommendations from friends and family.
- . The mean rank for male (4.2157) is slightly higher than that of female (4.1884) T- value: .196, P - value: .793 Since the p - value is greater than 0.05 hence the null hypothesis is accepted. This means there is no significant difference between male and female consumers advertisements and promotions to try Himalaya products.
- The mean rank for female (4.1739) is slightly higher than that of male (4.1600) T value: - .110, P - value: .185 Since the p - value is greater than 0.05 hence the null hypothesis is accepted. This means there is no significant difference between male and female trusted and well-established brand influenced decision.
- The mean rank for male (4.2549) is slightly higher than that of female (4.1884) T -: value .481, P - value: .042 Since the p - value is less than 0.05, hence the null hypothesis is rejected, there is no significant difference between male and female easily available in stores or online.
- The mean rank for male (4.1765) is slightly higher than that of female (4.1304) T- value: .364, P - value: .203 Since the p – value is greater than 0.05, hence the null hypothesis is accepted, there is no significant difference between male and female switch to a brand with a natural and eco friendly lifestyle.
- The mean rank for female (4.1884) is slightly higher than that of male (4.1373) T - value: - .374 P - value: .125 Since the p - value is greater than 0.05, hence the null hypothesis is

accepted, there is no significant difference between male and female dissatisfaction with the previous brand.

FINDINGS

- Majority 45 percent of the respondents have influenced to buy products due to natural ingredients.
- Majority 43 percent of them have obtained information about Himalaya products through social media.
- Majority 61 percent of respondents felt that the price of Himalaya product is reasonable.
- The study reveals that 52 percent of respondents most preferred product is skin care.
- The study reveals 43 percent of respondents have been switching to Himalaya products through advertising.

SUGGESTIONS

- Since social media is the primary source of information for most respondents, Himalaya should focus more on digital marketing and influencer collaborations
- The majority of consumers purchase Himalaya products due to their natural ingredients. The company should emphasize this aspect through packaging, advertisements, and customer testimonials
- Although most respondents find Himalaya products readily available, further expansion in rural areas could improve accessibility.
- Since a majority of respondents consider Himalaya products reasonably priced, maintaining competitive pricing while ensuring quality will help retain customers.
- Skin care products are the most preferred category. Expanding product lines within this category or introducing new herbal-based products could attract more customers.

CONCLUSION

This study provides a clear understanding of consumer preferences for Himalaya products. The majority of users are young (21-30 years old), female, and reside in urban areas. Most consumers prefer Himalaya products due to their natural ingredients and perceive them as effective and reasonably priced. Skincare products, especially face wash, are the most popular.

Social media and advertisements play a crucial role in influencing purchase decisions, and most users buy both online and offline. While product availability and pricing are considered good, continued focus on maintaining quality, affordability, and strong marketing efforts will help sustain consumer satisfaction and brand loyalty.

WEBSITES:

- <https://himalayawellness.in/pages/milestones>
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CONSUMERS PREFERENCE AND ATTITUDE TOWARDS USING OF PURPLE APP IN THOOTHUKUDI

Riya R, * and P. Maria Sahaya Rossiyana

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

With digital platforms like Purple providing customers with a quick and customised purchasing experience, the beauty and personal care business has undergone a transformation due to the rapid expansion of e-commerce. In Thoothukudi, a developing online cosmetic retail industry, this study investigates user preferences and attitudes towards the Purple app. The study uses a structured poll to look at things like product variety, cost, simplicity of use, and special offers that affect adoption. The survey also looks into user satisfaction, trust, and difficulties encountered when using the app. The results shed light on user behaviour by identifying the main factors that influence and hinder customer engagement. In the context of e-commerce, this study also looks at how cultural elements, brand trust, and digital literacy affect consumer behaviour. The findings contribute to a deeper understanding of consumer dynamics in tier-2 cities by providing Purple with important implications for customising its services and marketing tactics to better suit the requirements and expectations of customers in Thoothukudi.

KEYWORDS

Consumer preference, Purple app, Consumer behaviour, Beauty, Attitude

INTRODUCTION

The cosmetics industry is a vibrant, constantly changing field that is essential to improving one's own appearance, health, and general well-being. The vast array of items available in the cosmetics sector, ranging from skincare products to makeup, hair care, and perfumes, meets the needs, tastes, and concerns of a wide spectrum of consumers. The need for creative, superior, and environmentally responsible beauty products is continuously growing as consumers become more sensitive of ingredients, ethical issues, and sustainable processes.

The ancient Greek term "kosmētikos" is where the word "cosmetics" originates. In

essence, "kosmos" implies "order," "ornament," and "decorate." Only substances that are meant to come into external touch with the human body—such as skin, nails, hair, and teeth— can be classified as cosmetics. Over the course of thousands of years, cosmetics have been used in many different cultures and civilisations. From straight forward natural components to intricate concoctions, the use of beauty products has long been a fundamental aspect of human culture, social identity, and self-expression. The history of cosmetics encompasses not just beauty and aesthetics but also social and cultural.

India will rank among the top 5 worldwide markets in terms of revenue by 2030 and account for 8% of the global cosmetics market. Over the past three to four years, India's online industry for buying cosmetics has grown rapidly due to the country's growing internet usage. A few vertical specialists have been drawn to this sector, such as Amazon, Nykaa, and others. The Purpille app provides a large selection of beauty items. Its online store offers a wide range of 10,000 products and an accurate selection of more than 70 international beauty brands. Recently, a global beauty store was introduced through the Purpille app.

A number of elements, including the variety of cosmetic items offered, personalised recommendations, easy app navigation, and special offers, influence consumer preferences for Purpille. The app appeals to a wide range of users since it provides a large assortment of skincare, makeup, hair care, and wellness goods from both high-end and low-end companies.

In Modern Era with ongoing innovation in products, formulations, and marketing strategies, the cosmetics industry has become one of the biggest and most influential sectors in the global economy. The emphasis on sustainability, inclusivity, health, and wellness has shaped a new era of beauty that embraces individuality and self-expression, looking beyond conventional standards. The industry has also been further transformed by social media platforms such as YouTube and Instagram, where makeup artists and beauty influencers are setting trends and fostering a globalised beauty culture.

STATEMENT OF THE PROBLEM

Although there are numerous beauty products on the market right now, each consumer may have a different preference for a certain brand. The market for Purpille app brands and products is growing daily, and these products have a promising and lucrative future. Purpille app brands and products are well-known worldwide for their exceptional

quality and cost- effectiveness.

Well-known businesses are trying to create more distinctive goods. We face countless challenges when we enter the realm of online shopping. Another more well-known platform that currently reaches millions of people globally is the Purplle app.

The goal is to investigate consumer preferences and attitudes regarding online purchases made using the Purplle app, as well as the factors that impact these decisions.

Understanding consumer behaviour with regard to the acquisition, use, and disposal of cosmetics in Purplle app—including brand loyalty, impulsive shopping, and sustainability considerations—is known as consumer behaviour and purchasing patterns.

Many well-educated people who are also actively using their phones utilize the Purplle app. The goal of this project is to determine the true needs of customers and their preferences for the Purplle app in order to assess the elements that affect their decision to buy a specific brand.

OBJECTIVES:

1. To study about the buying behaviour of the consumers.
2. To analyse the quality of the product available in the Purplle app.
3. To examine about the availability of products provided at Purplle app.
4. To examine the satisfaction level of the consumers.

RESEARCHMETHODOLOGY

Sampling design	Random sampling method
Period of study	December2024 –March2025
Data used	Primary data and Secondary data
Test for analysis	Percentage analysis, Likert scale, Garrett ranking, Chi-square test and Descriptive analysis

LIMITATIONS OF THE STUDY

- Time is the major constraint while doing surveys.
- Out of 110 samples taken, only 100 of them filled in the questionnaire.
- Some respondents would not have given true information; this may not give accurate results.
- Only the most essential information has been studied.

RESULTS AND DISCUSSIONS

TABLE NO:1

SATISFACTION ON PURCHASING OF BRAND

Response	No. of Respondents	% of Respondents
Yes	96	96.0
No	4	4.0
Total	100	100.0

Source: Primary Data

Inference:

From the above table it is inferred that 96% of them satisfied and 4% of them do not satisfied. Thus, more than half the respondents i.e., 96% of them satisfied with the brand they purchase.

TABLE NO: 2 QUALITY LEVEL OF PRODUCTS

Quality level	No. of Respondents	% of Respondents
Best	35	35.0
Good	45	45.0
Satisfied	20	20.0
Total	100	100.0

Source: Primary

Data Inference:

From the above table it is inferred that 35% have chosen best, 45% good and 20% satisfied about the quality of the product. Thus, majority of the i.e., 45% of the respondents think

that the quality of product is good after purchasing.

TABLENO:3 USED SKIN CARE

Brands	No. of Respondents	% of Respondents
Mamaearth	29	29.0
Good Vibes	28	28.0
Wow Skin Science	10	10.0
Ponds	16	16.0
Foxtale	6	6.0
Dermadoc	11	11.0
Total	100	100.0

Source: Primary

Data Inference:

From the above table it is inferred that 29% of them use mamaearth, 28% good vibes, 10% wow skin science, 2%biotique, 16%ponds, 6%foxtaleand11%dermadoc. Thus, most of the respondents i.e., 29% of them use mamaearth as their skin care brand.

GARRETT'SRANKING

TABLENO:4 PACKING OPINION

Factors	No. Of Respondents	Rank
Highly attractive	55	I
Neutral	40	II
Not attractive	5	III

Rank	Present position	Percent age position
I	$100(3-1+0.5)/3=100*2.5/3$	83.33
II	$100(3-2+0.5)/3=100*1.5/3$	50.00
III	$100(3-3+0.5)/3=100*0.5/3$	16.67

Factors	Garrett score	Average Garrett score	Rank
Highly attractive	4583.15	$4583.15/55=83.33$	I
Neutral	2000.00	$2000.00/40=50.00$	II
Not attractive	83.35	$83.35/5=16.67$	III

Source: Primary Data

Inference:

The ranking is based on the responses given by the respondents. By multiplying these items with the corresponding number of respondents, we have arrived at individual scores and the total score for the concerned factors. The highest response of their packing opinion was highly attractive and therefore it is ranked as I, neutral is ranked as II and not attractive is ranked as III.

CHI-SQUARETEST

TABLE NO:5

Table showing the comparison between the monthly income and spending behaviour of the respondents:

Observed Value

	Less than 1,000	1,001-5,000	5,001- 10,000	Morethan 10,000	Total
Upto10,000	41	9	0	0	50
10,001- 20,000	9	10	0	0	19
20,001- 50,000	4	10	10	0	24
More than 50,000	0	5	1	1	7
Total	54	34	11	1	100

Expected Value

	Less than 1,000	1,001-5,000	5,001- 10,000	More than 10,000	Total
Upto10,000	27.0	17.0	5.5	0.5	50.0
10,001- 20,000	10.3	6.5	2.1	0.2	19.0
20,001- 50,000	13.0	8.2	2.6	0.2	24.0

More than 50,000	3.8	2.4	0.8	0.1	7.0
Total	54.0	34.0	11.0	1.0	100.0

	Value	df	Significance
Pearson Chi-Square	67.855 ^a	9	.000

Source: Primary

Data Inference:

From the above hypothesis, it is inferred that the table value for 1 degree of freedom at 5% level of significance is 3.841. It is found that the calculated value i.e., 67.855 is greater than the table values **significant value is less than 0.05**, we **reject the null hypothesis**. This means that there is a significant relationship between monthly income and spending behaviour of the respondents. So the **null hypothesis is rejected**.

LIKERT SCALE

TABLENO:6

Statement showing the consumers preference and attitude while using the Purpille app

Statement	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total
I find the Purpille app easy to navigate.	61	30	7	2	0	450
I can quickly find the products I am looking for on the Purpille app.	31	56	9	3	1	413
Purpille offers a wide range of beauty products.	43	35	20	2	0	419
I am satisfied with the variety of brands available on Purpille.	20	54	17	8	1	384
The Purpille app frequently offers new and trendy beauty products.	39	40	16	3	2	411
The prices of products on Purpille Are reasonable.	35	47	14	4	0	413
I feel that Purpille offers good discounts and deals.	41	29	23	4	2	400
I am satisfied with the customer service on Purpille app.	35	42	17	5	1	405
I am overall satisfied with my experience using The Purpille app.	30	43	25	2	0	401
I find it easy to complete a purchase using the Purpille app.	30	49	20	1	0	408



The products I have purchased from Purplle are of High quality.	40	43	17	0	0	423
I believe Purplle offers premium-quality beauty products at affordable prices.	32	48	14	5	1	405
I am satisfied with the delivery speed of my orders on Purplle	31	42	22	2	3	396
The payment options on Purplle are convenient and Easy to use.	32	44	19	4	1	402
I am satisfied with the available payment methods On the Purplle app.	36	43	14	5	2	406
						6181

Source: Primary Data

Variables	Average	Rank
I find the Purplle app easy to navigate.	4.50	I
I can quickly find the products I am looking for on the Purplle app.	4.13	IV
Purplle offers a wide range of beauty products.	4.19	III
I am satisfied with the variety of brands available on Purplle.	3.84	XV
The Purplle app frequently offers new and trendy beauty products.	4.11	VI
The prices of products on Purplle are reasonable.	4.13	IV
I feel that Purplle offers good discounts and deals.	4.00	XIII
I am satisfied with the customer service on Purplle app.	4.05	IX

I am overall satisfied with my experience using the Purplle app.	4.01	XII
I find it easy to complete a purchase using the Purplle app.	4.08	VII
The products I have purchased from Purplle are of high quality.	4.23	II
I believe Purplle offers premium-quality beauty products at Affordable prices.	4.05	IX
I am satisfied with the delivery speed of my orders on Purplle	3.96	XIV
The payment options on Purplle are convenient and easy to use.	4.02	XI
I am satisfied with the available payment methods on the Purplle app.	4.06	VIII

Inference:

From the above table reveals that the respondents have been said that Purplle app easy to navigate ranked as I, the products they have purchased from Purplle are of high quality ranked as II, Purplle offers a wide range of beauty products ranked as III, they can quickly find the products they looking for on the Purplle app and the prices of products on Purplle are reasonable ranked as IV, the Purplle app frequently offers new and trendy beauty products ranked as VI, they find it easy to complete a purchase using the Purplle app ranked as VII, they satisfied with the available payment methods on the Purplle app ranked as VIII, they satisfied with the customer service on Purplle app and they believe Purplle offers premium- quality beauty products at affordable prices ranked as IX, the payment options on Purplle are convenient and easy to use ranked as XI, they overall satisfied with my experience using the Purplle app ranked as XII, they feel that Purplle offers good discounts and deals ranked as XIII, they satisfied with the delivery speed of my orders on Purplle ranked as XIV and they satisfied with the variety of brands available on Purplle ranked as XV. Thus, it is inferred that the majority of the respondents have been said that Purplle app easy to navigate ranked as I.

TABLENO:7

DESCRIPTIVE ANALYSIS OF VARIABLES

Variables	Mean	Std. Deviation
Influencing factor of a brand	3.3400	1.51904
Specified brand purchased repeatedly	2.9200	1.20336
Recently purchased brand	3.1900	1.93163
Usage years of the product	2.0000	.93203
Opinion on Purplle products	2.1400	.77876
Satisfactory level of experience	2.1500	.74366

Inference:

The above table represents the overall perception of the respondents using Purplle app and it states the various features showing satisfactory report of the respondents. The variables **“Influencing factors of a brand”, “Specified brand purchased repeatedly”, “Recently purchased brand”** exhibit a strong correlation, with their mean values exceeding 2.5. This

shows that these factors significantly related to the studied phenomenon, indicating a preference and attitude within the dataset. The variables **“Usage years of the product”, “Opinion on Purplle products”, “Satisfactory level of experience”** exhibits a medium correlation, with their mean values ranging between 1 to 2.5. This suggests these variables significantly related to the studied phenomenon, indicating the satisfactory level and strategy applications used within the dataset.

SUGGESTIONS:

- Purplle can provide working people with more time-efficient beauty solutions or goods.
- Purplle might implement subscription models or loyalty programs that compensate clients for making regular purchases.
- Purplle's advertising should high light how important its products are.
- Purplle ought to think about leveraging brand satisfaction as a marketing advantage.
- To further increase client loyalty and confidence, Purplle should keep enhancing the quality assurance of its goods and promote their affordability.
- Purplle ought to make an investment in preserving or enhancing visually appealing packaging.
- Purplle should keep improving the app's appearance and usability to guarantee a more seamless user experience.
- Purplle by showcase in variety of brands on the platform can help cater to diverse tastes and encourage more consumers to browse and purchase.

CONCLUSION

Numerous factors that affect Thoothukudi consumers' purchase decisions are identified by the study on their preferences and attitudes regarding the use of the Purplle app. Purplle is thought to have played a significant role in the recent surge in online sales of cosmetics and personal hygiene products. Customers of Thoothukudi value the app's extensive product selection, which includes both established brands and new goods that cater to a range of beauty needs.

The Purplle app's popularity can be attributed in large part to its user- friendliness and attractive presentation.

It's a common misconception that cosmetics make women feel better emotionally. Women think makeup is a powerful instrument that can transform their ugly appearance into one that is pleasing and presentable. They feel lacking in the absence of these artificial beauty items.

In conclusion, the primary drivers of Purplle's success in Thoothukudi are the rising acceptance of online shopping and the demand for a wider range of cosmetics and personal hygiene products. The app might boost its market share and customer loyalty in Thoothukudi and beyond. The company must resolve consumer concerns to foster trust and increase customer satisfaction if it hopes to sustain long-term success in this competitive industry.

WEBSITES

- <https://www.researchgate.net/>
- <http://www.purplle.com/>
- <https://www.britannica.com/art/cosmetic>
- <https://cosmeticseurope.eu/cosmetics-industry/history-cosmetics/>
- <https://www.mdpi.com/2079-9284/10/3/71>
- <https://www.repsly.com/blog/consumer-goods/a-brief-history-of-cosmetics>
- <https://www.businessoutreach.in/success-story-of-purplle/>
- <https://in.linkedin.com/company/purplle-com>
- <https://www.inventiva.co.in/trends/purplle-success-story-indias-no-1/>
- <https://www.tofler.in/blog/purplle-sucess-story-indias-top-beauty-brand/>
- <https://www.zoko.io/case-studies/purplle>

A STUDY ON THE IMPACT OF INSTAGRAM SHOPPING ON THE PURCHASING DECISIONS OF COLLEGE STUDENTS'

R.P.Sasimitha, *and P.Bhanumathi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT:

A STUDY ON THE IMPACT OF INSTAGRAM SHOPPING ON THE PURCHASING DECISIONS OF COLLEGE STUDENTS' is the topic taken for research. To find out how Instagram shopping helps college student in purchasing decision. To suggest various threats and their protection in Instagram shopping and to determine the impact of instagram shopping on Brand Loyalty. Primary and Secondary used in the data was collected. The Convenient Sampling technique is adopted to select 120 respondents who use the impact of instagram shopping on the purchasing decisions of college students. The findings suggest the college student are more likely to make purchase on Instagram when they are presented the detailed product information, engaging video content and exclusive discount and promotion. Additionally, the study highlights the importance of optimising content for mobile devices, streamlining the shopping cart feature and prioritizing data protection and security measures. The suggestion provided emphasize the need for businesses leverage Instagram shopping feature, utilize user generate content and continuously monitor user behavior to adopt the marketing strategies accordingly. By doing so, Businesses can effectively target college student and influencing the purchase decision on Instagram.

KEYWORDS:

Engaging video content, Exclusive Discounts and Promotions, Online shopping Behavior .

INTRODUCTION:

This project aims to investigate the impact of Instagram Shopping on the purchasing decisions of college students. By examining the factors that influence college students' purchasing decisions on Instagram, this study seeks to provide insights into the effectiveness of Instagram Shopping as a marketing tool. The findings of this study will contribute to a deeper understanding of the role of social media in shaping consumer

behavior and in form businesses on how to optimize their Instagram Shopping strategies to effectively target college students.

REVIEW OF LITERATURE:

Baranidharan (2024)"The Impact of Instagram Marketing Strategies on Consumer Purchasing Behaviour within the Fashion Industry. "This literature review is an attempt to examine the impact of Instagram marketing strategies on consumer purchasing behaviour within the fashion industry. Findings revealed that brand equity is determinant of consumer behaviour, alongside influencer credibility, creative brand aesthetics, and interactive features. This review thus underscores the multifaceted nature of Instagram's influence on consumer behaviour and highlights the need for further research to develop adaptive marketing strategies that can resonate across diverse Consumer segments.

Ali Akbar Anggara, M.Elfan Kaukab and Yudhistira Pradhipta (2023)

"Social Media Instagram and Purchasing Decisions"

The study aims to analyze the influence of content creation, content sharing, connection, and community building on purchasing decisions. The research indicates that these factors significantly impact purchasing decisions, though specific details are not provided in the available summary. Businesses should focus on enhancing content creation, sharing, connection, and community building on Instagram to positively influence purchasing decisions. This study provides insights into how Instagram influences the purchasing decisions of college students, highlighting the roles of influencer marketing, trust, visual appeal, and content engagement in shaping consumer behavior.

Doaa Herzallah , Francisco Munoz-Leiva , Francisco Liebana-Cabanillas (2022)

"Drivers of Purchase Intention in Instagram Commerce"

The Research Approach is Quantitative study analyzing factors that drive purchases via Instagram using survey data. The results found from this study is Factors such as perceived usefulness, ease of use, and enjoyment significantly influence purchase intentions in Instagram commerce. This study also contains some recommendations that is Enhancing the user experience by improving the functionality and enjoyment of Instagram shopping features can boost purchase intentions. These studies provide insights into how Instagram influences the

purchasing decisions of college students, highlighting the roles of trust, influencer marketing, social interactivity, and user experience in shaping consumer behavior.

Noushan Memar (2021)"The Impact of Instagram Influencers on Consumer Purchasing Intention"

Methodology used here is Qualitative research using focus groups to gather data and analyze consumer perceptions. Instagram influencers significantly affect online consumer purchasing intentions. Trust in influencers is intertwined with emotional connections, social responsibility, electronic word-of-mouth (eWOM) is effective in influencing pre-purchase decisions, with both positive and negative WOM impacting consumer opinions these are some findings. The suggestions related to this study are Brands should collaborate with genuine and trustworthy influencers who are experts in their niche. Transparency in promotional content is crucial to maintain consumer trust.

Johnson M., &Lee S. (2020)"The Influence of Instagram Shopping on College Students' Purchasing Decisions"

The study employed a quantitative research approach using surveys to explore how

Instagraminfluencespurchasingdecisionsamongcollegestudents.**Instagram'svisualappeal** was found to be a significant factor in influencing the purchasing decisions of students. Posts with high-quality images, influencer endorsements, and interactive features like polls and stories effectively drew students into making impulsive purchases. **Social influence** and **peer recommendations** played a key role, with students often purchasing products recommended by influencer scorpers. **in the brand** was found to be crucial; students were more likely to purchase from brands they felt were genuine and transparent in their marketing. Brands should focus on creating **engaging, high-quality visual content** that resonates with college students, making use of Instagram's shopping. Brands should focus on creating engaging, high-quality visual content that resonates with college students, making use of Instagram's shopping features such as product tags and links in stories. **Collaborations with influencers** who align with the target audience's values and interests were recommended as a key. It was suggested that **brands provided**

detailed product information to build trust with potential buyers, as students tend to research products before making purchases.

OBJECTIVES:

1. To analyse the influence of Instagram shopping on online shopping habits.
2. To determine the impact of Instagram shopping on brand loyalty.
3. To find out how Instagram shopping helps college students in purchasing decisions.
4. To suggest the various threats and their protection in Instagram Shopping.

RESEARCH METHODOLOGY

Sampling Design	Convenient Sampling
Period of the study	November 2024 - March 2025
Data Based	Primary Data and Secondary Data
Test for Analysis	Percentage Analysis, Descriptive Analysis, One Sample t-test, Independent Sample t-test, One way ANOVA

LIMITATIONS OF THE STUDY:

- 1.The Study results may be impacted by the participants level of familiarity with Instagram.
2. The study's time frame may not capture long-term effects of Instagram shopping.
3. The study's focus on college students.
4. The study may not be repeated with the same results.
5. The study's findings may have limited implications for practical applications.

RESULTS AND DISCUSSION:

TABLE NO.1

THE IDEAL INSTAGRAM POSTING SCHEDULE FOR BUSINESS

Posting Schedule For Business	No.Of. Respondents	Percentage (%)
Once a day	25	21
2-3 times a day	40	33
Once a week	27	23
Irregular posting schedule	28	23
Total	120	100

SOURCE: Primary Data

INFERENCE

Table No.1 shows the posting schedule for Business. It is inferred that out of 120 respondents, 21 percent post once a day, 33 percent post 2-3 times a day, 23 percent post both a week and Irregular posting schedule. Therefore, Majority 33 percent of Businesses post 2-3 times a day.

TABLE NO. 2

PRIMARY GOAL OF INSTAGRAM ADVERTISING

Goal Of Instagram Advertising	No.Of.Respondents	Percentage (%)
Increase follower Count	45	37
Drive Website Traffic	27	23
Boost Post Likes	25	21
Share Personal Stories	23	19
Total	120	100

SOURCE : Primary Data

INFERENCE

Table No.2 shows the Instagram Advertising. It is inferred that out of 120 respondents , 37 percent of Advertising will Increase follower count, 23 percent of Advertising will Drive website traffic , 21 percent of Advertising will Boost Post Likes and 19 percent of Advertising will Share personal stories. Therefore , Majority 37 percent of Advertising will increase follower count.

TABLE NO.3

CATEGORY OF PRODUCTS PURCHASED ON INSTAGRAM

Category Of Products	No.Of.Respondents	Percentage (%)
Textiles	27	22
Mobile Accessories	47	39
Footwear	25	21
Cosmetics	21	18
Total	120	100

SOURCE : Primary Data

INFERENCE

Table No.3 shows the category of products purchased on Instagram. It is inferred that out of 120 respondents , 22 percent of them purchase Textiles , 39 percent of them purchase Mobile Accessories , 21 percent of them purchase Footwear and 18 percent of them purchase Cosmetics.

Therefore , Majority 39 percent of them purchase Mobile Accessories through Instagram.

TABLE NO.4

Online shoppers	No.of.respondents	Percentage (%)
20-40%	25	21
41-60%	29	24
61-80%	20	17
81-100%	46	38
Total	120	100

PERCENTAGE OF ONLINE SHOPPERS USE INSTAGRAM

SOURCE : Primary Data**INFERENCE**

Table No.4 shows online shoppers use Instagram . It is Inferred that out of 120 respondents , 21 percent of online shoppers are between 20-40% , 24 percent of online shoppers are between 41-60% , 17 percent of online shoppers are between 61-80% and 38 percent of online shoppers are between 81-100%.

Therefore , Majority 38 percent of online shoppers are between 81-100%.

TABLE NO.5
REASONS FOR STAYING TO INSTAGRAM BRANDS

Reasons	No. Of. Respondents	Percentage (%)
Quality of products	35	29
Brand values and mission	23	19
Engaging content	44	37
Exclusive discounts and promotions	18	15
Total	120	100

SOURCE : Primary Data

INFERENCE

Table No.5 shows the reasons for staying to Instagram Brands. It is inferred that out of 120 respondents , 29 percent of them are staying for quality of products , 19 percent of them are staying for brand values and missions , 37 percent of them are staying for engaging content , 15 percent of them are staying for exclusive discounts and promotion.

Therefore , Majority 37 percent of respondents stay with Instagram brands due to engaging content.

TABLE NO. 6
TYPE OF PRODUCTS OFTEN PURCHASE ON INSTAGRAM

Often Purchase	No.Of.Respondents	Percentage(%)
Fashion and apparel	46	38
Beauty and cosmetics	36	30
Electronics	27	23
Home decor	11	9
Total	120	100

SOURCE : Primary Data

INFERENCE

Table No.6 shows the products often purchase on Instagram. It is Inferred that out of 120 respondents , 38 percent of them often purchase fashion and apparel , 30 percent of them often purchase beauty and cosmetics , 23 percent of them often purchase electronics and 9 percent of them often purchase Home decor. Therefore , Majority 38 percent of them often purchase fashion and apparel.

TABLE NO. 7
FACTOR THAT INFLUENCES TO PURCHASE A PRODUCT AFTER SEEING IT ON INSTAGRAM

Factors	No.Of.Respondents	Percentage (%)
Aesthetic appeal of the product image	35	29
Positive reviews and ratings from other users	38	32
Price comparison with other online retailers	30	25
Endorsement by a trusted influencer or celebrity	17	14
Total	120	100

SOURCE : Primary Data

INFERENCE

Table No. 7 shows the factors that influences to purchase a product after seeing it on Instagram. It is Inferred that out of 120 respondents , 29 percent of them are Aesthetic appeal

of the product image , 32 percent of them are positive reviews and ratings from other users , 25 percent of them are price comparison with other online retailers and 14 percent of them are endorsement by a trusted influencer or celebrity.

Therefore , Majority 32 percent of them are positive reviews and ratings from other users .

TABLE NO. 8

**IMPORTANT TYPE OF PROTECTION FOR INSTAGRAM SHOPPING
TRANSACTIONS**

Type Of Protection	No.Of.Respondents	Percentage (%)
Data encryption	32	26
Secure payment processing	26	22
Clear refund policies	33	28
All of the above	29	24
Total	120	100

SOURCE : Primary Data

INFERENCE

Table No.8 shows the Protection for Instagram shopping transactions. It is inferred that out of 120 respondents , 26 percent of them need data encryption , 22 percent of them need secure payment processing , 28 percent of them need clear refund policies and 24 percent of them need all of the above. Therefore , Majority 28 percent of them needed clear refund policies.

TABLE NO. 9
DESCRIPTIVE ANALYSIS

Level of Effectiveness with Instagram Marketing	Mean	Standard Deviation
Instagram is effective for promoting products / Services	3.2333	1.60741
Instagram enhance brand visibility and recognition	3.2083	1.23599
Instagram analytics is refining marketing strategy	3.3583	1.15078
User-generated content on Instagram bolsters brand authenticity and trust.	3.3500	1.33253
Satisfied with targeting options available for Instagram advertising	3.1000	1.37444
Incorporate Instagram Stories frequently for dynamic marketing campaigns	3.1417	1.25220
Instagram influencers wield significant influence in driving brand awareness	3.1167	1.33589

SOURCE : Primary Data

INTERPRETATION

Based on the Highest Mean score (3.3583) respondents Strongly Agree that Instagram analytics play a crucial role in refining marketing strategies. The majority of participants recognize the value of Instagram’s analytical tools in helping businesses make data-driven decisions and optimize their marketing efforts.

The Lowest Mean Score (3.1167) showing that respondents are less convinced about the impact of influencers on brand awareness. While some agree that influencers help brands grow, others may perceive influencer marketing as less effective compared to other strategies like user-generated content or paid advertisements.

The highest Standard Deviation (1.60741), indicating significant variation in responses. While some respondents strongly agree that Instagram effectively promotes products and services, others disagree or remain neutral, leading to a wide range of opinions.

The lowest Standard Deviation(1.15078), indicating that responses were more consistent. Most participants share a similar opinion, agreeing that Instagram analytics play a crucial role in refining marketing strategies.

INFERENCE

Highest Mean Score suggest that Marketers highly rely on Instagram analytics to track engagement, measure campaign effectiveness, and adjust strategies accordingly. The strong agreement suggests that businesses should continue leveraging Instagram insights for better performance.

The lower agreement suggests that influencer marketing may not always guarantee brand awareness. Brands should carefully select influencers based on credibility, audience alignment, and engagement rates rather than relying solely on their popularity.

Based on Highest Standard Deviation, The effectiveness of Instagram for product promotion likely depends on factors such as industry type, content quality, and target audience. Businesses may experience different levels of success based on how they utilize Instagram's features, such as ads, reels, and posts.

Since responses show a strong consensus, businesses can confidently invest in Instagram analytics to improve their marketing efforts. This suggests that Instagram's analytical tools are widely recognized as beneficial and reliable for tracking marketing performance.

TABLE NO. 10

DESCRIPTIVE ANALYSIS

SERVICES RENDERED BY INSTAGRAM	MEAN	STANDARD DEVIATION
I get quality products	4.3250	2.45005
Return policy available	4.0000	1.98312
It provides me with all the necessary details to complete my purchase	4.1000	1.91588
It secures my account	4.3333	1.94605
It is speed enough	4.1750	1.84556
It get my products on promised date	4.3000	2.00252

SOURCE : Primary Data

INTERPRETATION

The highest mean (4.3333), indicating that respondents strongly agree that Instagram provides a secure environment for user accounts. Most participants trust Instagram's security measures in protecting their data and privacy.

The lowest mean(4.0000), although it still reflects a generally positive perception. While many respondents agree that return policies are available, some may have concerns about the efficiency or fairness of the process.

The highest standard deviation(2.45005), indicating significant variation in responses. Some users strongly agree that they receive quality products, while others may have encountered issues with product quality.

The lowest standard deviation (1.84556) indicates that responses are relatively consistent. Most users agree that Instagram's transaction and browsing speed is sufficient for a smooth shopping experience.

INFERENCE

Based on Highest Mean score, Instagram's security features are well-received, reinforcing user confidence in the platform. However, continuous improvements in privacy policies and security mechanisms are necessary to maintain trust and prevent potential security threats.

Lowest Mean score suggests that the return policy is acknowledged but may not be as effective or reliable for all users. Strengthening the return process, ensuring transparency, and enforcing standardized policies could enhance user satisfaction.

Based on Highest Standard Deviation, The inconsistency in product quality suggests that sellers on Instagram may have varying levels of reliability. Implementing stricter quality control measures and improving seller verification processes could help ensure better product consistency.

Lowest Standard Deviation says that Speed is a well-appreciated aspect of Instagram's shopping features. While general satisfaction is high, Instagram can continue optimizing its platform to maintain efficiency, especially in handling high traffic and processing transactions.

TABLE NO.11
ONE SAMPLE T-TEST

NULL HYPOTHESIS (H₀) : There is no significant difference between the mean response and neutral value (3).

ALTERNATIVE HYPOTHESIS (H₁) : There is a significant difference between the mean response and the neutral value (3). **T = 3 Value**

Level of Effectiveness With Instagram Marketing	Mean	Standard Deviation	T-Value	P Value
Instagram is effective for promoting products / Services	3.2333	1.60741	1.590	0.114
Instagram enhance brand visibility and recognition	3.2083	1.23599	1.846	0.067
Instagram analytics is refining marketing strategy	3.3583	1.15078	3.411	0.001
User-generated content on Instagram bolsters brand authenticity and trust	3.3500	1.33253	2.877	0.005
Satisfied with targeting options available for Instagram advertising	3.1000	1.37444	0.797	0.427
Incorporate Instagram Stories frequently for dynamic marketing campaigns	3.1417	1.25220	1.239	0.218
Instagram influencers wield significant influence in driving brand awareness	3.1167	1.33589	0.957	0.341

SOURCE : Primary Data

INTERPRETATION

“Instagram’s effectiveness in promoting products and services” resulted in a t-value of 1.590 and a p-value of 0.114. **Since the p-value is greater than 0.05, the null hypothesis (H_0) is not rejected.** This indicates that there is no statistically significant evidence to confirm that Instagram is highly effective in promoting products and services. While Instagram is widely used for marketing, this result suggests that its effectiveness may vary depending on factors such as content strategy, audience engagement, and industry type.

For **“brand visibility”**, the test yielded a t-value of 1.846 and a p-value of 0.067. **Since the p-value is greater than 0.05, the null hypothesis (H_0) is not rejected.** This means that while Instagram may help in improving brand recognition, the statistical evidence is not strong enough to confirm a significant impact. Brands may need to enhance their content strategies and engagement methods to maximize visibility.

“Instagram analytics significantly refine marketing strategies”, with a t-value of 3.411 and a p-value of 0.001. Since the p-value is less than 0.05, the **null hypothesis (H_0) is rejected.** This confirms that Instagram’s analytics tools contribute significantly to enhancing marketing strategies, allowing businesses to make data-driven decisions for improved performance.

The test results show that **“user-generated content significantly strengthens brand authenticity and trust”**, as evidenced by a t-value of 2.877 and a p-value of 0.005. Since the p-value is below 0.05, the **null hypothesis (H_0) is rejected.** This suggests that customer-generated content, such as reviews and testimonials, plays a crucial role in increasing consumer trust and should be a key component of brand marketing.

The analysis indicates a t-value of 0.797 and a p-value of 0.427, showing that **“satisfaction with Instagram’s ad targeting options”** is not significantly different from the neutral value. Since the p-value is well above 0.05, the **null hypothesis (H_0) is not rejected.** This suggests that users have mixed feelings about Instagram’s ad targeting, and businesses should explore alternative advertising strategies to improve ad effectiveness.

The test results for **“Instagram Stories in marketing”** show a t-value of 1.239 and a p-value of 0.218. Since the p-value exceeds 0.05, the **null hypothesis (H_0) is not rejected.** This indicates that using Instagram Stories frequently does not necessarily lead to better marketing outcomes, implying that brands need to refine their storytelling techniques or explore additional engagement strategies.

For “**influencer marketing**”, the t-test yielded a t-value of 0.957 and a p-value of 0.341. Since the p-value is greater than 0.05, **the null hypothesis (H_0) is not rejected**. This indicates that Instagram influencers do not have a statistically significant impact on brand awareness in this study. While influencers may still contribute to brand recognition, their effectiveness is not strong enough to be confirmed with statistical evidence.

TABLE NO.12
ONE SAMPLE T-TEST

NULL HYPOTHESIS (H_0): There is no significant satisfaction or dissatisfaction with the given service.

ALTERNATIVE HYPOTHESIS (H_1): There is significant satisfaction or dissatisfaction with the given service. **T = 4 Value**

SERVICES RENDERED BY INSTAGRAM	MEAN	STANDARD DEVIATION	T-VALUE	P-VALUE
I get quality products	4.3250	2.45005	1.453	0.149
Return policy available	4.0000	1.98312	0.000	1.000
It provides me with all the necessary details to complete my purchase	4.1000	1.91588	0.572	0.569
It secures my account	4.3333	1.94605	1.876	0.063
It is speed enough	4.1750	1.84556	1.039	0.301
It get my products on promised date	4.3000	2.00252	1.641	0.103

SOURCE : Primary Data

INTERPRETATION

Users generally perceive “**Instagram as providing quality products**”. However, the t-value (1.453) shows only a slight deviation from neutral satisfaction, and the p-value (0.149) is greater than 0.05, meaning there is no statistically significant satisfaction. Since the p-value is greater than 0.05, **the null hypothesis is accepted, indicating** that while users are slightly satisfied with product quality, it is not strong enough to be considered a major factor in their experience. This suggest that Instagram could improve its verification system for

sellers to ensure high product quality, thereby boosting user confidence.

A mean score of 4.0000 suggests neutral opinions on **“Instagram’s return policy”**. The t-value of 0.000 indicates that responses are exactly at the expected mean, and the p-value (1.000) is the highest possible, meaning there is no statistical significance. Since the p-value exceeds 0.05, **the null hypothesis is accepted**, confirming that users do not see the return policy as a crucial satisfaction factor. It suggested that Instagram could enhance its return policy with clearer guidelines and a more seamless return process to improve user trust.

With a mean of 4.1000, users feel that **“Instagram provides adequate purchase details”**, but the t-value (0.572) suggests weak deviation from neutral opinions. The p-value (0.569) is much greater than 0.05, indicating that this factor is not a significant contributor to user satisfaction. Since the p-value is above 0.05, **the null hypothesis is accepted**. This suggests that Instagram could include more detailed product descriptions, reviews, and seller credibility ratings to improve purchasing confidence.

“Instagram’s security” measures received a relatively high mean score of 4.3333. The t-value (1.876) is one of the highest in this study, showing stronger deviation from neutrality. The p-value (0.063) is slightly above the 0.05 threshold, meaning satisfaction with security is almost statistically significant but does not fully meet the requirement. Since the p-value is above 0.05, **the null hypothesis is accepted**, but it indicates that security is a nearly significant factor in user satisfaction. It Suggest that Instagram should continue improving security features, such as multi-factor authentication and scam prevention tools, to increase user confidence.

Users generally find **“Instagram’s speed acceptable”**, as reflected in the mean score of 4.1750. However, the t-value (1.039) is low, and the p-value (0.301) is greater than 0.05, meaning that there is no statistically significant satisfaction regarding speed. Since the p-value is above 0.05, **the null hypothesis is accepted**, confirming that while speed is not a major issue, it is not a strong contributor to satisfaction either. Instagram can work on optimizing platform performance, reducing loading times, and improving responsiveness, especially for users with slower internet connections.

Users have a generally **“positive perception of Instagram’s delivery timelines”**, as indicated by the mean score of 4.3000. The t-value (1.641) suggests moderate satisfaction, but the p-value (0.103) is greater than 0.05, meaning it is not statistically significant.

Since the p-value is above 0.05, **the null hypothesis is accepted**, indicating that while users do not frequently experience delays, delivery punctuality is not a major driver of satisfaction. Suggestion: Instagram should implement better tracking features and collaborate with reliable delivery partners to further improve on-time deliveries.

TABLE NO. 13

INDEPENDENT SAMPLE T-TEST

ANALYZING MARKETING STRATEGY EFFECTIVENESS ACROSS GENDERS

NULL HYPOTHESIS (H₀):There is no significant difference between male and female in their perception of Instagram's marketing strategies.

ALTERNATIVE HYPOTHESIS (H₁):There is a significant difference between male and female in their perception of Instagram's marketing strategies.

Marketing Strategy	Gender				T-value	P-value
	MALE		FEMALE			
	MEAN	S.D.	MEAN	S.D.		
Instagram is effective for promoting products / Services	3.3500	1.59262	3.1167	1.62701	0.794	0.912
Instagram enhance brand visibility and recognition	3.1167	1.20861	3.3000	1.26625	-0.811	0.816
Instagram analytics is refining marketing strategy	3.4500	1.12634	3.2667	1.17699	0.872	0.829
User-generated content on Instagram bolsters brand authenticity and trust	3.5667	1.18417	3.1333	1.44347	1.798	0.105
Satisfied with targeting options available for Instagram advertising	3.0833	1.40570	3.1167	1.35411	-0.132	0.803
Incorporate Instagram Stories frequently for dynamic marketing campaigns	3.0833	1.21141	3.2000	1.29928	-0.509	0.365



Instagram influencers wield significant influence in driving brand awareness	3.2667	1.30015	2.9667	1.36502	1.233	0.680

SOURCE : Primary Data

INTERPRETATION

Male (3.3500) perceive Instagram as slightly more effective for promoting products/services than female (3.1167). However, since the p-value (0.912) is greater than 0.05, this difference is not statistically significant. **The null hypothesis (H_0) is accepted.** There is no significant difference in how male and female perceive Instagram's effectiveness in product/service promotion. It suggests that Instagram should focus on improving targeted promotions, increasing engagement through interactive ads, and offering better analytics for businesses to enhance promotional effectiveness.

Female (3.3000) rate Instagram's brand visibility and recognition slightly higher than males (3.1167). However, the p-value (0.816) is greater than 0.05, meaning this difference is not significant. **The null hypothesis (H_0) is accepted.** There is no significant difference in perception of Instagram's role in enhancing brand visibility and recognition between male and female. Instagram should focus on improving brand discoverability by offering better hashtag strategies, collaborations, and influencer marketing to boost visibility for businesses.

Male (3.4500) slightly perceive Instagram analytics as more useful in refining marketing strategies compared to female (3.2667). However, since the p-value (0.829) is greater than 0.05, this difference is not statistically significant. **The null hypothesis (H_0) is accepted.** There is no significant difference in how male and female perceive Instagram's analytics in refining marketing strategies. It suggests that To make analytics more effective, Instagram should offer better data visualization, insights on competitor performance, and AI-driven recommendations for improved marketing strategies.

Male (3.5667) rate user-generated content as more beneficial for brand authenticity and trust than female (3.1333). However, the p-value (0.105) is greater than 0.05, meaning this difference is not statistically significant. **The null hypothesis (H_0) is accepted.** There is no significant difference between male and female in how they perceive user-generated content in building brand trust. Brands should encourage more customer testimonials,

reviews, and interactive content to enhance trust. Also, promoting real user experiences can improve engagement and credibility.

Female (3.1167) are slightly more satisfied with Instagram's targeting options than males (3.0833). However, the p-value (0.803) is greater than 0.05, indicating that the difference is not statistically significant. **The null hypothesis (H_0) is accepted.** There is no significant difference in how males and females perceive Instagram's targeting options.

The mean value for male is 3.0833, while for female, it is 3.2000, showing a slight difference in perception. The t-value is -0.509, and the p-value is 0.365, which is greater than 0.05, meaning the difference between male and female opinions is not statistically significant. Since the p-value is greater than 0.05, **the null hypothesis (H_0) is accepted**, meaning that there is no significant difference in how males and females perceive the importance of Instagram Stories for dynamic marketing.

The mean score for male is 3.2667, and for female, it is 2.9667, indicating that male slightly perceive influencers as more impactful. The t-value is 1.233, and the p-value is 0.680, which is greater than 0.05, indicating that gender does not significantly influence perceptions of influencer marketing. Since the p-value is greater than 0.05, **The null hypothesis (H_0) is accepted**, meaning that there is **no significant difference** in how males and females perceive the role of influencers in brand awareness.

The null hypothesis (H_0) was accepted in all cases. This indicates that there is no significant difference between male and female perceptions of Instagram marketing.

TABLE NO. 14

INDEPENDENT SAMPLE T-TEST

COMPARING THE LEVEL OF SATISFACTION WITH SERVICES RENDERED BY INSTAGRAM BETWEEN MALE AND FEMALE

NULL HYPOTHESIS (H_0): There is no significant difference between male and female in their level of satisfaction with the services rendered by Instagram.

ALTERNATIVE HYPOTHESIS (H_1): There is a significant difference between male and female in their level of satisfaction with the services rendered by Instagram.

Services	Gender				T- value	P-value
	MALE		FEMALE			
	MEAN	S.D.	MEAN	S.D.		
I get quality products	4.1000	2.47496	4.5500	2.42463	-1.006	0.851
Return policy available	3.9500	1.99512	4.0500	1.98661	-0.275	0.818
It provides me with all the necessary details to complete my purchase	3.9833	1.92655	4.2167	1.91419	-0.666	0.939
It secures my account	4.3667	2.02499	4.3000	1.88032	0.187	0.283
It is speed enough	4.2833	1.80481	4.0667	1.89439	0.641	0.372
It get my products on promised date	4.4500	2.02045	4.1500	1.99002	0.819	0.758

SOURCE : Primary Data

INTERPRETATION

Females (4.5500) slightly rate the **quality of products** higher than males (4.1000). However, since the p-value (0.851) is greater than 0.05, the difference is not statistically significant. This suggests that both genders are generally satisfied with product quality. **The null hypothesis (H₀) is accepted.** There is **no significant difference** in satisfaction levels between males and females regarding product quality. Since both genders are satisfied, Instagram sellers should maintain product quality while addressing any minor gender-based preferences, such as packaging, durability, or product variety.

Females (4.0500) slightly rate the **return policy** better than males (3.9500). However, the p-value (0.818) is greater than 0.05, indicating that the difference is not statistically significant. **The null hypothesis (H₀) is accepted.** There is **no significant difference** between males and females in their satisfaction with Instagram's return policy. Although no significant difference exists, businesses can enhance their return policies by ensuring clear

return instructions, faster processing, and improved customer support to increase overall satisfaction.

Females (4.2167) find the availability of purchase details slightly more satisfactory than males (3.9833). However, the p-value (0.939) is greater than 0.05, meaning this difference is not significant. **The null hypothesis (H_0) is accepted.** There is **no significant difference** in how males and females perceive the availability of necessary purchase details. To improve satisfaction, Instagram sellers should focus on clearer product descriptions, better FAQs, and more transparent pricing and shipping details to create a more informed shopping experience.

Males (4.3667) and females (4.3000) rate **account security** very similarly. Since the p-value (0.283) is greater than 0.05, there is **no significant difference** between their satisfaction levels. **The null hypothesis (H_0) is accepted.** Males and females have similar levels of satisfaction with account security on Instagram. While satisfaction is high, Instagram could introduce more security features such as enhanced fraud detection, biometric logins, and clearer privacy settings to further strengthen user trust.

Males (4.2833) rate the **speed** slightly higher than females (4.0667), but the p-value (0.372) is greater than 0.05, indicating that this difference is not statistically significant. **The null hypothesis (H_0) is accepted.** There is **no significant difference** in male and female satisfaction regarding Instagram's service speed. Although speed is satisfactory for both genders, Instagram can improve checkout processing, payment verification, and response times to further enhance the shopping experience.

Males (4.2833) rate the speed slightly higher than females (4.0667), but the p-value (0.372) is greater than 0.05, indicating that this difference is not statistically significant. **The null hypothesis (H_0) is accepted.** There is **no significant difference** in male and female satisfaction regarding Instagram's service speed. Although speed is satisfactory for both genders, Instagram can improve checkout processing, payment verification, and response times to further enhance the shopping experience.

The null hypothesis (H_0) was accepted in all cases. This indicates that there is no significant difference between male and female satisfaction levels with Instagram's service.

TABLE NO.15
LEVEL OF EFFECTIVENESS WITH INSTAGRAM MARKETING ACCORDING TO AGE - ANOVA

NULL HYPOTHESIS (H₀) : There is no significant difference in the perception of Instagram marketing effectiveness among different age groups.

Factors		Age (in years)				F value	P value
		Under18	18-30	31-40	Above41		
Instagram is effective for promoting products / Services	Mean	4.0625	2.9000	3.3750	3.9000	3.230	0.025
	S.D.	1.48183	1.54310	1.73988	1.37032		
Instagram enhance brand visibility and recognition	Mean	3.7500	3.0000	3.3750	3.4000	1.959	0.124
	S.D.	1.00000	1.25109	1.31256	1.07497		
Instagram analytics is refining marketing strategy	Mean	3.5625	3.0714	3.8750	3.8000	4.004	0.009
	S.D.	0.89209	1.25480	0.67967	1.13529		
User-generated content on Instagram bolsters brand	Mean	3.6250	3.1143	3.6667	3.8000	1.826	0.146
	S.D.	1.31022	1.37833	1.23945	1.03280		

Quest – A Bi-annual Multidisciplinary Research Journal. Vol.19 ISSN2249-7145.							
Satisfied with targeting options available for Instagram advertising	Mean	2.8125	2.7857	3.6667	4.4000	6.616	0.000
	S.D.	1.32759	1.29540	1.37261	0.84327		
Incorporate Instagram Stories frequently for dynamic marketing campaigns	Mean	2.8750	3.0429	3.1250	4.3000	3.440	0.019
	S.D.	1.14746	1.23283	1.36135	0.67495		
Instagram influencers wield significant influence in driving brand awareness	Mean	3.3750	2.9286	3.5417	3.0000	1.517	0.214
	S.D.	1.36015	1.33320	1.41357	0.94281		

SOURCE : Primary Data

INTERPRETATION

Instagram is effective for promoting products/services. F-value = 3.230, P-value = 0.025. Since the p-value is less than 0.05, **The null hypothesis is rejected.** There is a significant difference in how different age groups perceive Instagram's effectiveness in promoting products/services. Younger and older individuals may have varying levels of trust and engagement with Instagram marketing. **Instagram enhances brand visibility and recognition.** F-value = 1.959, P-value = 0.124. Since the p-value is greater than 0.05,

The null hypothesis is not rejected. There is no significant difference in perception among different age groups regarding Instagram's role in brand visibility. This means all age groups generally perceive Instagram's branding effectiveness similarly.

Instagram analytics is useful for refining marketing strategy. F-value = 4.004, P-value = 0.009. Since the p-value is less than 0.05, **The null hypothesis is rejected.** Age groups differ significantly in their perception of Instagram analytics' usefulness. Younger marketers or business owners may be more inclined to use analytics, while older users may not rely on it as much.

User-generated content on Instagram bolsters brand authenticity and trust. F-value = 1.826, P-value = 0.146. Since the p-value is greater than 0.05, **The null hypothesis is not rejected.** Different age groups do not have significantly different perceptions regarding user-generated content and brand trust. This suggests that all age groups generally recognize the role of user-generated content in brand authenticity.

Satisfied with targeting options available for Instagram advertising. F-value = 6.616, P-value = 0.000. Since the p-value is less than 0.05, **The null hypothesis is rejected.** Age groups have significantly different levels of satisfaction with Instagram's targeting options. Some age groups may find Instagram's ad targeting more effective than others, possibly due to their familiarity with digital marketing tools.

Incorporate Instagram Stories frequently for dynamic marketing campaigns. F-value = 3.446, P-value = 0.019. Since the p-value is less than 0.05, **The null hypothesis is rejected.** There is a significant difference among age groups regarding the use of Instagram Stories for marketing. Younger users may be more engaged with Stories, while older users might not use this feature as actively.

Instagram influencers wield significant influence in driving brand awareness. F-value = 1.517, P-value = 0.214. Since the p-value is greater than 0.05, **The null hypothesis is not rejected.** There is no significant difference between age groups in their perception of influencer marketing. This suggests that all age groups recognize the role of influencers in brand awareness similarly.

The study found that perceptions of Instagram marketing effectiveness vary by age for certain factors, such as its role in promoting products, analytics usage, targeting options, and Instagram Stories. However, other factors, like brand visibility, user-generated content, and influencer impact, are perceived similarly across all age groups.

This suggests that while some Instagram marketing strategies should be age-specific, others can be applied universally.

TABLE NO.16

LEVEL OF SATISFACTION WITH SERVICES RENDERED BY INSTAGRAM ACCORDING TO AGE - ANOVA

NULL HYPOTHESIS (H₀) : There is no significant difference in the level of satisfaction with services rendered by Instagram among different age groups.

FACTORS		AGE (in years)				F VALUE	P VALUE
		UNDER18	18-30	31-40	ABOVE41		
I get quality products	Mean	5.5000	3.8286	4.2917	6.0000	4.030	0.009
	S.D.	2.33809	2.34658	2.54489	2.00000		
Return policy available	Mean	4.9375	3.6000	4.0833	5.1000	3.371	0.021
	S.D.	2.14379	1.94415	1.63964	2.07900		
It provides me with all the necessary details to complete my purchase	Mean	4.6875	3.7857	4.3750	4.7000	1.648	0.182
	S.D.	1.70171	1.94782	1.90680	1.82878		
It secures my account	Mean	4.7500	3.7571	5.0833	5.9000	6.407	0.000
	S.D.	1.98326	1.89152	1.63964	1.44914		
It is speed enough	Mean	4.4375	3.7429	4.7917	6.3000	3.764	0.013
	S.D.	1.36473	1.92381	1.53167	1.88856		
It get my products on promised date	Mean	4.0000	4.0286	5.0000	5.0000	1.981	0.121
	S.D.	1.82574	2.11257	1.95604	0.94281		

SOURCE : Primary Data

INTERPRETATION

I get quality products. F-value = 4.030, P-value = 0.009. Since the p-value is less than 0.05, **The null hypothesis is rejected.** Different age groups have significantly different levels of satisfaction regarding the quality of products received via Instagram. Older users (above 41) seem to be more satisfied compared to younger users.

Return policy available. F-value = 3.371, P-value = 0.021. Since the p-value is less than 0.05, **The null hypothesis is rejected.** Age groups differ significantly in their satisfaction with return policies on Instagram. Older users (above 41) are more satisfied with the return policy than younger users, possibly due to different expectations or experiences.

It provides me with all the necessary details to complete my purchase. F-value = 1.648, P-value = 0.182. Since the p-value is greater than 0.05, **The null hypothesis is not rejected.** All age groups generally perceive Instagram as equally effective in providing necessary purchase details. This suggests that the availability of product information is not a major differentiating factor among age groups.

It secures my account. F-value = 6.407, P-value = 0.000. Since the p-value is less than 0.05, **The null hypothesis is rejected.** Different age groups perceive account security on Instagram differently. Older users seem more confident in Instagram's security measures than younger users, who might have had more concerns or negative experiences.

It is speed enough. F-value = 3.764, P-value = 0.013. Since the p-value is less than 0.05, **The null hypothesis is rejected.** Age groups have different levels of satisfaction with the speed of Instagram's services. Older users (above 41) find Instagram faster and more efficient, whereas younger users may expect even quicker service.

I get my products on the promised date. F-value = 1.981, P-value = 0.121. Since the p-value is greater than 0.05, **The null hypothesis is not rejected.** All age groups generally share similar satisfaction levels regarding the timely delivery of products via Instagram. This suggests that delivery reliability is not a major differentiating factor among age groups.

Finally, Satisfaction levels with product quality, return policy, account security, and service speed vary significantly across age groups, with older users generally more satisfied. However, the availability of purchase details and timely product delivery are perceived similarly across all age groups. This indicates that while some aspects of Instagram's service need age-specific improvements, others are consistent across different age groups.

FINDINGS :

- The study reveals of the respondent i.e., 33 percent prefer posting on Instagram 2-3 times a day for business.
- The Majority 37 percent focus on increasing their follower count as the primary goal of Instagram Advertising.
- The Majority 39 percent of respondents purchase mobile accessories on Instagram.
- The Majority 38 percent of respondents indicated that 81-100% of their online shopping is done through Instagram.
- The Majority 37 percent of respondents stay with Instagram brands due to engaging content.
- The Majority 38 percent of respondents often purchase fashion and apparel on Instagram.
- The study says that i.e., 32 percent of respondents are influenced by positive reviews and ratings from other users when deciding to purchase a product.
- It found that Majority of the respondents i.e., 32 percent of respondents abandon Instagram shopping transactions due to high shipping costs.
- The Highest mean score 3.3583 indicates that the majority of respondents strongly agree that Instagram analytics play a crucial role in refining marketing strategies.
- The Highest Standard Deviation 1.60741 indicating that the majority of respondents strongly agree that Instagram effectively promotes products and services,
- The Majority of respondents with a mean score 4.3333 strongly agree that Instagram provides a secure environment for user accounts.
- The Highest Standard Deviation 2.45005 indicating that the majority of respondents strongly agree that they receive quality products.
- The Majority of the Null Hypotheses in the one-sample t-test were not rejected, indicating that there is insufficient statistical evidence to support the claims of significant differences in most cases. However, in one case the null hypothesis was rejected, confirming that Instagram analytics significantly refine marketing strategies.
- The one-sample t-test results for the services rendered by Instagram, the null hypothesis was accepted in all cases, indicating no significant satisfaction or dissatisfaction with the services.

- In Independent sample test, the null hypothesis was accepted in all cases. This indicates that there is no significant difference between male and female perceptions of Instagram marketing.
- In Independent sample test, the null hypothesis (H_0) was accepted in all cases. This indicates that there is no significant difference between male and female satisfaction levels with Instagram's services.
- In ANOVA, the null hypothesis was rejected indicating significant differences in how age groups perceive these aspects. However, In other cases, the null hypothesis failed to be rejected that there is no significant differences across age groups.
- In ANOVA, the null hypothesis was rejected, indicating significant differences in satisfaction levels across age groups. older users were more satisfied with the quality of products received on Instagram and the return policy. However, in other cases, such as availability of necessary purchase details and timely delivery, the null hypothesis failed to be rejected, no significant differences in satisfaction levels among age groups.

SUGGESTIONS :

1. Optimize content for mobile devices to enhance the user experience.
2. Streamline the shopping cart feature to make it easy for users to make a purchase.
3. Utilize Instagram's shopping feature to tag products and enable users to make a purchase directly from the app.
4. Provide detailed product information, including product descriptions, pricing, and reviews.
5. Focus on creating engaging video content that resonates with college students.
6. Encourage satisfied customers to leave reviews and ratings to build trust and credibility.
7. Offer exclusive discounts and promotions to incentivize college students to make a purchase.
8. Improve shipping and refund policies to enhance the overall user experience.
9. Prioritize data protection and security measures to safeguard user information.

CONCLUSION :

Instagram shopping has a significant impact on the purchasing decisions of college students. The platform's visual and interactive features, combined with its vast user base, make it an ideal channel for businesses to reach and engage with college students.

The findings suggest that college students are more likely to make purchases on Instagram when they are presented with detailed product information, engaging video content, and exclusive discounts and promotions. Additionally, the study highlights the importance of optimizing content for mobile devices, streamlining the shopping cart feature, and prioritizing data protection and security measures.

The suggestions provided emphasize the need for businesses to leverage Instagram's shopping features, utilize user-generated content, and continuously monitor user behavior to adapt their marketing strategies accordingly. By doing so, businesses can effectively target college students and influence their purchasing decisions on Instagram.

Overall, the study concludes that Instagram shopping has the potential to significantly influence the purchasing decisions of college students, and businesses that effectively leverage the platform's features and tailor their marketing strategies to this demographic can reap substantial benefits.

JOURNALS

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- ❖ "Examining the Effect of Instagram Shopping on College Students' Purchase Intentions: A Study of Cognitive and Affective Factors" by Choi, H., & Lee, S. (2020) - Published in the Journal of Retailing and Consumer Services.
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IMPACT OF TECHNOLOGY ON EMPLOYEE MENTAL HEALTH (IT) WITH SPECIAL REFERENCE TO THOOTHUKUDI DISTRICT

Shajusnow.J* and P.Jayamary,

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi,
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Technology plays a crucial role in modern workplaces, significantly impacting employee mental health. This study explores both the benefits and challenges associated with workplace technology, analysing its effects on stress levels, work-life balance, and overall well-being. While technology enhances productivity, communication, and efficiency, it also contributes to increased stress, anxiety, and burnout due to long working hours, high-pressure deadlines, system downtimes, and digital fatigue. A survey revealed that 71% of employees experienced heightened stress due to technological demands, yet 69.9% acknowledged its positive impact on mental health. Statistical analysis indicated no direct correlation between technology use and mental well-being; however, ANOVA results suggest a significant relationship between technology-related challenges and stress levels. To mitigate negative effects, organizations should implement strategies such as flexible work hours, realistic deadlines, regular system updates, and digital wellness initiatives. AI and automation can further reduce workload, while mental health programs, mentorship, and recognition efforts can support employees. The findings emphasize the need for a balanced approach, ensuring that technological advancements improve workplace efficiency without compromising employee well-being. Effective management of digital tools and workplace policies can foster a healthier and more productive workforce.

Keywords: Technology, Mental health, Stress, IT Employee

INTRODUCTION:

Technology has become an important part of our daily lives, changing the way we communicate, work and receive information. The rapid advancement of technology has transformed the modern workplace, offering numerous benefits such as increased efficiency, productivity, and connectivity. However, this digital revolution has also introduced a new set of challenges that affect employee mental health.

It has brought many benefits, such as improved communication and increased access to mental health resources, and has changed the way we approach mental health care. Online therapy systems, mental health apps, and virtual support communities are expanding access to mental health services, especially for people who are remote or underserved. This technology has been shown to be effective in treating and preventing mental illness, leading to better care and reducing the stigma surrounding mental illness. The widespread adoption of technology in the workplace has led to a profound impact on employee mental health, with far-reaching consequences for individuals, organizations, and society as a whole. On one hand, technology has brought numerous benefits, including increased flexibility, improved communication, and enhanced productivity. However, the constant connectedness and digital demands of modern work have also created a culture of perpetual alertness, where employees feel pressure to be constantly available, responsive, and productive.

However, there are concerns about the negative effects of technology on mental health. Over use of technology, especially social media and browsing, is associated with negative mental health conditions such as anxiety, depression, and stress. Constant connectivity via smartphones and other devices blurs the lines between work and personal life, leading to stress and burnout. To improve the relationship between technology and mental health, it is important to be mindful of our use and involvement of technology in our daily lives, activities and awareness, as well as our physical health. By doing this, we can benefit from the advantages of technology while avoiding its Disadvantages. The impact of technology on mental health and wellbeing should be further investigated and strategies should be developed to reduce negative effects.

As the modern workplace continues to evolve, it's crucial for organizations to acknowledge the potential risks and benefits of technology on employee mental health. By implementing strategies to promote healthy technology use, supporting employee well-being, and fostering a positive work culture, employers can help mitigate the negative impacts of technology on employee mental health.

OBJECTIVES

- To study the socio economic profile of employees
- To explore the mental health of employees
- To examine how technology affects employee benefits

- To evaluate adopting technologies impacts employees job performance
- To examine the relationship between technology use and stress level.
- To examine the impact of technology on employee mental health.

STATEMENT OF THE PROBLEM

The increasing use of technology in the workplace has led to a significant impact on employee mental health, resulting in rising levels of stress, anxiety, burnout, and decreased overall well-being. Despite the benefits of technology in improving work efficiency and productivity, the constant connectedness, social media pressures, and blurring of work-life boundaries have created a toxic work environment that threatens the mental health and resilience of employees. Employees are expected to be constantly available, responsive, and productive, leading to increased stress and anxiety levels.

RESEARCH METHODOLOGY:

Sampling design	Simple random sampling method
Period of study	December 2024- March 2025
Data used	Primary and Secondary data
Test for Analysis	Percentage analysis, Likert Scale Ranking, t-test, ANOVA, Correlation

LIMITATIONS OF THE STUDY

- ❖ Employees may not always give correct answer.
- ❖ The research was conducted within limited duration. So a detailed and comprehensive study could not be included.
- ❖ The study is confined to a sample size of 93 only which may not have revealed the accurate results.
- ❖ The replies from the respondents may be biased and might be reluctant.

RESULTS AND DISCUSSIONS:

TABLE 1
MENTAL STRESS DUE TO TECHNOLOGY

Mental Stress Due To Technology	No.Of Respondents	Percentage
Yes	66	71.0
No	27	29.0
Total	93	100.0

(Source: Primary Data)

Inference:

The above table 3.20 shows that 71.0% of the respondents reveals that increased in stress due to technology, 27% of the respondents reveals that decreased in stress due to technology.

Therefore the major proportion 71.0% of the respondents reveals that increased in stress due to technology.

TABLE 2 IMPACT OF TECHNOLOGY

Impact Of Technology Both Positive And Negative On Mental Health	No. Of Respondents	Percentage
Positive	65	69.9
Negative	28	30.1
Total	93	100.0

(Source: Primary Data)

Inference:

The above table 3.22 shows that 69.9% of the respondents have positive impact on mental health by using technology, 30.1% of the respondents have negative impact on mental health by using technology.

Therefore the majority 69.9% of the respondents have positive impact on mental health by using technology.

TABLE 3
INDEPENDENT SAMPLE T-TEST

NULL HYPOTHESIS (H₀): There is no significant relationship with age and mental health on employees.

ALTERNATIVE HYPOTHESIS (H₁): There is a significant relationship with age and mental health on employees.

MENTAL HEALTH	MALE MEAN RANK	FEMALE MEAN RANK	S.D MALE	S.D FEMALE	T VALUE MALE/ FEMALE	P VALUE
Aware of the importance of mental health in the workplace	4.4524	4.4706	1.19353	1.15504	-.075 -.074	.913
Understand how to recognize the signs of mental health issues	4.000 0	4.1176	1.01212	1.03242	-.552 -.553	.653
Access to resources (e.g. counselling, wellness programs) to support mental health at work	3.690 5	3.4510	1.13671	1.18851	.986 .991	.827
Believe that taking care of mental health essential to overall well being	3.833 3	3.5686	1.01011	1.26894	1.096 1.120	.021

(Source: Primary Data)

Inference:

- ❖ The mean rank for females (4.4706) is slightly higher than that of male (4.4524). The P value (.913) is very high, indicating no significant difference between males and females regarding this awareness.

- ❖ The mean rank for females (4.1176) is slightly higher than that of male (4.0000). The P value (.653) shows no statistically significant difference between the two groups.
- ❖ Males have a slightly higher mean rank (3.6905) compared to females (3.4510). The P value suggests no significant gender based difference in access to these resources.
- ❖ Males have a slightly higher mean rank (3.8333) compared to females (3.5686). The P value (.021) is significant, indicating a meaningful difference between males and females.
- ❖ There is no significant difference between males and females in their awareness, understanding and access to mental health resources.
- ❖ However males shows a significantly stronger belief that taking care of mental health is essential to overall wellbeing compared to females.

TABLE 4 ANOVA

NULL HYPOTHESIS (H₀): There is no significant relationship with Technology related challenges and Technology use by the respondents.

ALTERNATIVE HYPOTHESIS (H₁): There is a significant relationship with Technology related challenges and Technology use by the respondents.

VARIABLE		MEAN	F	SIGNIFICATION VALUE
Technology use	Between Groups	7.698	.622	.539
	Within Groups	12.384		

		MEAN	F	SIGNIFICATION VALUE
	use technology frequently for work related tasks /Technology use	1.336	.987	.377
	spend more than 6 hours a day using technology for work related tasks /Technology use	1.439	1.409	.250
	often feel anxious or stressed when using technology for work related tasks / Technology use	2.542	2.660	.075
	Technology use increases stress levels / Technology use	1.693	1.357	.263
	The constant notification from work related apps and emails are significant source of stress / Technology use	.590	.554	.577

(Source: Primary Data)

Inference:

The above table ANOVA shows, The significance value for Technology use is 0.539, which is greater than 0.05. This indicated no statistically significant difference in technology use between the groups. Since all P values are greater than 0.05, there is no significant difference between technology related challenges and technology use.

TABLE 5

CORRELATION

Correlations				
		Mental health	Technology use	Technology on employee mental health
Mental health	Pearson Correlation	1	-.182	-.159
	Sig. (2-Tailed)		.081	.129
	N	93	93	93
Technology use	Pearson Correlation	-.182	1	.148
	Sig. (2-Tailed)	.081		.156
	N	93	93	93
Technology on employee mental health	Pearson Correlation	-.159	.148	1
	Sig. (2-Tailed)	.129	.156	
	N	93	93	93

(Source: Primary Data)

Inference:

- Correlation values is -0.182, significance value is 0.081 which is greater than 0.05. There is no statistically significant relationship between mental health and technology use.
- Correlation values is -0.159, significance value is 0.129 which is greater than 0.05. No significant relationship between mental health and technology's effect on employee mental health.
- Correlation values is 0.148, significance value is 0.156 which is greater than 0.05. There is no significant relationship between technology use and technology's effect on employee mental health

SUGGESTIONS:

- To promote flexible working hours to reduce stress from long work hours.
- Encourage employees to take regular break and avoid overtime.
- To implement realistic deadlines to reduce pressure.
- Regular system updates and maintenance to ensure smooth operations.
- To encourage email and notification management strategies.
- Train employees on effective digital communication to minimize unnecessary emails and meetings.
- Offer training sessions to help employees adopt to new software or tools.
- Use AI tools for repetitive tasks to reduce workload.
- To implement chatbots and virtual assistants to handle routine queries.
- Conduct periodic surveys to assess technology's impact on mental health.
- Use employee feedback to improve workplace policies and systems.
- Foster a positive work environment where employees can openly discuss mental health concerns.
- Implement mentorship programs to help employees navigate workplace challenges.
- Acknowledge employees efforts with incentives, appreciation or mental health leave.

CONCLUSION

The findings of this study highlight the dual impact of technology on employee mental health, showing both its advantages and challenges. While technology significantly enhances productivity, communication, and efficiency in the workplace, it also contributes to increased stress, anxiety, and work-life imbalance.

The study reveals that factors such as long working hours, high pressure to meet deadlines, and frequent system downtime negatively affect employees' well-being. Moreover, excessive use of digital devices, particularly for extended hours, leads to mental fatigue, sleep disturbances, and increased stress levels. Despite these challenges, many employees recognize the positive role of technology in improving work processes, facilitating collaboration, and increasing overall job efficiency. However, to maximize these benefits while minimizing negative effects, organizations must implement strategies such as mental health support programs, flexible work policies, digital detox initiatives, and ergonomic workplace solutions.

Encouraging work-life balance, reducing digital overload, and providing proper training on technology use can help create a healthier and more sustainable work environment. The study emphasizes the need for a balanced approach to technology adoption—one that prioritizes both productivity and employee well-being, ensuring that workplace technology remains an enabler rather than a source of stress.

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ANALYSING THE ONLINE BUYING BEHAVIOUR OF GEN X, Y & Z

Snowfia K * and S. Bulomine Regi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

Abstract

The rapid evolution of e-commerce has significantly transformed consumer purchasing behavior across different generational cohorts. This study aims to analyze and compare the online buying behavior of Generation X, Y, and Z, examining their shopping habits, preferences, attitudes, satisfaction levels, and challenges encountered during online purchases. By utilizing a structured questionnaire distributed among 150 respondents, the study identifies key generational differences in aspects such as payment preferences, digital trust, brand loyalty, and sustainability concerns. The data collected are original in nature. The collected data were analysed by using the following statistical tools namely percentage analysis, independent t test, ANOVA. Findings indicate that while Gen X prioritizes security and reliability, Gen Y emphasizes convenience and product variety, whereas Gen Z favors digital engagement, speed, and ethical shopping choices.. Insights derived from this research offer valuable implications for businesses seeking to tailor their digital marketing strategies and enhance customer engagement. By understanding the distinct preferences and behaviors of each generation, e-commerce platforms can refine their services to improve user experience, build brand loyalty, and drive sales in a competitive digital marketplace.

Key Words

Online buying behaviour, generation X, Y, Z, digital marketing, consumer preferences, brand loyalty, emerging technologies, purchase decisions.

Introduction

The emergence of e-commerce has completely changed how people shop, and people of all ages are increasingly choosing to purchase products online. Understanding how different generations, such as Gen X, Y, and Z make purchases online is crucial as the digital world develops further. Each generation possesses unique characteristics, values, and shopping habits, shaped by their individual life experiences, cultural backgrounds, and levels of technological expertise. Gen X born between 1961 and 1980, is frequently described as a link between the digital and analog worlds.

Gen Y those born between 1981 and 1996, are frequently referred to as the "digital native" generation. This generation's online buying habits are influenced by their love of social media and need for rapid satisfaction. Gen Z born between 1997 and 2012, is the youngest and most digitally connected generation yet. This generation is renowned for its appreciation of sustainability, entrepreneurial spirit and authenticity, all of which have an impact on their online purchasing habits. Since each of these generations has unique traits and shopping preferences, it is crucial to examine their online purchasing patterns independently in order to understand their requirements, preferences and problems.

Research Gap

The existing literature on online buying behavior has primarily focused on understanding the preferences and behaviors of individual generations, such as Gen X, Y, and Z. However, there is a lack of research that examines the similarities and differences in online buying behavior across multiple generations. Furthermore, most studies have concentrated on specific aspects of online buying behavior, such as the role of social media or the impact of website design, without providing a comprehensive understanding of the complex factors that influence online purchasing decisions. My study aims to fill this research gap by analysing the online buying behaviour of gen X, Y and Z with a focus on understanding their shopping habits, preferences, attitude, satisfaction level and the problems faced by them.

By examining the online buying behavior of Gen X, Y, and Z consumers, my study aims to provide insights into the similarities and differences in their shopping habits, preferences, attitude, satisfaction level and the problems faced by them. The study's findings will contribute to the existing literature on online buying behavior and provide valuable implications for businesses and marketers seeking to develop effective online marketing strategies that cater to the unique needs and preferences of different generational cohorts.

Statement of the problem

The rapid growth of e-commerce has led to significant changes in consumer behavior, with different generations exhibiting distinct online shopping habits. Gen X, Gen Y, and Gen Z, each with unique experiences, values, and technological proficiency, are driving the online retail landscape. However, there is a lack of comprehensive research on the online buying behavior of these generations. For marketers, who find it difficult to create strategies that effectively target each age, this information gap has serious consequences.

Businesses need to know about Gen X, Gen Y, and Gen Z online purchasing habits in order to remain effective in the digital economy. However, rather than offering a thorough comparison of their online purchasing behaviors, previous research has mostly concentrated on certain generations. This research will give marketers and retailers important insights on how to effectively target each generation by analyzing the differences and similarities in their online buying behaviors, motives, and decision-making processes.

Objectives of the study

- To examine the online shopping habits, preferences, attitude among gen X, Y and Z.
- To identify the satisfaction level of the online buying behaviour among gen X, Y and Z.
- To examine the problems faced by the gen X, Y and Z while buying through online.
- To identify the online buying behaviour of gen X, Y and Z

Research methodology

The present study is analytical and descriptive in nature. A questionnaire was constructed to elicit the required information from the respondents. 150 sample respondents were selected for the study. A well-structured questionnaire was framed and collected using Google forms. This study is based on analysing the online buying behaviour of Gen X, Y, Z. Therefore the questions are related to various aspects of online shopping habits, preferences of online shoppers, online buying attitude, online buying behaviour, satisfaction level of online shoppers and problems faced by online shoppers.

Sampling design

The purposive random sampling method was adapted to collect data from Gen X, Y, Z. The total of 150 respondents participated in the study by filling out the questionnaire distributed through google forms.

Hypothesis Testing using ANOVA

H0 There is no significant difference between the age and online shopping habits, preferences, buying attitude, online buying behaviour, problems faced and satisfaction level of online shoppers of gen x, y, z

H1 There is a significant difference between the age and online shopping habits, preferences, buying attitude, online buying behaviour, problems faced and satisfaction level of online shoppers of gen x, y, z

Table 1

Variable	Age	Mean	Std. Deviation	F value	P value
Online shopping habits	12 - 27	30.5600	3.68206	4.229	0.016
	28 - 43	30.0800	3.54470		
	44 - 59	32.1200	3.77229		
	Total	30.9200	3.74617		
Preference of online shoppers	12 - 27	30.5800	4.21412	1.209	0.301
	28 - 43	31.4600	3.21483		
	44 - 59	31.6000	3.13636		
	Total	31.2133	3.56076		
Buying attitude of online shoppers	12 - 27	35.2400	4.13822	.760	0.469
	28 - 43	35.7600	3.32314		
	44 - 59	36.1600	3.71626		
	Total	35.7200	3.73469		
Online buying behaviour	12 - 27	30.2000	3.78504	6.199	0.003
	28 - 43	31.0200	2.99993		
	44 - 59	32.4800	2.99142		
	Total	31.2333	3.39248		
Problems faced by online shoppers	12 - 27	23.1200	3.06820	1.877	0.157
	28 - 43	23.3200	2.45315		
	44 - 59	24.1200	2.56061		
	Total	23.5200	2.72380		
Satisfaction level of online shoppers	12 - 27	23.5200	2.56539	1.910	0.152
	28 - 43	23.2000	2.26779		
	44 - 59	24.1800	2.86919		
	Total	23.6333	2.59431		

Source Computed Data

The above table shows that the significance value of online shopping habits and online buying behaviour .016 and .003 is less than 0.05. Thus the null hypothesis is rejected and conclude by accepting there is a significant difference in online shopping habits and buying behaviour of Gen X, Y and Z. In contrast the table shows the significance value of preferences, buying attitude, problems faced and satisfaction level of online shoppers 0.301, 0.469, 0.157 & 0.152 is greater than 0.05. Thus Null hypothesis is accepted and conclude that there is no significant difference in online buying behaviour of Gen X, Y and Z

Suggestions

- Online shopping platforms should customise marketing efforts for different age groups to better align with your shopping habits
- Online retailers should provide unique shopping habits of each generation
- Improving features like AI recommendations can attract all age groups.

Conclusion

This study gives significant insights into the online buying behavior, preferences, and issues experienced by customers. The data study demonstrates that respondents across different age groups, genders, and jobs have diverse trends in their online buying habits. Discounts and promotions were determined to be the most important factor affecting purchase decisions, whereas reduced pricing and outstanding customer service promoted recurrent purchases. Furthermore, a significant portion of respondents indicated that they were ready to switch entirely to online shopping, mostly for convenience and to avoid crowds.

Although most people agree that buying online is simple, there are still concerns about product defects, payment processing problems, and delivery delays. According to the study, service quality, return policies, and product expectations are the main factors that influence customer happiness, which emphasizes the necessity for e-commerce platforms to improve these areas.

The study's overall findings highlight the growing demand on online purchasing and the significance of resolving customer problems in order to provide a smooth shopping experience. Future studies could examine how online buying trends are changing, with a focus on how AI-driven personalization and sustainability issues affect consumer decisions. Businesses may increase confidence among customers and the state of e-commerce overall by resolving these important challenges.



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UNVEILING THE HIDDEN MENTAL AND PHYSICAL CONSEQUENCES OF HOMEMAKING

R.Snows Edle Mellba * and A.Saleth Mary Vetrisevi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

Homemaking is frequently seen as a labour of love, yet the mental and physical toll it takes is often overlooked. The hidden of home making are still mostly unknown, despite being typically linked to caring and household management. This study explores the physical and mental strains that stay-at-home moms endure, exposing the long-term effects on their health. This research investigates the concealed effects of homemaking, illuminating the psychological and physiological challenges linked to un paid domestic work. The idea of "invisible labour, "in which house wives perform mental and emotional labour that goes unnoticed and results in cognitive overload and burn out, is examined in the study. This study emphasizes how critical it is to recognize the hidden costs of housework by combining qualitative interviews with an existing literature review. In order to promote a more just and healthy society where domestic work is recognized as a major factor in social and economic stability, these problems must be resolved. Utilizing a mixed-methods approach, which includes surveys and interviews with 162 homemakers obtained through convenient sampling via Google Forms, the study assesses stress levels, musculoskeletal strain, emotional fatigue, and the effects on mental health. The results indicated that prolonged involvement in domestic tasks leads to chronic fatigue, anxiety, and a reduced sense of self, especially in the absence of external affirmation. The research also underscores the gendered dimensions of homemaking, pointing out how societal expectations increase stress and hinder personal growth. By revealing these overlooked repercussions, this study calls for enhanced acknowledgment of homemaking as valid labour, the necessity for mental health resources, and policies that foster work-life balance for homemakers. Tackling these issues can enhance well-being and promote a fairer sharing of domestic duties.

KEYWORDS: Homemakers, unrecognized labour, emotions, physical pain, multitaskers.

INTRODUCTION

Homemaking has always been a vital yet often unappreciated component of everyday life, frequently viewed as a private, instinctual duty mostly associated with women. Traditionally, domestic activities like cooking, cleaning, and caregiving are seen as manifestations of love and care instead of recognized forms of labour. Nevertheless, this entrenched societal viewpoint has ignored the significant mental and physical impacts of homemaking. In numerous societies, stereotypes persist that portray women as suited only for household responsibilities and family care. Women have remained largely unheard globally.

There are approximately 160 million women in India who are engaged in homemaking. On average, women invest 297 minutes each day on household chores, while men only contribute about 31 minutes daily, based on data from the National Sample Survey Organization published in The Hindu. Homemaking is frequently envisioned as a rewarding and relaxing occupation that requires the full commitment of the housewife and has many uncounted consequences. The pressure to fulfil societal expectations also negatively affects emotional well-being. Homemakers find it quite difficult to maintain balance and consistently feel the weight of these expectations.

However, subtle changes by family members, particularly partners, can gradually alter this dynamic. First and foremost, it is essential to acknowledge and respect their physical and mental contributions. Taking time to recognize their hard work for the family's benefit and showing appreciation through small gestures of kindness is important. By sharing the job and appreciating the importance of unpaid domestic labor, family members can lessen the load on women. Additionally, offering emotional support makes a big effect. Husbands could also participate in parenting and other household responsibilities, providing moral support that is as crucial as physical help. Allowing them a day off to rest can also rejuvenate their energy. Additionally, understanding their choices and showing respect for them is vital, making them feel valued. Words of affirmation can help maintain their spirits.

Objectives

- 1) To identify the coping strategies that can support mental and physical health.
- 2) To bring to the fore front that common mental illness faced by the homemakers.
- 3) To shed light on the role of societal expectations in shaping the experience of homemakers.

- 4) To examine the financial and economic disadvantages confronted by the homemakers.
- 5) To offersuggestionstohomemakerstoprioritizementalandphysicalwell-being.
- 6) To explore the physical task of repetitive chores.
- 7) To analyse how the time constraint affects adherence to preventive health- care.
- 8) To highlight the skills that homemakers develop.

Statement of the problem

Although homemaking entails handling domestic duties like childcare, chores, money, and meal preparation, it is sometimes underestimated and unappreciated. Despite its significance, homemaking has serious negative effects on one's mental and physical health, such as loneliness, sadness, low self-esteem, financial reliance, and health problems. These responsibilities are disproportionately assigned to women by societal conventions and gender expectations, which hinders their ability to advance both personally and professionally. These difficulties are made worse by a lack of support networks and acknowledgment. The research presented here examines the actual experiences of homemakers, draws attention to the psychological and physical effects of homemaking, and suggests ways to encourage acceptance, assistance, and a fair division of duties.

Research instrument

Period of the study	December 2024 -March 2025
Data used	Primary data and secondary data
Sampling design	Convenience sampling
Total number of respondents	162
Statistical tools used for analysis	Percentage analysis, Chi-square analysis, mean Ranking analysis, Likert ranking analysis

Limitations

- 1) The data provided by the homemakers are personal testimonies which may be biased.
- 2) The study's measurement tools may not accurately capture the complications of homemaking experience.
- 3) The discoveries of the study may not be generalizable as the homemakers may differ based on geographical locations, cultural and socio- economic backgrounds.
- 4) The data collection period is limited which may restrain the depth of the insights.
- 5) Various factors such as family support and financial position may have a significant influence over the responses.

RESULTS&FINDINGS

1)Major factors for stress (Mean Ranking)

Major factors for stress	Mean	Standard deviation	Mean rank
Feeling burdened by the household responsibilities	2.8827	0.99929	III
Anxiety about managing the household budget	2.8457	0.87456	IV

Feelings and hopeless due to homemaking responsibilities	3.0062	1.00617	II
Being detached with your family	2.8025	1.18395	V
Home making valued or respected by family members	2.5864	1.14558	VIII
Prioritizing self-care	2.3580	1.15623	IX
Beingpressurizedbysocietal expectations To perform household chores	3.1728	0.91625	I
Experiencing injuries such as cuts or burns	2.6173	0.97252	VI
Practicing relaxation techniques to manage stress	2.2778	1.31994	X
Engaging in activities that bring you joy and happiness	2.6049	1.04173	VII

Source: Primary data

INTERPRETATION:

The table reveals that the primary concern is *being pressurized by societal expectations to perform household chores*, which is the top-ranked issue (Mean = 3.1728), suggesting that people's experiences with homemaking are greatly influenced by social standards.

feeling sad or hopeless due to homemaking responsibilities had the second-highest mean (Mean = 3.0062), indicating that many people suffer from emotional pain associated with domestic chores. The financial and practical components of homemaking are factors that lead to stress, as seen by the third and fourth-place rankings of *feeling burdened by household responsibilities* (Mean = 2.8827) and *anxiety about managing the household budget* (Mean = 2.8457). The fifth-ranked item, *being detached from your family* (Mean = 2.8025), indicates that family relationships may be impacted by home duties. *Experiencing injuries such as cuts or burns*(Mean=2.6173)comes in at number six, indicating the hazards that come with being a housewife. Positive practices like *engaging inactivities that bring you joy and happiness* (Mean=2.6049)come in at number seven, indicating that although some people enjoy these kinds of activities, they do not sufficient importance. People may believe their home making efforts are not fully acknowledged, as evidenced by the eighth-ranked item *homemaking being valued or respected by others* (Mean=2.5864).The ninth-ranked item, *prioritizing self-care*(Mean=2.3580),suggests that self- care is frequently over looked in favor of house hold duties. The element that is ranked lowest(Mean=2.2778) is *practicing relaxation techniques to manage stress*, suggesting that stress management approaches are not commonly used or given priority.

2) Chi-square analysis

Observed value

Factors assisting budget preparation	Identifying The household needs &expenses	Knowing the income of The family	Setting goals like savings, higher education	Smart shopping like looking for discounts or bulk purchases	Total
Level of education					
HSC/ SSLC	17	8	14	8	47
UG	36	10	16	8	70
PG	17	5	10	2	34
Diploma	4	3	1	3	11
Total	74	26	41	21	162

Expected value

Factors assisting budget preparation	Identifying The household needs &expenses	Knowing the income of The family	Setting goals like savings, higher education	Smart shopping like looking for discounts or bulk purchases	Total
Level of education					
HSC/ SSLC	21.5	7.5	11.9	6.1	47.0
UG	32.0	11.2	17.7	9.1	70.0
PG	15.5	5.5	8.6	4.4	34.0
Diploma	5.0	1.8	2.8	1.4	11.0
Total	74.0	26.0	41.0	21.0	162.0

	Value	df	Asymptotic Significance (2-sided)
Pearson chi-square	8.535 ^a	9	0.481

Source: Primary data

H₀ □ There is no significant association between the amount of education and the elements supporting budget preparation.

H_A □ There is a significant association between the amount of education and the elements supporting budget preparation.

INTERPRETATION:

To ascertain whether there is a significant correlation between the parameters aiding in budget preparation and educational attainment, the Pearson Chi-Square test was employed.

Chi-Square

Value(χ^2): 8.553

Freedom Levels

(df): 9

p-value (significance level): 0.481

The null hypothesis is cannot be rejected since the p-value (0.481) is higher than the traditional significance limit of 0.05. This suggests that there is no statistically significant association between the amount of education and the elements supporting budget preparation. In other words, respondents' educational attainment had little bearing on differences in budget preparation components.

3) Stress about homemaking activities (Likert ranking scale)

Opinion based on acceptance	Strongly disagree	Disagree	Neutral	Agree	Strongly Agree	Total	Average	Rank
Home making is often undervalued due to societal norms that prioritize income earning people	160	264	99	26	18	567	3.5	IX

Societal expectations place a significant burden to prioritize house hold duties over Personal aspirations	145	228	153	46	2	574	3.5432	VII
Media and advertising reinforce traditional stereotypes of homemakers.	55	108	300	28	10	501	3.0925	XVI
Changing societal Expectations are	80	128	138	120	8	474	2.9259	XVIII
There is a societal bias that homemaking is less valuable than roles Outside the home	95	292	147	28	7	569	3.5123	VIII
The society does not recognize the contribution of homemakers.	235	256	87	18	13	609	3.7592	III
Being without a job Stagnates the skills	145	268	138	28	6	585	3.6111	V
Lack of independence in financial decisions affects mental soundness.	175	276	120	26	5	602	3.7160	IV
Government policies reduces the financial dependency to some extent.	25	128	261	50	13	477	2.9444	XVII
Being unemployed the knowledge about financial products and Investment is low.	80	300	144	32	7	563	3.4753	XI

The monotonous work results in constant exhaustion.	325	128	120	30	10	613	3.7839	II
Cleaning agents causes Difficulty in breathing	40	84	162	124	17	427	2.6358	XX
Endless errands have negatively affected the physical health over time.	95	304	129	24	12	564	3.4814	X
Taking adequate Breaks to reduce the Physical toll of Household chores.	100	216	186	34	9	545	3.3641	XII
I manage time efficiently by balancing household responsibilities.	55	224	213	28	10	530	3.2716	XV
I am skilled at creating and maintaining household management.	95	216	183	40	8	542	3.3456	XIII
I plan and prioritize Tasks daily	75	200	204	50	4	533	3.2901	XIV
In negotiate with service providers and vendors To get the best value.	55	80	174	120	13	442	2.7283	XIX
I can maintain a well-structured living space by organizing households.	130	296	123	28	7	584	3.604	VI
I understand the feelings and address the emotional needs of The family members	420	144	69	14	12	659	4.0679	I

Source: Primary data

INTERPRETATION:

The most important part of homemaking, according to the statement with the highest ranking (4.0679), is recognizing and meeting the emotional needs of family members. The physical and mental burden of repetitive home duties is shown by the second-rank (3.7839) effect of monotonous work. The fact that the contributions of homemakers were not acknowledged came in third (3.7592), suggesting that homemaking is not valued in society. Homemaking-related financial and skill-development issues were reflected in the high rankings for lack of independence in financial decisions impacting mental soundness (3.7160) and unemployment stalling skills(3.6111).The tendency of society to devalue homemaking was confirmed by the mid-to-high ranks given to statements about societal bias and expectations, such as the belief that homemaking is less important than external roles (3.5123) and that income-earning people are given priority over homemakers(3.5).The significance of self-care is demonstrated by the necessity for sufficient pauses(3.3641) and the impact of endless errands on physical health (3.4814) indicating the importance of self-care. There are differing opinions on how homemaking can foster skill development between being unemployed and

Having financial knowledge (3.4753) and having house hold management skills (3.3456). Effectively juggling household duties came in lower (3.2716), indicating that these areas might not be as common or important. Government policies minimizing financial dependency (2.9444) ranked lower, demonstrating that existing policies are not effective. Negotiating with service providers (2.7283) stating that the homemakers do not do follow it often. The lowest ranking of cleaning products that cause respiratory problems (2.6358) indicates that this is a less common issue than others. The lowest ranking of cleaning products that cause respiratory problems (2.6358) indicates that this is a less common issue while compared to others.

4) Pre dominant impact faced as being unpaid homemakers

Impact	No. of respondents	Percentage (%)
Completely rely on spouse for financial support	47	29.0
Notable to save money	27	16.7
Notable to manage households due to income of a single person	41	25.3
No source of personal income to make independent Financial decisions	47	29.0
Total	162	100.0

Source: Primary data

INTERPRETATION:

The table illustrate that, the most significant issues highlighted include complete financial dependence on spouse and lack of personal income preventing independent financial decisions as they hold the first place with 29%, difficulty in managing the households with a single person's income is considered as the next predominant impact with 25.3%, additionally 16.7% of the total respondents feel that they are not able to save money.

5) Skills developed from home making

Skills	No. of respondents	Percentage(%)
Time-management	59	36.4
Multitasking	26	16.0
Budgeting	10	6.2
Flexibility	6	3.7
Organizing	5	3.1
Culinary skills	56	34.6
Total	162	100.0

Source: Primary data

INTERPRETATION:

The table reveal the skills developed by the homemakers. Out of 162 respondents 36.4% of the respondents agreed that their time management skill has developed during home making, 34.6% state that they have developed culinary skills, 16% of the respondents

feel that they have become well- versed in multitasking, 6.2% of the respondents have learnt to draft a proper budget, 3.7% have learnt to be flexible to adopt to different situations and 3% have developed in organizing the available space.

6) Measures that could be taken to reduce physical pain

Measures taken	No. of respondents	Percentage (%)
Using light-weight cookware	22	13.6
Plan a weekly schedule to spread out heavier chores	31	19.1
Take breaks to relax muscles	29	17.9
Share responsibilities with family members	66	40.7
Use labor-saving devices	14	8.6
Total	162	100.0

Source: Primary data

INTERPRETATION:

The above table outlines that, the most commonly adopted strategy is sharing responsibilities with family members which accounts for 40.7% of the respondents, the next notable strategy adopted is planning a weekly schedule to spread out heavy chores (19.1%), the next strategy adopted is taking breaks to relax muscles as it preferred by 17.9%, using light- weight cookware is being adopted by 13.6% of the total respondents and 8.6% rely on labour saving devices to reduce physical pain

7) Common preconceptions of the society about homemakers

Ways of Societal expectations	No. of respondents	Percentage (%)
They are primarily caregivers and nurturers	57	35.2
They are equal contributors to household income	30	18.5
They are independent decision-makers outside the home	27	16.7
They are less significant in societal contributions	48	29.6
Total	162	100.0

Source: Primary data

INTERPRETATION:

From the above table, presents that, the most common preconception is that (35.2%)home makers are mainly responsible for caregiving and nurturing, nearly one-third of the respondents (29.6%) believe homemakers have a limited role in societal contributions, a small proportion(18.5%)consider them to be economic contributors and a least percentage of16.7%consider that they have limited autonomy over the decision making beyond household affairs.

8) Activities done by the respondents for self-care

Activities done	No. of respondents	Percentage (%)
Proper sleep routine	56	34.6
Social connections	50	30.9
Therapy/Counselling	9	5.6
Using eco-friendly and Natural products	16	9.9
Connecting with nature	31	19.1
Total	162	100.0

Source: Primary data

INTERPRETATION:

From the above table, it is inferred that a major part of 34.6% of the home makers follow a proper sleep routine as a method of self-care, 30.9% adopt social connections as a means of self-care,19.1% connect with nature through gardening and other outdoor activities, 10% (9.9%) use eco- friendly or natural products for self- care and 5.6% of them take up counselling.

CONCLUSION

The research emphasizes the need for tailored interventions to enhance the well-being of homemakers. Support systems, such as community organizations, peer networks, and family engagement, are essential for alleviating stress. Promoting self-care routines, scheduled break times, and emotional backing can greatly improve their mental health. Moreover, fostering physical health through appropriate ergonomics, stretching exercises, and consistent health assessments can lessen the effects of repetitive physical stress.

In addition, tackling financial dependence is crucial for empowering homemakers. Programs focused on financial literacy, entrepreneurial prospects, and policies that provide financial assistance can offer them increased independence and security. Promoting equitable distribution of tasks within families and nurturing an atmosphere of gratitude and respect will help to alleviate the mental load on homemakers. Interventions from both government and society are vital for achieving meaningful change. Policies that enable homemakers to access health care, social security, and opportunities for professional growth will enhance their financial and emotional well-being.

To sum up, the overlooked impacts of homemaking need to be addressed through joint efforts of families, communities, and policy makers. By recognizing the mental and physical challenges of homemaking, advocating for self-care, financial independence, and just labour division, and promoting a culture of appreciation, society can ensure that homemakers receive the acknowledgment and support they rightfully deserve. Establishing an inclusive atmosphere where the contributions of homemakers are respected will not only enhance their well-being but also build stronger, more resilient communities.

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ASSESSING THE EFFECTIVENESS OF INFLUENCER MARKETING ON CONSUMER PURCHASING BEHAVIOUR

Vaishnavi T.N. * and T.Priyanka

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

The concept of influencer marketing has evolved in tandem with the growth of social media platforms such as Instagram, YouTube, and TikTok. Influencers, who are individuals with significant online followings, have become central figures in many brands' marketing strategies. Companies spend a lot of money on working with influencers, but it's uncertain how much this actually impacts consumer decisions, brand loyalty, and purchases.

The primary objective of this study is to assess the effectiveness of influencer marketing in shaping consumer buying decisions. The methodology followed for collecting the data in simple random sampling from 120 respondents Thoothukudi City through a structured questionnaire distributed via Google Forms. The collected data were analysed using statistical tools, including percentage analysis and graphical methods like, pie charts, Likert scales, and the Chi-square test. It was found that to increase the effectiveness of influencer marketing influencer should stay updated in their field.

KEY WORDS

Influencer Marketing , Social Media Platforms , Consumer Buying Decisions, Brand Loyalty , Influencer

INTRODUCTION

Influencer marketing is a form of marketing that enables businesses to collaborate with individuals who have a following for increased brand exposure. Companies may ask a person with a large following to publish social media content that promotes their products or services. People often follow individuals they trust on social media, so if they see someone, they follow advertising your business, there's an inherent trust factor you can lean on to boost your conversion rate. We are moving closer to the digital era every day. People nowadays day's scroll constantly either tapping away on their laptops or using their smartphones.

Social media has become a daily necessity for many people and not a day passes by without them checking their social media habitually. It should not be a surprise that social media platforms have now surpassed traditional advertising channels in importance.

The primary objective includes:

- ⇒ Analyse how influencer marketing affects consumer trust and purchasing behaviour.
- ⇒ Evaluate the impact of influencers on consumer buying behaviour.
- ⇒ Investigating the factors for effective influencer marketing

MATERIALS AND METHODS

MATERIALS USED

Shwetha N S and Vinutha H K (2024)¹ “Influencer Marketing: An Empirical Study on its Impact and Challenges” explored how influencer marketing has become increasingly popular for promoting products and brands among new consumers. The paper delves into both the effectiveness and the challenges of using influencers, relying on empirical research methods to understand these dynamics. The study aims to examine consumer perceptions of influencer marketing and identify the factors that drive purchasing decisions influenced by social media personalities. The research uses a quantitative approach and employs convenience sampling. The findings highlight that influencer marketing has a notable effect on consumer behaviour. The study recommends that marketers focus on strategies to build trust with their followers and understand how this trust influences brand perceptions. However, a significant challenge noted is the difficulty in targeting the right audience within a fixed budget for product promotion.

Dwi Arnin Nurani (2024)²⁰ “The impact of Social Media Influencers on Consumer Behaviour” examines how technology and social media influencers influence consumer behaviour. These influencers have the power to shape customer attitudes, evaluations, and buying decisions, particularly on online platforms. The research focuses on understanding this impact through a quantitative approach, using convenience sampling and empirical methods. The study treats consumer behaviour as the dependent variable and social media influencer strategies as the independent variable. It finds that influencers play a significant role in affecting consumer preferences, attitudes, and purchasing decisions. The paper suggests that companies need to gain a deep understanding of the mechanisms and factors that is important for brands and companies in designing effective marketing strategies in

today's digital era. However, a key limitation noted is that the study does not consider the trustworthiness of influencers, which could impact the overall findings.

METHODOLOGY

Data was collected from both primary and secondary data. Primary data was collected from the respondents by means of questionnaire. Secondary data was collected from the magazines, journals and websites. The collected data were analysed by using the following statistical tools namely percentage analysis and graphical method like pie charts, Likert scale and Chi square test.

TABLE 1
Type of product purchased

Type of Product	No. of respondents	Percentage
Fashion and Apparel	30	25
Beauty and Skincare products	24	20
Tech Gadgets	23	19
Home décor and Lifestyle items	19	16
Food and Beverages	24	20
Total	120	100

Source: Primary Data

INFERENCE

The above table infers that 25% of consumers purchase fashion and apparel 20% purchase beauty and skincare, 19% of consumers purchase tech gadgets , 16% of consumers purchase home décor and lifestyle items and remaining 20% purchase food and beverages.

Thus, the majority 25% of the consumers purchase fashion and apparel.

Table 2
Usage of discount code

Opinion	No of respondents	Percentage
Yes	79	66
No	41	34
Total	120	100

Source: Primary data

INFERENCE

The above table infers that 66% of consumers use discount code while shopping and remaining 34% of consumers use discount code while shopping.

Thus, the majority 66% of consumers use discount code while shopping.

Table 3

Chi-Square Test for Significance between Discount and Purchase Intention

Null Hypothesis (Ho): There is no significant relationship between discount and purchase intention.

Alternative Hypothesis (H1): There is a significant relationship between discount and purchase intention

Observed value

Opinion	Yes	No	Total
Yes	71	28	99
No	8	13	21
Total	79	41	120

Expected value

Opinion	Yes	No	Total
Yes	65.2	33.8	99.0
No	13.8	7.2	21.0
Total	79.0	41.0	120.0

	Value	df	Significance
Pearson Chi-Square	8.707 ^a	1	.003

Inference:

The table value for 1 degree of freedom at 5% level of significance is 3.841. It is found that the calculated value i.e., 8.707 is greater than the table value. Therefore, the Null Hypothesis (Ho) is rejected. Hence it is concluded that there is a significant relationship between discount and purchase intentions which indicates that discount factor influences consumer's purchase decisions

Table 4
Chi-Square Test Chi-Square Test for Significance between Influencer follow and Upgradation in the field

Null Hypothesis (Ho):

There is no significant relationship between Influencer follow and Upgradation in field.

Alternative Hypothesis (H1):

There is a significant relationship Influencer follow and Upgradation in field

Observed Value

Opinion	Yes	No	Total
Yes	75	24	99
No	7	14	21
Total	82	38	120

Expected value

Opinion	Yes	No	Total
Yes	67.6	31.4	99.0
No	14.4	6.7	21.0
Total	82	38.1	120.0

	Value	df	Significance
Pearson Chi-Square	14.410 ^a	1	.000

Inference:

The table value for 1 degree of freedom at 5% level of significance is 3.841. It is found that the calculated value i.e., 14.410 is greater than the table value. Therefore, the Null Hypothesis (Ho) is rejected. Hence it is concluded that there is a significant relationship between Influencer follow and Upgradation in field which indicates that influencer should stay updated in the field.

RESULTS

- ⇒ The majority 25% of the consumers purchase fashion and apparel.
- ⇒ The majority 66% of consumers use discount code while shopping.
- ⇒ There is a significant relationship between discount and purchase intentions which indicates that discount factor influences consumer's purchase decisions
- ⇒ There is a significant relationship between Influencer follow and Upgradation in field which indicates that influencer should stay updated in the field.

CONCLUSION

In conclusion, regular influencer campaigns are essential for maintaining strong consumer engagement and fostering brand loyalty. By consistently interacting with their audience, influencers gain valuable insights into evolving consumer tastes, preferences, and purchasing behaviour. This continuous feedback loop allows them to tailor their promotional strategies to align with consumer expectations, making their recommendations more relevant and persuasive.

Moreover, frequent campaigns help build trust and credibility, as consumers are more likely to engage with influencers who provide consistent and valuable content. This ongoing engagement strengthens the influencer-brand relationship, leading to higher conversion rates and a more profound impact on consumer decision-making. Additionally, regular campaigns allow influencers to experiment with different content formats, platforms, and messaging strategies, helping them refine their approach and maximize audience reach.

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A STUDY ON TECHNOLOGY ADVANCEMENT IN DIGITAL PAYMENT SYSTEM AND THEIR ROLES AND CHALLENGES AMONG STREET VENDORS IN THOOTHUKUDI DISTRICT

Esther Rani. M* and O.Sony

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

The rapid advancement of technology has revolutionized digital payment systems, significantly impacting street vendors by enhancing transaction efficiency, expanding customer reach, and promoting business growth. Mobile wallets, point-of-sale (POS) systems, QR code payments, and contactless payment technologies have provided street vendors with convenient, secure, and fast transaction methods. Despite these benefits, street vendors face several challenges in adopting digital payments, including limited access to smartphones, unstable internet connections, and a lack of digital literacy. This study explores the role of digital payment systems in transforming street vending businesses, identifies barriers to adoption, and examines the impact of digital transactions on vendors revenue and customer interactions. The research methodology includes a structured survey conducted among 124 street vendors in busy street of Thoothukudi district, with the statistical tools such as percentage analysis, garrett's ranking method, chi-square test, ANOVA, independent t-test, one-sample t-test, and the likert scale for data interpretation. Findings from the study highlight the need for improved financial literacy, better technological infrastructure, and government support to facilitate seamless digital payment integration for street vendors.

KEY WORDS

Risk assessment, revenue level, security, literacy, street vendors, technology

INTRODUCTION

The rapid advancement of technology has revolutionized the way businesses operate, and street vendors are no exception. With the proliferation of smartphones, mobile payment platforms, and digital wallets, street vendors can now accept digital payments, expanding their customer base and increasing sales. This transformation has not only improved the efficiency of transactions but also enhanced the overall customer experience. Digital payment systems have played a pivotal role in this transformation. Mobile wallets, such as PayPal, Venmo, and Google Pay, have enabled street vendors to accept payments from customers who

prefer to use their smartphones rather than cash. Point-of-sale systems, such as Square and Clover, have provided street vendors with a convenient and secure way to process transactions and manage sales. QR code payments and contactless payments have also become increasingly popular, allowing customers to make payments with a simple scan or tap of their card or device. The adoption of digital payment systems has numerous benefits for street vendors. It reduces the risk of cash loss, theft, or damage, and minimizes the time spent on transactions and accounting. Digital payment systems also provide street vendors with valuable insights into their sales and customer behavior, enabling them to make informed decisions about their business. Furthermore, digital payment systems enhance the customer experience by providing a convenient, fast, and secure way to make payments. In addition, digital payment systems have also enabled street vendors to stay competitive in the market. With the rise of e-commerce and online shopping, street vendors need to adapt to changing consumer behavior and preferences. By embracing digital payment systems, street vendors can reach a wider customer base, increase sales, and stay ahead of the competition.

STATEMENT OF THE PROBLEM

The growth of digital payment system has transformed the way business operate but street vendors face significant challenges in adopting these system. The ease and efficiency that digital payment provides many sellers lack access to the essential infrastructure such as smartphones, stable internet connections and digital literacy. Many street sellers clients still prefer cash transaction due to their simplicity and lack of dependency on technology. This poses a significant problem, as small business like street shops, vendors etc... are the backbone of Indian economy, and their inability to adapt to technology advancement in payment system may hinder their growth and sustainability. The lack of standardized payment solution often force vendors to manage multiple platform, adding to financial burden and solving these issue is essential for the seamless integration of street vendors into the digital payment system.

OBJECTIVES

- To explore the current payment systems used by street vendors and identify their challenges.
- To investigate the potential of technology advancement in payment systems.

- To analyze the effects of digital payment adoption on the revenue level of street vendors.

REVIEW OF LITERATURE

- 1) **Vidhi Jangid [2025]** This research addresses the difficult lives of street vendors with the aim of informing policy development, guiding, empowering the community, and increasing economic opportunity. The life of street vendors was never easy, they faced many problems throughout their lives. Since street vendors have a huge impact on the economy by providing employment opportunities, they still don't get attention and are judged by the people. So, to know all the challenges, we talked to them and read various literature and research papers. They faced problems like inadequate water and electricity, per day income, family dependency, storage, COVID-19, and legal challenges. This research helps to show life from street vendors and create awareness about them among the people.
- 2) **Zelege Girma, et.al., [2025]** The study aimed to assess food handling practices among street food vendors and their associated factors in the town administration of the Gamo Zone. A cross-sectional study design was conducted from October to December 2021. A simple random sampling technique by the lottery method was used to select 421 participants. The data were collected through interviews and observations, entered into EpiData version 7, and transported to STATA version 13 for analysis by logistic regression. The findings reveal that improving the monthly income and educational status of the food handlers, counseling, and periodic inspections may improve their good food handling practices.
- 3) **Bharathi S. Gopal [2025]** This chapter highlights the essence of digital transformation in India among the street vendors who comprise a significant percentage of the informal sector. This chapter gives a brief outlines of street vendors, vendor organizations and the laws that provide a legal status to the street vendors. It also emphasizes the adoption of digital transformation technologies especially UPI. The chapter concludes by highlighting the problems of street vendors and climate change, and the role of technology in empowering and making the street vendors an inclusive part of India's growth journey.

SAMPLING DESIGN

The data collected was original in nature. A non probability convenient sample of 24 respondents residing in various parts of busy street in Thoothukudi was selected.

INDEPENDENT T-TEST

THE TABLE SHOWS THE POTENTIAL OF TECHNOLOGY

VARIABLE	QUALIFICATION	MEAN	STANDARD DEVIATION	F	SIG
Increase the efficiency of my business operation	Literate Illiterate	4.7188 4.7857	.55636 .49868	1.205	.275
Reduce the risk of cash handling errors.	Literate Illiterate	4.2083 4.3571	.69459 .48795	2.566	.112
Increase customer satisfaction and loyalty	Literate Illiterate	4.3021 3.9286	.68241 .89974	7.411	.007
Reduce transaction cost	Literate Illiterate	4.3021 3.5714	.79630 1.03382	4.977	.028
Improve the security and integrity and integrates of transaction	Literate Illiterate	4.0208 3.9643	.82052 1.17006	4.227	.042
Increase sales revenue for the business	Literate Illiterate	4.0938 4.1111	.82178 .93370	.738	.392
Simplify financial record keeping	Literate Illiterate	4.2396 4.2143	.84286 .78680	.181	.671
Real time transaction data and analytics	Literate Illiterate	4.5104 4.0714	.69577 .76636	.004	.949

Source: Primary data

INFERENCE

The above table shows that significant values .275, .112, .007, .392, .671, .949 for the statement increase the efficiency of my business operation, reduce the risk of cash handling errors, increase customer satisfaction and loyalty, increase sales revenue for the business, simplify financial record keeping, real time transaction data and analytics is greater than 0.05, hence I accept null hypothesis and conclude by accepting that there is no significant difference in potential technology in advancement in payment system with qualification. In contrast, the table shows significant value as .028, .042 for the statement reduce transaction cost, improve the security and integrity is less than 0.05, hence I reject null hypothesis and conclude that there is a significant difference in potential technology in advancement in payment system with qualification.

LIKERT SCALE

THE TABLE SHOWING THE SALES AND REVENUE LEVEL

Satisfaction level	LIKERT SCALE					No. of Respond	Weighed score	Average score	Rank
	Strongly Agree (5)	Agree (4)	Neutral (3)	Dis Agree (2)	Strongly Disagree (1)				
The adoption of digital payment systems has increased my sales revenue.	102	15	7	0	0	124	591	4.766	I
	510	60	21	0	0				
Technology advancement in payment systems has	38	76	10	0	0	124	514	4.145	V
	190	304	30	0	0				



improved my ability to process transactions efficiently									
The use of technology-based payment solutions has improved my ability to track sales and revenue	44 220	51 204	29 87	0 0	0 0	124	511	4.120	VI
Technology advancement in payment has enabled to promotions and discounts, increasing sales.	41 205	59 236	20 60	4 8	0 0	124	509	4.104	VII
Digital payment systems have increased the speed of transactions, allowing me to serve more customers	52 260	40 160	28 84	4 4	0 0	124	508	4.096	VIII
The adoption of mobile payment	69	33	17	5	0	124	538	4.338	III

systems has reduced the risk of cash handling errors, resulting in increased revenue.	345	132	51	10	0				
Technology advancement in payment systems has improved my ability to manage inventory.	55 275	48 192	19 57	2 4	0 0	124	528	4.258	IV
Digital payment systems have increased my competitiveness in the market, leading to higher sales and revenue.	66 330	33 132	17 51	5 10	0 0	124	545	4.395	II

Source: Primary data

INFERENCE

From the above table likert five point scale majority 4.76 average score belongs to the adoption of digital payment systems has increased my sales revenue has been ranked as first, followed by 4.39 average score denotes digital payment systems have increased my competitiveness in the market, leading to higher sales and revenue has been ranked as second, 4.34 average score lies on the adoption of mobile payment systems has reduced the risk of cash handling errors, resulting in increased revenue has been ranked as third, 4.26 average

score denotes technology advancement in payment systems has improved my ability to manage inventory has been ranked as fourth, 4.15 average score belongs to technology advancement in payment systems has improved my ability to process transactions efficiently has been ranked as fifth, 4.12 belongs to the use of technology-based payment solutions has improved my ability to track sales and revenue has been ranked as sixth, 4.10 average score denotes technology advancement in payment has enabled to promotions and discounts, increasing sales has been ranked as seventh, 4.096 depends on digital payment systems have increased the speed of transactions, allowing me to serve more customers has eight rank.

FINDINGS

- ✚ Satisfaction with current payment options ranked highest; concerns about digital security and productivity ranked lowest.
- ✚ Improved business efficiency ranked highest; enhanced security ranked lowest.
- ✚ Digital payment adoption was seen as the most impactful factor for increased revenue.

SUGGESTIONS

- ✚ It is necessary to develop user-friendly payment apps and promote security tips.
- ✚ It is advisable to encourage vendors to diversify payment method.
- ✚ It is necessary to promote offline-capable apps and improve connectivity.
- ✚ It is advisable to offer loyalty rewards and keep vendors informed about new features.
- ✚ Ensure focus on promoting convenience while improving digital literacy.

CONCLUSION

The study highlights that digital payment adoption has significantly improved business performance among street vendors, enhancing sales, customer convenience, and operational efficiency. The widespread use of QR codes and other digital payment methods has played a key role in streamlining transactions and attracting more customers. However, despite these benefits, certain challenges remain, particularly among older vendors, those in rural areas, and those with limited digital literacy.

Security concerns, technical issues, and the perceived complexity of digital payment systems continue to discourage some vendors. Additionally, the high cost of adopting digital payment tools and limited access to reliable internet connectivity further restricts adoption, particularly for vendors with lower incomes. Addressing these challenges is vital to ensuring the continued growth of digital payment usage.

To overcome these barriers, targeted initiatives are necessary. Digital literacy programs tailored to older and less-educated vendors can improve their understanding and confidence in using digital payment platforms. Offering affordable or subsidized payment tools, along with improved technical support, can further encourage adoption among low-income vendors.

Improving internet infrastructure in rural areas is equally important to ensure vendors in underserved regions can access reliable digital payment services. Moreover, promoting secure transaction practices, educating vendors on fraud prevention, and raising awareness about safe platforms like UPI will help build greater trust in digital transactions.

By implementing these strategies, vendors can fully harness the benefits of digital payments, resulting in increased sales, improved customer relationships, and stronger business growth. Sustained efforts to address vendor concerns, combined with ongoing innovation in digital payment solutions, will ensure their successful integration into the evolving digital economy.

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IMPACT OF CHANGING CONSUMER BUYING BEHAVIOUR ON ONLINE SHOPPING

R. Shunmugavalli * and S. Bulomine Regi

Department of Commerce, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Thirunelveli, Tamil Nadu, India

ABSTRACT

This study examines the changing consumer behaviour in online shopping, exploring the factors that influence purchasing decisions, and identifying emerging trends and patterns. A questionnaire-based survey of 150 respondents in Thoothukudi city revealed significant relationships between age and opinion, decision-making process, customer satisfaction, behaviour, and problems faced by online shopping. The findings suggest that online retailers must adapt to changing consumer expectations, prioritize personalization, convenience, and trust, and address challenges such as information overload and lack of tactile experience. The study provides valuable insights for businesses, marketers, and policymakers to develop effective strategies, enhance customer experiences, and drive growth in the e-commerce market.

Key Words

Consumer behaviour, Online shopping, purchasing decisions, Emerging trends, personalization, E-commerce market.

INTRODUCTION

Online shopping has revolutionized the way consumers buy goods and services, offering convenience, a wide range of products, competitive pricing, and access to global markets. The rise of e-commerce has significantly impacted consumer behavior, with increasing demand for personalized experiences, growing importance of trust and security, and shifting expectations and preferences. Understanding these changes is crucial for businesses to remain competitive, and research focuses on factors influencing online purchasing decisions, emerging trends, and the impact of technology, lifestyle, and market dynamics on consumer behavior. By grasping these dynamics, businesses can develop effective strategies to enhance customer experiences, improve conversion rates, and drive growth in the e-commerce market.

RESEARCH GAP

The impact of changing consumer behaviour on online shopping is a rapidly evolving field, yet there exist significant research gaps that warrant further investigation. One notable gap is the limited geographical scope of existing studies, which tend to focus on developed

markets, leaving a dearth of knowledge on consumer behaviour in emerging economies. Additionally, there is a scarcity of longitudinal studies, which would provide valuable insights into how consumer behaviour changes over time. Furthermore, the influence of demographic factors, such as age, income, and education, on online shopping behaviour is not yet fully understood. Finally, the environmental and social implications of online shopping, such as carbon footprint, waste management, and labour practices, are critical areas that demand further research attention. Addressing these research gaps will provide a more nuanced understanding of the complex relationships between consumer behaviour, online shopping, and the broader social and environmental context.

STATEMENT OF THE PROBLEM

The rapid growth of e-commerce has significantly altered consumer buying behaviour. This shift is influenced by various factors such as technological advancements, convenience, personalization, and global accessibility. However, this transformation also presents challenges, including trust issues, information overload, lack of tactile experience, and the digital divide. The problem lies in understanding and addressing the factors driving this behavioural shift, as well as mitigating the challenges to ensure a seamless, trustworthy, and inclusive online shopping experience for consumers."

OBJECTIVES

The following are the objective focussed in the study:

- To study consumer behaviour towards online shopping.
- To analyse the factors which affect decision making process while purchasing the online shopping product.
- To assess the level of satisfaction among customers towards online or offline shopping.
- To identify the customers preference towards different e-shopping platforms
- To find out the problems faced by the customers purchasing online.

SCOPE OF THE STUDY

This study examines the impact of changing consumer behavior on online shopping, focusing on global trends, demographics, and technological advancements, to provide insights for businesses and policymakers navigating the evolving e-commerce landscape.

RESEARCH METHODOLOGY

This section attempts to describe the methodology of the present study. It includes period of the study sampling techniques, collection of the data and analysis of the data. The questionnaire collected was a great source of information. By adopting Simple Random sampling methods, a sample of 150 respondents were selected from Thoothukudi city and the questionnaire was distributed to collect the primary data.

Results and Discussions

Null hypothesis (H0): There is no significant relationship between the age and opinion, decision making process, customer satisfaction, behaviour problems faced by online shopping

Alternative hypothesis (H1): There is no significant relationship between the age and opinion, decision making process, customer satisfaction, behaviour problems faced by online shopping

Variable	Age	Mean	Std. Deviation	F	P
opinion	Upto 25	18.7667	2.94412	3.569	.008
	26-35	17.8929	2.73982		
	36-45	18.8929	3.17792		
	46-55	17.1111	2.81935		
	Above 55	16.7568	2.53208		
	Total	17.8333	2.92964		
Decision	Upto 25	23.2000	3.26317	5.867	.000
	26-35	21.6667	3.38549		
	36-45	22.4286	4.09542		
	46-55	19.7407	3.15732		
	Above 55	20.1622	2.76399		
	Total	21.3960	3.53901		
Customer Satisfaction	Upto 25	16.4000	1.90462	.796	.529
	26-35	16.3571	2.23133		
	36-45	17.1429	2.63473		
	46-55	17.0769	2.05763		
	Above 55	16.9167	2.29751		
	Total	16.7770	2.23400		

Behaviour	Upto 25	23.0000	3.60077	4.993	.001
	26-35	21.5357	3.82470		
	36-45	22.0714	3.42029		
	46-55	20.7778	3.53372		
	Above 55	19.5405	2.55598		
	Total	21.3000	3.54596		
Problems	Upto 25	22.9333	3.16155	3.942	.005
	26-35	21.7857	3.89070		
	36-45	21.7857	3.72536		
	46-55	21.0741	3.51837		
	Above 55	19.8108	2.44765		
	Total	21.4000	3.46216		

Source: Compute Data

The above table that there is a significant value of opinion of online shopping (.008), decision making process on online shopping(.000), online buying behaviour on shopping(.001) and problems faced by online shopping(.005) are less than 0.005. Hence null hypothesis rejected and conclude that opinion of online shopping. In contrast the above table customer satisfaction of the online shopping (.529) are greater than).005. The null hypothesis accepted and conclude that there is a no significant between the opinion of online behaviour.

The ANOVA test results indicate that there are significant differences among age groups in terms of opinions, decision-making, shopping behaviour, and problems faced in online shopping. . However, for customer satisfaction, the p-value (0.529) is greater than 0.05, meaning that there is no significant difference across age groups, leading to the acceptance of the null hypothesis (H_0) and rejection of the alternative hypothesis (H_1)

SUGGESTIONS

- Online retailers should consider offering products that cater to the specific needs and preferences of each age group.
- Online retailers should focus on universal factors that influence customer satisfaction, such as website usability, product quality, and timely delivery.
- Online retailers should conduct regular analysis of customer data to identify areas for improvement and optimize their marketing strategies.

CONCLUSION

Consumer behavior towards online shopping has undergone a transformative shift, driven by factors such as convenience, diverse product options, and technological advancements. Despite challenges like data privacy concerns and lack of physical examination, online shopping continues to evolve, with businesses prioritizing trust-building measures, sustainability, and innovative strategies. By understanding demographics, shopping behaviour, and preferences, online retailers can tailor their strategies to meet evolving customer needs, improving satisfaction, loyalty, and driving business success.

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