Project Report

On

ASSESSING MENSTRUAL CUP AWARENESS AND BARRIES TO USE: A RESEARCH STUDY

Submitted in partial fulfilment of the requirements for the degree of
BACHELOR OF SCIENCE
In

MATHEMATICS
By

FIONA VINOD
(AB23BMAT018)

Under the Supervision of
Ms. DONA MARY K.D



DEPARTMENT OF MATHEMATICS ST.
TERESA'S COLLEGE (AUTONOMOUS)
ERNAKULAM, KOCHI- 682011
MARCH 2026

ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

CERTIFICATE

This is to certify that the dissertation entitled, **Assessing menstrual cup and barrier To use: A research study** is Bonafide record of the work done by **Ms. FIONA VINOD** under my guidance in partial fulfilment of the award of degree of **Bachelor of Science in Mathematics** at St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam. No part of this work has been submitted for any other degree elsewhere

Date: 16/1/2026

Place: Ernakulam

ST. TERESA'S COLLEGE (AUTONOMOUS) DEPARTMENT OF MATHEMATICS AND STATISTICS ERNAKULAM

Ms. DONA MARY K.D
Assistant Professor,
Department of Mathematics and Statistics
St. Teresa's College
(Autonomous), Ernakulam

Dr. ELIZABETH RESHMA M T
Assistant Professor and Head,
Department of Mathematics and Statistics
St. Teresa's College
(Autonomous), Ernakulam

External Examiners

20/01/26

1:.....

Dr. SREEJA K.U. (PEN:716628)
Assistant Professor
Department of Mathematics
Maharaja's College
Ernakulam - 682 011

2:.....

DECLARATION

I hereby declare that the work presented in this project is based on the original work done by me under the guidance of M.s DONA MARY K.D Assistant Professor, Department of Mathematics, St. Teresa's College (Autonomous), Ernakulam and has not been included in any other project submitted previously for the award of any degree.

Ernakulam

Date: 16/1/2026

FIONA VINOD (AB23BMAT018)

ACKNOWLEDGEMENT

I extend my deepest gratitude to Ms. DONA MARY K.D Assistant Professor in the Department of Mathematics at St. Teresa's College, for her invaluable contribution as the coordinator of our project. Her guidance and support have been instrumental in facilitating the completion of all stages of our project Furthermore, I extend my heartfelt appreciation to the members of group for their unwavering dedication, insightful contributions, and collaborative spirit throughout this endeavors. and. Finally, I wish to acknowledge the divine guidance that has illuminated my path and provided strength and inspiration amidst challenges. Every day, I have felt you're guiding.

Ernakulam

Date:

FIONA VINOD (AB23BMAT018)

CONTENTS

1. INTRODUCTION

1.1 INTRODUCTION..... 1

1.2 STATISTICS.....2

1.3 VARIABLES……..2

1.4 DESCRIPTIVE STATISTICS……2

1.5 INFERENTIAL STATISTICS……3

1.6 STATISTICAL SURVEY……..3

1.7 OBJECTIVES…….4

1.8 DATA SOURCE…….4

1.9 DATA DESCRIPTION…….……4

1.10 LITERATURE REVIEW……5

1.11 SIGNIFICANCE OF THE STUDY……..7

1.12 LIMITATIONS OF THE STUDY……..8

2 METHODOLOGY

2.1 STATISTICAL TOOLS USED FOR STUDY…….10

MICROSOFT EXCEL……..10

SPSS…….10

POWER BI……...10

2.2 CHI-SQUARE TEST OF INDEPENDENCE…….11

2.3 BINARY LOGISTIC REGRESSION……13

3 DATA ANALYSIS AND REPRESENTATION

3.1 GRAPHICAL REPRESENTATION…….……..14

3.2 CHI-SQUARE TEST……...19

To evaluate the relation between age group and other variables such as Awareness, restriction, willingness, and actual use age

3.3 BINARY LOGISTIC REGRESSION…….…24

To analyse actual usage of menstrual cup as dependent variable with

Independent variables age group, education, awareness, willingness,
Hygiene and restriction

4 RESULT AND CONCLUSION

4.1 RESULT……26

4.2 CONCLUSION……27

4.3 RECOMMENDATIONS……..…….28

BIBILOGRAPHY

A-ANNEXURE

CHAPTER 1
INTRODUCTION

1.1 Introduction

Menstruation is a natural biological process that marks an important stage in the reproductive cycle of women. However, menstrual hygiene management continues to be one of the most neglected areas of women's health, particularly in developing countries. Traditionally, women rely on sanitary pads, cloth, or tampons to manage their periods. While these products are widely used, they come with challenges such as high recurring costs, disposal issues, risk of infections, and a negative impact on the environment.

In this context, the menstrual cup has emerged as a modern, sustainable, and eco-friendly alternative. A menstrual cup is a small, flexible, medical-grade silicone cup that is inserted into the vagina to collect menstrual blood. Unlike pads and tampons, which are disposable, a menstrual cup is reusable for 8–10 years. This makes it an economically viable option as well as an environmentally sustainable one. Despite these advantages, the adoption of menstrual cups in India remains very low.

The reasons for this low adoption are multi-dimensional. Lack of awareness is a primary barrier—many women are simply not informed about menstrual cups. Even when they are aware, cultural taboos, family restrictions, and misconceptions about hygiene and comfort act as obstacles. Women often fear pain or discomfort in using the cup, while others are discouraged by social stigma or lack of guidance on proper usage. Therefore, the issue is not only about providing information but also about changing mindsets and addressing cultural beliefs.

From an economic perspective, menstrual cups are highly cost-effective. A single cup can replace thousands of sanitary pads over its lifetime, thereby reducing monthly expenses significantly. However, despite recognizing this economic benefit, many women still do not shift to menstrual cups. This indicates that economic factors alone cannot influence adoption—social, cultural, and psychological factors play a more critical role.

From an environmental standpoint, menstrual cups are an important solution. The disposal of pads and tampons generates tons of non-biodegradable waste every year, contributing to landfill and pollution. By replacing disposable products with a reusable cup, women can contribute towards reducing plastic waste and environmental damage. Thus, menstrual cups have a dual benefit—empowering women with a cost-effective solution while also helping society move towards sustainability.

This study was undertaken to analyze the awareness, willingness, barriers, and actual usage of menstrual cups among women. The aim was to understand whether demographic variables such as age and education, along with social and cultural barriers, have an influence on the adoption of menstrual cups. For this purpose, statistical tools such as Chi-Square Test of Independence and Binary Logistic Regression were used. While Chi-Square helped in identifying associations between age and variables such as awareness, willingness, restrictions, and actual usage, Binary Logistic Regression was used to analyze the combined effect of factors like age, education, awareness, willingness, restrictions, and hygiene perception on actual usage.

The findings of this study are significant as they highlight the gap between knowledge and practice. While many women are aware of the existence of menstrual cups and acknowledge their economic and environmental benefits, their actual usage is still minimal. This highlights the urgent need for targeted awareness programs, counseling, and community-based campaigns to promote menstrual cup adoption.

1.2 STATISTICS

The gathering, organizing, analyzing and extrapolating conclusions from samples to the entire population are all covered within the scientific field of statistics. A suitable design is necessary for this of the investigation, judicious research sample selection, and proper statistical test selection. For a study or clinical trial to be properly designed, a sufficient understanding of statistics is required. Using flawed statistical approaches can lead to incorrect findings and unethical behavior.

1.3 VARIABLES

In this study, the dependent variable is the actual usage of menstrual cups, which was coded as a binary variable (Yes = 1, No = 0). The independent variables include age group, education level, awareness, willingness, family or social restrictions, and perception of hygiene and safety. Age group was considered as an ordinal variable with four categories (15–25, 26–35, 36–45, and 45+), while education level was also treated as ordinal with categories such as School, Undergraduate, Postgraduate, and Others. Awareness, willingness, and restrictions were included as binary variables, coded as Yes = 1 and No = 0, to simplify analysis. Perception of hygiene and safety was treated as an ordinal variable with responses categorized as hygienic all variables were coded appropriately to make the dataset suitable for statistical analysis in SPSS.

1.4 STATISTICS: DESCRIPTIVE

Descriptive statistics refers to a branch of statistics that involves summarizing, organizing, and presenting data meaningfully and concisely. It focuses on describing and analyzing a dataset's main features and characteristics without making any generalizations or inferences to a larger population.

The primary goal of descriptive statistics is to provide a clear and concise summary of the data, enabling researchers or analysts to gain insights and understand patterns, trends, and distributions within the dataset. This summary typically includes measures such as central tendency (e.g., mean, median, mode), dispersion (e.g.. range, variance, standard deviation), and shape of the distribution (e.g., skewness, kurtosis).

Descriptive statistics also involves a graphical representation of data through charts, graphs, and tables, which can further aid in visualizing and interpreting the information. Common graphical techniques include histograms, bar charts, pie charts. scatter plots, and box plots.

By employing descriptive statistics, researchers can effectively summarize and communicate the key characteristics of a dataset, facilitating a better understanding of the data and providing a foundation for further statistical analysis or decision-making processes.

1.5 INFERENTIAL STATISTICS

Inferential statistics is the analysis of data from a sample in order to draw conclusions about the population as a whole. The goal is to provide an answer or test the hypotheses. A hypothesis (plural hypotheses) is theory put out to explain a phenomenon. Thus, hypothesis testing are methods for logical decision-making regarding the veracity of observed consequences. The term "null hypothesis" or Ho in inferential statistics, indicates that the population variables don't relate to one another or differ from one another.

The "alternative hypothesis" or Hi, indicates the expectation that a statement involving the variables will be accurate. The probability that the event will happen by chance if the null hypothesis is true is known as the p value, also known as the calculated probability. Researchers use the p value, which is a numerical value between 0 and 1, to determine whether to reject or keep the null hypothesis. The null hypothesis Ho is rejected if the p value is smaller than the value that was selected at random. sometimes referred to as the significance threshold.

It is a branch of statistics that involves drawing conclusions and making predictions about a population based on a sample of data. Unlike descriptive statistics, which summarize and describe the main features of a dataset, inferential statistics aim to infer properties of the broader population from a subset of that population.

The foundation of inferential statistics lies in probability theory. Researchers use probability distributions and mathematical models to make educated guesses about the likelihood of certain outcomes occurring in the larger population. Central to inferential statistics is the concept of sampling, where a representative subset of individuals or elements is selected for analysis. It plays a crucial role in generalizing findings from samples to populations. Through hypothesis testing, confidence intervals, and various statistical tests, researchers gain insights that extend beyond the observed data, contributing to informed decision-making and advancing knowledge in diverse domains.

1.6 STATISTICAL SURVEY

A statistical survey is a comprehensive and structured method used to gather, analyze, and interpret data from a subset of a population, enabling researchers to make valid inferences about the entire group. The process involves several key steps, beginning with the careful selection of a representative sample. Ensuring the sample's representativeness is crucial, as it forms the basis for drawing meaningful conclusions. Various sampling techniques, such as random sampling or stratified sampling, help achieve this representation Statistical surveys are

indispensable tools for collecting and interpreting data in a systematic and scientific manner. Their careful design, execution, and analysis empower decision-makers with reliable information, making them essential in shaping policies, modding research, and informing strategic initiatives across diverse sectors.

1.7 OBJECTIVES

1. To identify the barriers to adoption of menstrual cups by women.
2. To analyze the economic advantages of menstrual cups.
3. To assess awareness of menstrual cups among women.
4. To understand the attitudes of different age groups towards the use of menstrual cups.
5. To predict the influence of actual usage on age, education, awareness, restrictions, hygiene, and willingness regarding menstrual cup use.

1.8 DATA SOURCE

The data for this study was collected primarily through a structured online survey circulated using Google Forms. The questionnaire was carefully prepared with 24 questions focusing on both awareness and usage-related aspects of menstrual cups. A total of 263 women participated in the survey, representing a diverse sample that included 97 urban and 166 rural respondents from different age groups. This structured method of data collection helped ensure reliable and relevant information to achieve the objectives of the study.

1.9 DATA DESCRIPTION

The data for this study was collected through a self-administered questionnaire. The questionnaire covered demographic details such as age, education, occupation, and location, along with questions related to awareness, willingness, social restrictions, barriers, perception of hygiene, and actual usage of menstrual cups.

The survey was conducted entirely through online mode using Google Forms, which was circulated via WhatsApp and Email. A total of 263 valid responses were obtained from women in the reproductive age group.

The collected responses were then coded numerically for analysis. Binary questions were coded as Yes = 1 and No = 0, while categorical variables such as age group and education level were coded into appropriate numerical categories. This coding allowed the data to be analyzed using SPSS software, applying statistical tools such as the Chi-Square Test and Binary Logistic Regression.

1.10 LITERATURE REVIEW

1. Introduction & scope

Menstrual cups (MCs) are reusable bell- or cup-shaped devices (usually medical-grade silicone, rubber, or thermoplastic) inserted into the vagina to collect menstrual blood. Interest has grown because MCs promise lower lifetime cost, reduced waste, and long wear time compared with disposables. This review summarizes evidence on effectiveness, safety, acceptability, environmental and economic impacts, barriers to adoption, and research gaps.

2. Effectiveness and performance

Evidence from systematic reviews and trials shows that MCs are effective at containing menstrual blood with generally low leakage once users become experienced. The biggest short-term outcome measured across studies is leakage/comfort; most quantitative studies report improving leakage scores and satisfaction after a short "learning" period. Many trials and observational studies measure acceptability alongside leakage and find that comfort and wear-time increase with use.

3. Safety and adverse events

Overall safety profiles are favorable, but with important caveats:
Serious infectious adverse events (e.g., toxic shock syndrome — TSS) are very rare in the literature; large systematic reviews have not identified a clear increased risk compared with other products, but several case reports of TSS and other infections exist and are cited as proof that risk, while low, is not zero. Good hygiene (handwashing, correct cleaning/sterilization) is emphasized. There is ongoing investigation into potential mechanical interactions with intrauterine devices (IUDs). Some observational reports and more recent analyses suggest a possible association between removal of a cup and IUD displacement/expulsion, leading to updated cautionary guidance for people with IUDs; recent 2023–2025 studies explicitly examine this risk but results vary and more robust prospective data are needed. Clinicians often counsel caution and advise careful removal technique or alternative products for IUD users until stronger evidence is available.

1. Acceptability, barriers, and determinants of use

Common facilitators of uptake:

- Cost-savings over time and environmental concerns motivate many users.
- Proper instruction/demonstration significantly increases uptake and continued use.

Common barriers:

- Concerns about insertion and pain, cultural taboos around vaginal insertion, fear about affecting virginity, limited awareness, and lack of access to proper cleaning infrastructure (water, private space) in some settings. Studies from India and other LMICs repeatedly show that education plus hands-on training substantially increases acceptance and sustained use.

2, Environmental & economic impact

Life-cycle assessments repeatedly rank menstrual cups as having much lower environmental impact (GHG emissions, solid waste) than single-use pads and tampons — often dramatically so (many LCAs find cups produce the least waste and lowest overall environmental footprint). Economically, initial purchase cost is higher but the lifetime per-cycle cost is a small fraction of the cost of disposables. This makes cups attractive for sustainability and cost-effectiveness programs.

2. Special populations & programmatic use

- Adolescents, students, and low-income groups: acceptability improves with school- or clinic-based education interventions. Several programs (including government-led distribution campaigns in places like Kerala, India) show large increases in uptake when distribution is paired with training.
- People with disabilities or limited mobility: emerging work (including registered trials) is evaluating feasibility; early indications show promise if tailored supports are provided

3. Policy, regulation, and quality concerns

- Product quality varies; research on material biocompatibility and potential contaminants (e.g., PFAS in some menstrual products) highlights the need for regulatory oversight and standardized safety testing for cups. In vitro and biocompatibility testing frameworks have been proposed.

4. Key gaps & research recommendations

- High-quality longitudinal studies to quantify rare adverse events (e.g., TSS), and prospective studies on IUD displacement risk.
- Standardized outcome measures (leakage scales, hygiene metrics, quality-of-life tools) to allow pooling across studies.
- Contextual implementation research in low-resource settings (water/sanitation needs, cultural acceptability, training models)
- Regulatory and material-safety surveillance for contaminants and long -term material effects.

5. Practical implications for programs and clinicians

- Combine distribution with structured training and follow-up; one-off distribution without education leads to lower sustained uptake.
- Counsel IUD users about careful removal and discuss alternatives until more definitive evidence is available

- Emphasize hygiene: handwashing and recommended cleaning/sterilization routines.
- Policymakers: menstrual-cup distribution programs can offer strong environmental and lifetime-cost benefits but must budget for education, quality procurement, and monitoring.

6. Selected references (representative)

- van Eijk AM, et al. Menstrual cup use, leakage, acceptability, safety, and availability — Lancet Public Health (2019).
- Fourcassier S., et al. Menstrual products life cycle assessment (2022).
- Case reports and reviews on TSS with cups (Mitchell 2015; El Soufi 2021).
- Recent studies on acceptability & programmatic rollouts (India, 2024–2025) and ongoing concerns re: IUD displacement (2023–2025)

1.11 SIGNIFICANCE OF THE STUDY

The present study is highly significant because it addresses one of the most important yet less discussed issues in women's health – menstrual hygiene management. In India, despite advancements in education and technology, menstruation is still surrounded by myths and misconceptions. Many young women and girls either lack awareness about hygienic menstrual practices or face social and cultural barriers that restrict them from adopting healthier alternatives. This project gains importance as it tries to understand the role of different factors such as age, education, awareness, willingness, and restrictions in influencing the actual usage of menstrual cups.

The study is also significant from an economic perspective. Menstrual products like sanitary pads and tampons need to be purchased every month, which creates a financial burden, especially for students and women from low-income families. In contrast, menstrual cups are reusable for several years, making them a cost-effective solution. By promoting menstrual cups, women can save money in the long run and invest in other essential needs.

From an environmental angle, the significance of the study is even greater. Disposable sanitary products generate huge amounts of non-biodegradable waste, which adds to pollution and creates challenges for waste management systems. A single menstrual cup can replace hundreds of sanitary pads or tampons, thus reducing menstrual waste drastically. Therefore, increasing the adoption of menstrual cups is not just a health or economic issue but also an environmental necessity.

The study also carries social significance. In many households, menstruation is considered unclean, and women face restrictions in their daily activities. By analyzing how social and family restrictions affect menstrual cup adoption, the study provides insights into the cultural barriers that need to be broken. Promoting menstrual cups also means promoting open conversations about menstruation, which will ultimately reduce stigma and empower women.

Finally, this project is significant in the academic and research field. By using tools like SPSS (Chi-Square Test and Binary Logistic Regression) and Power BI visualizations, the study combines statistical rigor with modern data representation. The findings will add value to the existing literature on menstrual hygiene and provide a reference point for future researchers, NGOs, and policymakers.

1.1 LIMITATIONS OF THE STUDY

Every research project has its own limitations, and this study is no exception. The first limitation is related to the sample size. The data was collected from a limited number of respondents, and therefore the findings may not fully represent the views of the entire population. A larger sample size covering different regions, age groups, and socioeconomic backgrounds would have given more generalized results.

Another limitation is the geographical coverage of the study. Since the survey was conducted within a restricted area, the responses mainly reflect the opinions and practices of people from that locality. Menstrual practices, awareness levels, and restrictions vary greatly across different states, urban and rural regions, and communities in India. Hence, the findings cannot be applied to the entire country. population. A larger sample size covering different regions, age groups, and socioeconomic backgrounds would have given more generalized results,
Another limitation is the geographical coverage of the study. Since the survey was conducted within a restricted area, the responses mainly reflect the opinions and practices of people from that locality. Menstrual practices, awareness levels, and restrictions vary greatly across different states, urban and rural regions, and communities in India. Hence, the findings cannot be applied to the entire country.

Another limitation is the geographical coverage of the study. Since the survey was conducted within a restricted area, the responses mainly reflect the opinions and practices of people from that locality. Menstrual practices, awareness levels, and restrictions vary greatly across different states, urban and rural regions, and communities in India. Hence, the findings cannot be applied to the entire country.

The method of data collection also presents a limitation. The study relied on a self-administered questionnaire. This means that the responses depend on the honesty and understanding of the participants. Some respondents may have given socially acceptable answers rather than their true opinions, leading to response bias. In addition, a few questions might not have been fully understood by all participants, which could affect the accuracy of the data.

Another limitation is the restricted set of variables considered in the analysis. While the study focused on age, education, awareness, willingness, restrictions, and perception of hygiene, there are several other factors such as income level, peer influence, access to healthcare, and media exposure that could also influence menstrual cup usage. Since these were not included, the study does not provide a complete picture.

The study also faced limitations in terms of time and resources. Due to the academic nature of the project and the limited time frame available, it was not possible to conduct in-depth interviews, focus group discussions, or longitudinal studies that might have given more detailed insights. Finally, the use of statistical tools such as Chi-Square Test and Logistic Regression also has limitations. These tests can show relationships between variables but do not fully explain the deeper cultural and emotional reasons behind menstrual practices. Human attitudes and behaviors are influenced by complex factors that may not always be captured by numbers and statistics in conclusion, while this study provides useful insights into the factors affecting menstrual cup usage, its findings should be interpreted with caution due to the above limitations. Future research with a larger sample size, broader geographical coverage, and inclusion of more variables will help in obtaining a more comprehensive understanding of the issue.

CHAPTER 2
METHODOLOGY

2.1 STATISTICAL TOOL USED FOR THE STUDY MICROSOFT EXCEL

Microsoft Excel is a powerful spreadsheet software that simplifies tasks related to organizing, analyzing and presenting data. In simple terms. Excel is like a digital grid or table where you can input and manipulate information. It consists of rows and columns, forming cells where you can enter numbers, text or formulas. The primary purpose of Excel is to perform calculations and automate various mathematical operations. Each cell in the spreadsheet can hold data and you can use formulas to perform calculations on these data. For example, you can add, subtract, multiply or divide numbers easily using Excel formulas. Excel is widely used for tasks such as budgeting, creating charts and graphs, managing lists and analyzing data. It provides functions and features that make it easy to organize information and visualize patterns. The program allows users to create formulas that automatically update when data changes, saving time and reducing errors. One of Excel's strengths is its ability to create charts and graphs to represent data visually. This makes it easier to understand trends and patterns in the information you have inputted. Additionally, Excel allows users to sort and filter data, making it simple to find specific information within a large dataset. It's also widely utilized in academia for scientific research, statistical analysis and data visualization.

SPSS

SPSS, or Statistical Package for the Social Sciences, is a software program used for statistical analysis and data management. It is widely employed by researchers, analysts and students to process and interpret data in various fields, including social sciences, health sciences and business. One of SPSS's primary functions is to help users organize and manipulate data. It allows you to input data into a spreadsheet-like interface, making it easy to arrange information in rows and columns. Once your data is entered, SPSS offers a range of tools for cleaning and transforming it, ensuring accuracy and reliability in your analyses. The software's statistical analysis capabilities are extensive. You can perform a variety of tests, from basic descriptive statistics to complex inferential analyses. SPSS enables users to explore patterns, relationships and trends within their data. This can involve examining means, correlations or conducting more advanced analyses like regression or factor analysis. SPSS is known for its user-friendly interface, making statistical analyses accessible to individuals extensive programming knowledge. It often involves pound-and-click operations, reducing the need for complex coding. However, for those with programming skills, SPSS does allow the use of syntax commands for more advanced customization. The output generated by SPSS provides detailed summaries and visual representations of the analyses conducted. This makes it easier to interpret results and communicate findings to others. Overall, SPSS is a powerful tool for anyone needing to analyze and make sense of data, offering a versatile and user-friendly environment for statistical exploration.

POWER BI

Power BI is a powerful data visualization and business intelligence tool developed by Microsoft. It enables users to connect to various data sources, clean and transform raw data,

and create interactive visualizations such as charts, graphs, dashboards, and reports. The tool is widely used in research and industry to convert complex datasets into meaningful insights.

One of the major advantages of Power BI is its user-friendly interface and the ability to handle large datasets efficiently. It allows researchers to represent statistical findings visually, making it easier for both technical and non-technical audiences to understand the results. Visualizations created in Power BI can also be exported into PowerPoint presentations or PDF reports, which adds to its usefulness for academic projects and professional presentations.

In this project, Power BI was specifically used for the visual representation of survey data collected through the questionnaire. The responses were imported into Power BI, and charts such as pie charts and bar charts were generated. These visualizations helped in identifying trends like awareness levels, willingness to adopt menstrual cups, and age-wise differences in perception of hygiene and restrictions.

By using Power BI alongside SPSS, the study achieved a balance between statistical rigor and visual clarity. While SPSS was used for statistical testing (Chi-Square and Logistic Regression), Power BI added value by providing clear, easy-to-understand graphical representations of the findings.

2.2CHI SQUARE TEST

The Chi-Square Test is an important test among the several tests of significance. It was developed by Karl Pearson in 1990. In general, the test that is used to measure the difference between what is observed and what is expected according to an assumed hypothesis is called Chi-square Test. The Chi-square test of independence determines whether there is a significant relationship between categorical variables. There are a null hypothesis and an alternative hypothesis in the Chi-square test. Ho that is the null hypothesis represents that there is no relation between two variables. H, that is the alternative hypothesis indicates that there exists a significant relation between two variables. The significant level is the probability of rejecting the null hypothesis, when it is true. In most of the cases, we use significant level as 0.05. First, we create the table of observed frequency from obtained data. Then expected frequency values are calculated using the following equation:

(Row total x column total) / Grand total

Then, we create the table of expected frequency, we can calculate the Chi-square value using the equation:

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

χ^2 = chi squared

O_i = observed value

E_i = expected value

The tabular Chi-Square value can be obtained by using degrees of freedom and significance level. Degrees of freedom refers to the maximum number of logically independent values, which are values that have the freedom to vary, in the data sample.

Degrees of freedom (Columns-1) x (Rows-1)

Logistic Regression

Logistic regression is a statistical modeling technique used to predict the probability of a categorical dependent variable based on one or more independent variables. Unlike linear regression, which predicts a continuous outcome, logistic regression is used when the dependent variable is categorical (binary or multinomial).

The core idea of logistic regression is to model the log-odds of the dependent variable as a linear combination of the independent variables. The log-odds, also called the logit, transforms probabilities that range between 0 and 1 into values ranging from -∞ to +∞, making it suitable for regression modeling.

The logistic regression model is represented as:

P(Y=1) = 1 / (1 + e^-(β0 + β1X1 + β2X2 + ... + βkXk))

Where:

- P(Y=1) is the probability that the dependent variable Y equals 1.

- β0 is the intercept term.

- β1, β2, ..., βk are the coefficients of the independent variables X1, X2, ..., Xk.

- e is the base of the natural logarithm.

The logit transformation is:

logit(P) = ln(P / (1-P)) = β0 + β1X1 + β2X2 + ... + βkXk

This transformation ensures the predicted probability lies between 0 and 1, which is essential for modeling categorical outcomes.

2.3 Binary Logistic Regression

Binary logistic regression is a specific type of logistic regression where the dependent variable has only two possible outcomes (e.g., Yes/No, Success/Failure, 1/0). It is widely used in fields like healthcare, social sciences, and behavioral studies to model binary responses.

The objective of binary logistic regression is to estimate the probability of an event occurring (coded as 1) versus not occurring (coded as 0), given a set of predictor variables.

The binary logistic regression model can be written as:

$P(Y=1 \mid X) = 1 / (1 + e^{-(\beta 0 + \beta 1X1 + \beta 2X2 + ... + \beta kXk)})$

The probability of the other outcome (Y=0) is:

$P(Y=0 \mid X) = 1 - P(Y=1 \mid X)$

The model coefficients (βi) are estimated using Maximum Likelihood Estimation (MLE), which finds the parameter values that maximize the likelihood of observing the given data.

The log-likelihood function for binary logistic regression is:

$L(\beta) = \Sigma [yi \ln P(Yi=1 \mid Xi) + (1-yi) \ln (1 - P(Yi=1 \mid Xi))]$

Where:

- yi is the observed outcome (0 or 1) for the ith observation.

- P (Yi=1 | Xi) is the predicted probability of success.

Maximizing the log-likelihood function gives the best-fitting model, allowing researchers to interpret the influence of each predictor variable on the likelihood of the outcome.

*Interpretation of coefficients: *

- Positive βi → Increases the odds of Y=1.

- Negative βi → Decreases the odds of Y=1.

- Odds ratio = e^(βi) quantifies the change in odds for a unit change in the predictor.

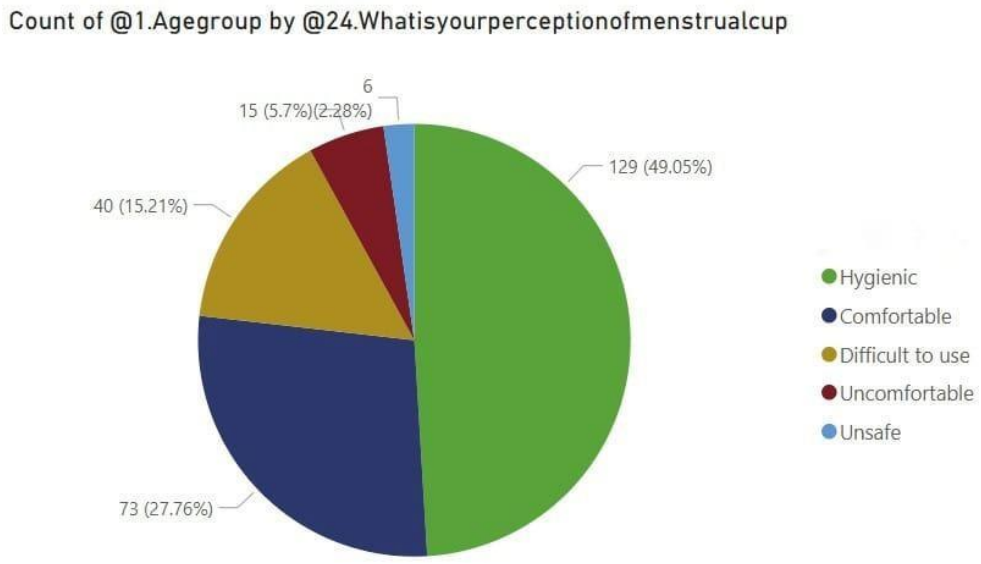
Binary logistic regression is preferred over linear regression for categorical outcomes because it naturally models probabilities within the [0,1] range and avoids unrealistic predictions.

CHAPTER 3
DATA ANALYSIS AND GRAPHICAL REPRESENTATION

3.1 GRAPHICAL REPRESENTATION

Graphical representation is the method of presenting statistical data in the form of diagrams, charts, and graphs. It helps to make the data more clear, easy to understand, and visually appealing. Complex information can be simplified through graphs, enabling quick comparison and analysis.

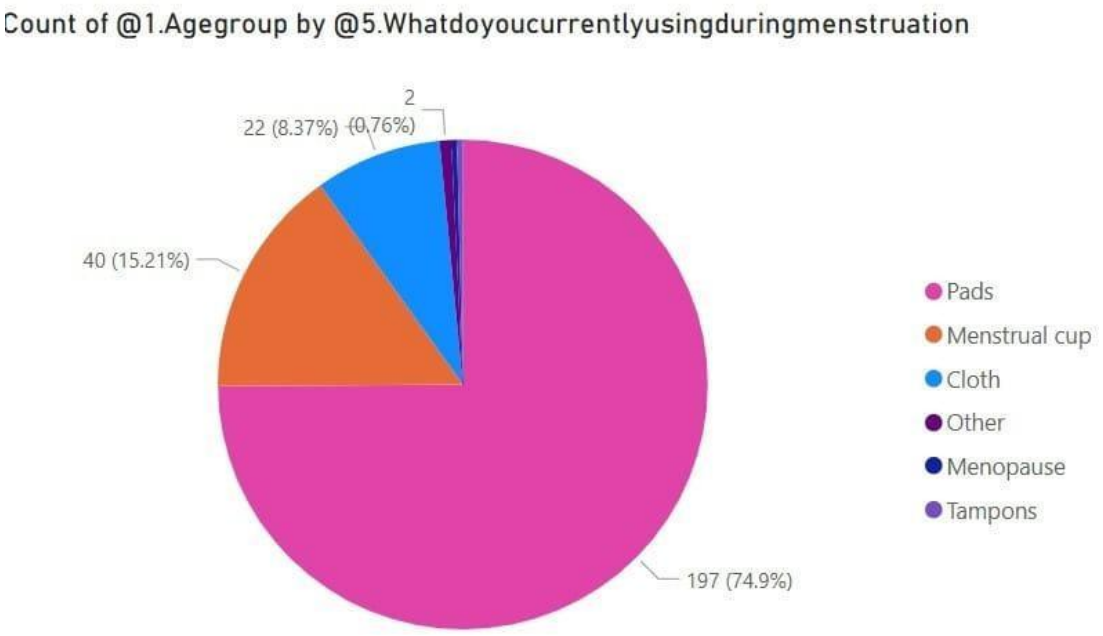
1. PERCEPTION OF MENSTRUAL CUP



3.1

The pie chart shows the count of perceptions of menstrual cups among a certain age group. The majority (49.05%) perceive menstrual cups as hygienic, followed by 27.76% who find them comfortable. 15.21% find them uncomfortable, 5.7% think they're difficult to use, and a small percentage (2.28%) consider them unsafe

2. CURRENT MENSTRUAL PRODUCT USAGE



3.2

The pie chart shows the count of respondents' age groups by what they currently use during menstruation.

- Pads: 197 respondents (74.9%)

- Other: 40 respondents (15.21%)

- Cloth: 22 respondents (8.37%)

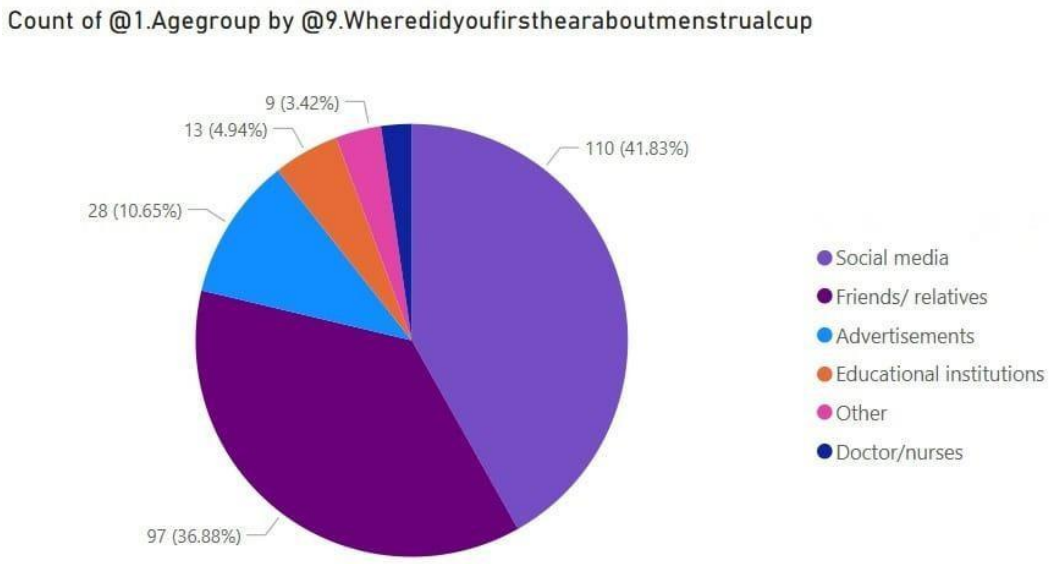
- Tampons: 2 respondents (0.76%)

- Menstrual cup: 0 respondents

- Menopause: Not applicable as a menstrual product usage category, likely included in the legend by mistake or for context.

Pads are the most commonly used product during menstruation among the respondents, with a significant majority of 74.9%.

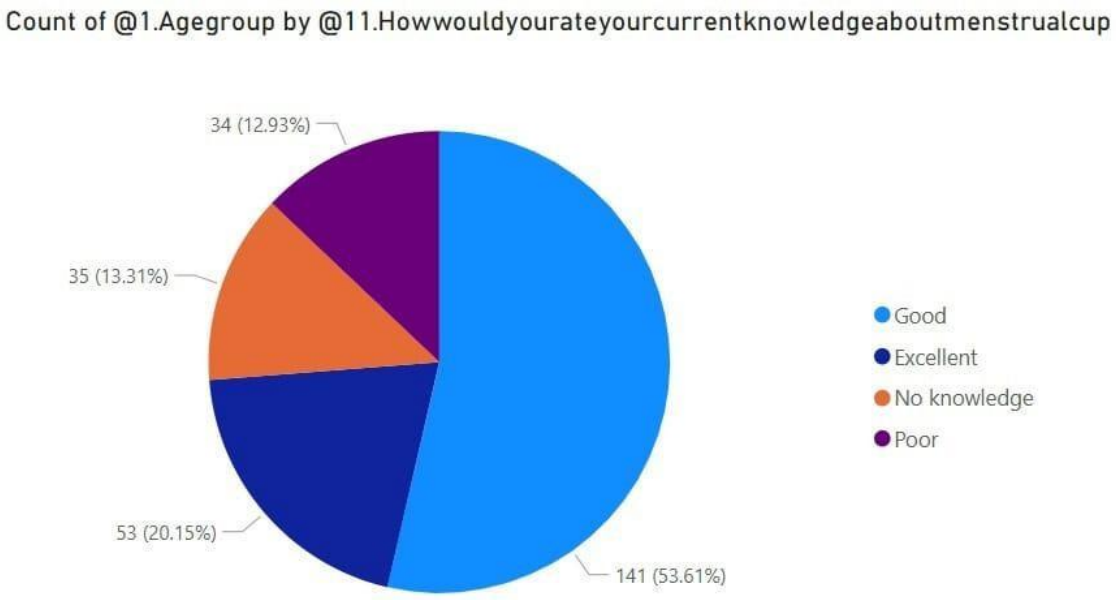
3. HOW PEOPLE HEARD ABOUT MENSTRUAL CUPS



3.3

The pie chart revealed that social media and personal networks are the primary sources of awareness about menstrual cups. Specifically, 41.83% of respondents learned about menstrual cups through social media platforms, while 36.88% were introduced to the concept by friends or relatives. Educational institutions also played a role, with 10.65% of respondents citing them as a source of information. Advertisements and healthcare professionals had a smaller impact, with 4.94% and 3.42% of respondents, respectively, reporting them as sources. Social media is the leading source of awareness about menstrual cups. Personal networks, including friends and relatives, are also a significant source of information educational institutions and healthcare professionals have opportunities to increase awareness and education about menstrual cup

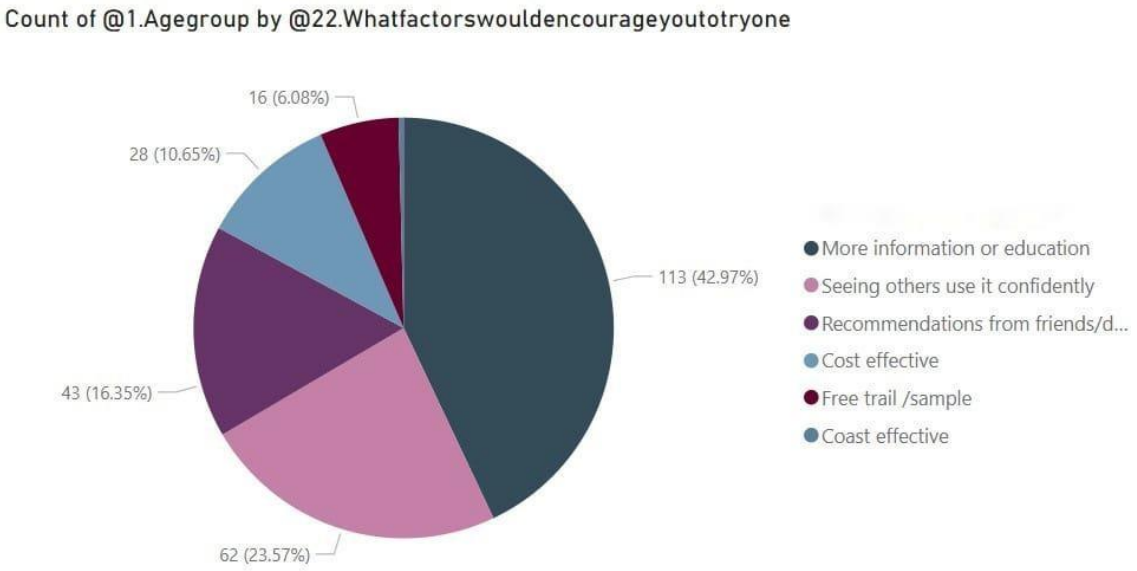
4. KNOWLEDGE ABOUT MENSTRUAL CUP



3.4

The pie chart revealed that the majority of respondents (54.44%) rate their knowledge about menstrual cups as "good", indicating a moderate level of understanding. Additionally, 20.15% of respondents consider their knowledge "excellent", while 12.93% rate it as "poor" and 9.65% report having "no knowledge" about menstrual cups. More than half of the respondents have a good understanding of menstrual cups. A significant proportion (20.15%) of respondents have excellent knowledge about menstrual cups. However, a notable percentage (22.58%) of respondents lack sufficient knowledge or have poor understanding about menstrual cups, highlighting the need for education and awareness.

5. FACTORS ENCOURAGING MENSTRUAL CUP ADOPTION



3.4

The pie chart shows the factors the encourage different age group to use menstrual cup

- More information or education is the biggest motivator for 42.97% of people (113 out of total responses). This suggests that people want to know more about a product or service before trying it.

- Seeing others use it confidently comes in second at 23.57% (62 responses). This implies social proof plays a role in encouraging people to try something.

- Recommendations from friends/ Doctor's influence 16.35% of people (43 responses), showing word-of-mouth matters.

- Cost effective is a factor for 10.65% (28 responses), meaning price considerations matter to some.

- Free trial/sample encourages the least at 6.08% (16 responses), but still a factor for trying something out.

3.2 CHI SQUARE TEST

To evaluate the relationship between Age group and other variables such as awareness about of menstrual cup, restriction faced, willingness to use, and actual usage in practice

1. AWARENESS

H_0: There is no relationship between age group vs awareness about menstrual cup

H_1: There is a relationship between age group vs awareness about menstrual cup

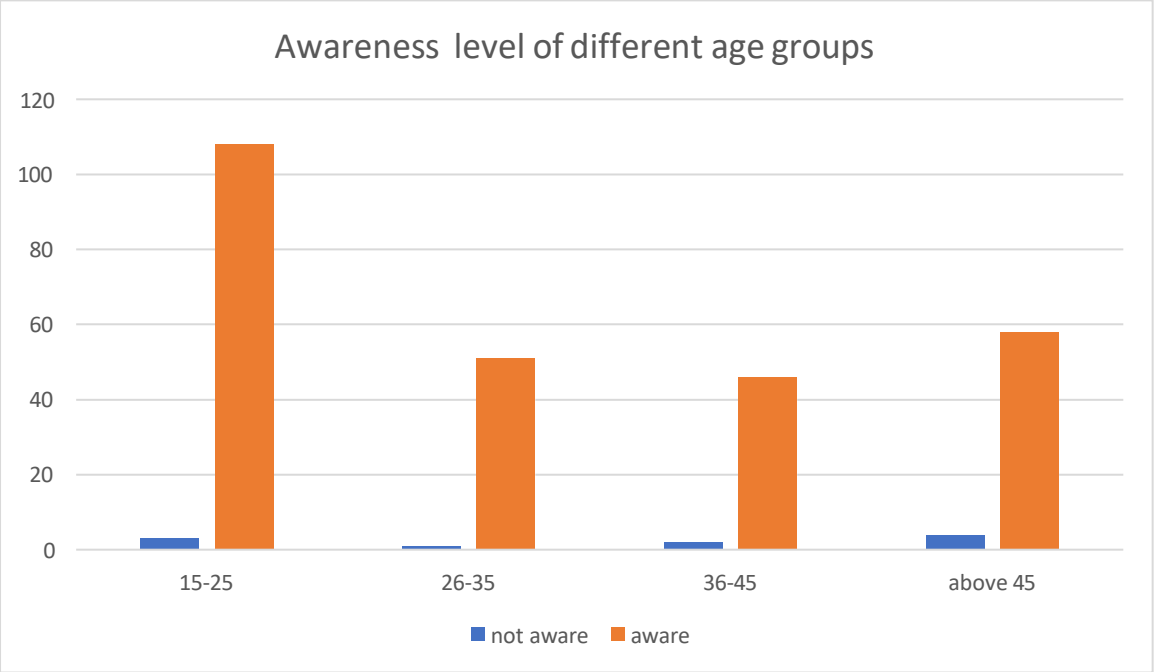
Observed Value (O)			
Age	Not aware	Aware	Total
15- 25	3	105	108
26-35	1	50	51
36-45	2	44	46
Above 45	4	54	58
Total	10	253	263

Expected Value (E)			
Age	Not aware	Aware	Total
15-25	4.1	103.9	108
26-35	1.9	49.1	51
36-45	1.7	44.3	46
Above 45	2.3	55.7	58
Total	10	253	263

X^2 VALUE	2.338
DF	3
P Value	0.505

The p value is greater than the 0.05 we fail to reject H_0

This shows that there is no statistically significant relationship between age group and awareness of menstrual cups. In other words, awareness is spread across all age groups fairly equally and age does not determine whether a respondent is aware of menstrual cup.



2. RESTRICTION

H_0: There is no relationship between age group vs restriction

H_1: There is a relationship between age group vs restriction

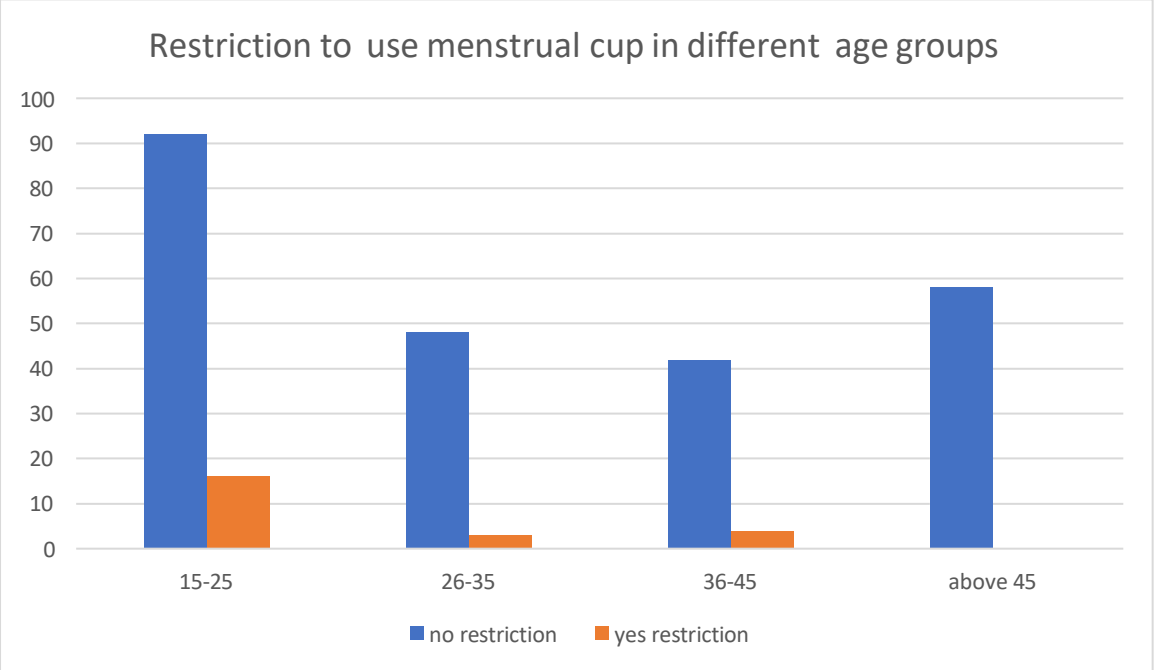
Observed Value (O)			
Age	No restriction	Yes restriction	total
15-25	92	16	108
26-35	48	3	51
36-45	42	4	46
Above 45	48	0	58
Total	240	23	263

Expected Value (E)			
Age	No restriction	Yes restriction	Total
15-25	98.5	9.5	108
26-35	46.2	4.8	51
36-45	41.7	4.3	46
Above 45	53.6	4.4	58
Total	240	23	263

X^2 value	11.068
DF	3
P Value	0.011

The p value is less than 0.05 we Reject H_0

This means age group influences the presence of family/social restriction regarding the use of menstrual cup. Restriction were found to be more common among younger respondents (15-25 years) while women in the above 45 group reported no restriction showing generational difference in openness and stigma



3. WILLINGNESS

H_0: There is no relationship between age group vs willingness to use

H_1: There is a relationship between age group vs willingness to use

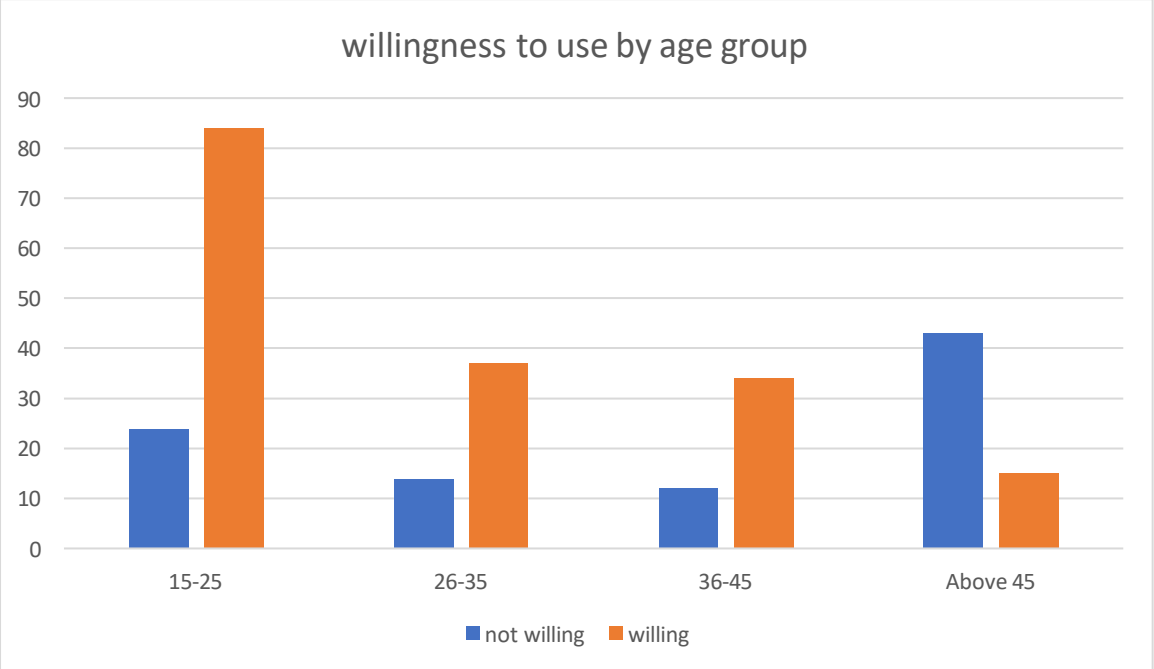
Observed Value(O)			
Age	Not willing	Willing	Total
15-25	24	84	108
26-35	14	37	51
36-45	12	34	46
Above 45	43	15	58
Total	93	170	263

Expected Value (E)			
Age	Not willing	willing	Total
15-25	44.5	63.5	108
26-35	21.0	30.0	51
36-45	19.0	27.0	46
Above 45	28.5	29.5	58
Total	93	170	263

X^2 Value	54.629
DF	3
P Value	0.000

The p value is less than 0.05 we Reject H_0

This indicates that willingness to use menstrual cup in future is strongly related to age. Younger women showed higher willingness to adopt menstrual cups, where older women especially in the above 45 age group were less willing, possibly due to established practices and lower adaptability to change



4. ACTUAL USAGE

H_0: There is no relationship between age group vs actual usage

H_1: There is a relationship between age group vs actual usage

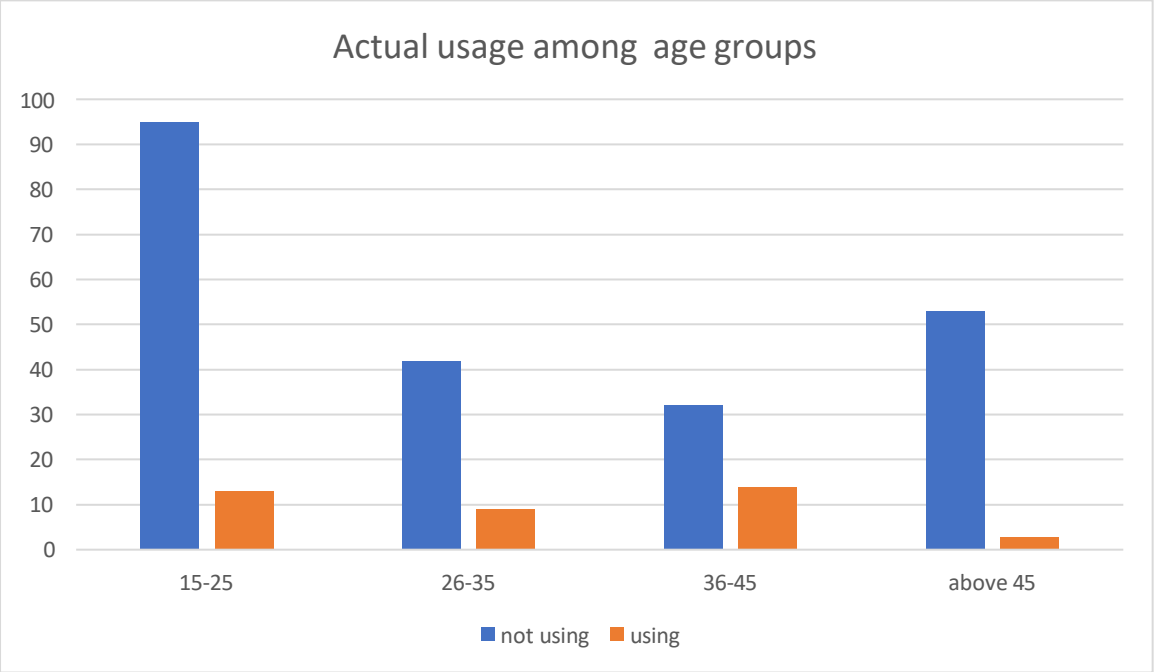
Observed Value (O)			
Age	Not using	Using	Total
15-25	95	13	108
26-35	42	9	51
36-45	32	14	46
Above 45	53	5	58
Total	222	41	263

Expected Value (E)			
Age	Not using	Using	Total
15-25	91.2	63.5	108
26-35	21.3	30.0	51
36-45	19.0	27.0	46
Above 45	28.5	27.5	58
Total	93	170	263

X^2 Value	11.044
DF	3
P Value	0.011

The p value is less than 0.05 we Reject H_0

This shows that actual usage of menstrual cups is associated with age group. Usage was highest among women aged 36–45 years, reflecting maturity and awareness, while it was lowest in the 45+ group, possibly due to nearing menopause or reluctance to change long-standing practices



3.3 BINARY LOGISTIC REGRESSION

To further analyze the determinants of menstrual cup adoption, a Binary Logistic Regression was conducted with actual usage of menstrual cups as the dependent variable. The independent variables considered in the model were age group, education level, awareness, willingness to use, family/social restrictions, and perception of hygiene. The results of the regression are presented in the coefficients (B), odds ratios (Exp(B)), and p-values are reported for each predictor variable.

	B	S. E	Wald	Df	Sig	Exp(B)	95% C.I For EXP(B)	
							Lower	Upper
Age group	0.410	0.177	5.357	1	0.21	1.506	1.065	2.130
Education	0.574	0.270	4.524	1	0.033	1.776	1.046	3.014
Awareness	0.054	1.174	0.002	1	0.963	1.056	0.106	10.533
Restriction	0.133	0.618	0,046	1	0.830	1.142	0.340	3.837
Willingness	1.964	0.596	10.843	1	0.001	7.124	2.214	22.925
Hygienic	1.197	1.086	1.214	1	0.271	3.310	0.394	27.839
Constant	-6.511	1.834	12.609	1	0.000	0.001		

INTERPRETATION

The actual usage of menstrual cups is significantly influenced by age, education, willingness, and perceived hygiene, while awareness and restriction do not play a significant independent role in predicting adoption.

The logistic regression model is statistically significant overall.

predictors that significantly influence menstrual cup usage are:

Age Group

Education

Willingness

Hygiene

Awareness and restriction are not significant predictors.

The model explains 17% of the variation and correctly predicts most “No” causes, but performs poorly for “Yes” cases

From the regression analysis, it can be observed that age group, education level, hygienic and willingness to use are the most important predictors of actual menstrual cup usage. Among these, willingness to use emerged as the strongest factor, with an odds ratio of approximately 7.12, meaning that respondents who are willing to try menstrual cups are over seven times more likely to actually adopt them compared to those unwilling.

Education also played a crucial role, with higher educational qualifications significantly increasing the probability of menstrual cup adoption. Similarly, age group showed a significant association, indicating that usage patterns vary across age categories.

On the other hand, the variables awareness and family/social restrictions perception were not found to be statistically significant in the regression model. This implies that while these factors may influence attitudes and discussions, they do not independently predict actual adoption once other variables such as age, education, and willingness are controlled for.
Thus, the logistic regression analysis highlights that improving educational outreach and strengthening willingness through awareness campaigns and training could substantially increase the adoption rate of menstrual cups, whereas focusing only on addressing restrictions or hygiene perceptions may not directly impact usage levels.

CHAPTER 4
RESULT AND CONCLUSION

4.1 RESULT

1. From the chi-square test we can understand that awareness of menstrual cups is not significantly related to age group. Respondents across all age groups showed similar levels of awareness.

2. From the analysis it is clear that willingness to use menstrual cups is higher among younger respondents, though actual usage remains low in all age categories.

3. The chi-square test between age group and actual usage shows that usage is slightly higher among educated and younger respondents, but overall usage levels remain very low compared to awareness and willingness.

4. The chi-square test between age group and family/social restrictions indicates that restrictions are present across different age groups, and there is no strong statistical difference between them.

5. The binary logistic regression shows that age group, education, willingness and hygiene are the strongest predictors of actual menstrual cup usage. Respondents with higher education and stronger willingness are much more likely to adopt menstrual cups.

6. Awareness, family/social restrictions, did not significantly predict actual usage in the logistic model, even though they are commonly discussed barriers.

7. Overall, the study highlights that awareness alone does not lead to adoption. Instead, education, willingness, hygiene and age differences play the most important role in
influencing whether women actually use menstrual cups.

4.2 CONCLUSION

1. The study reveals that awareness of menstrual cups is relatively high, but the Chi-Square test shows that awareness is not significantly associated with age group. This indicates that awareness is spread across all age groups without a major difference.

2. The Chi-Square analysis of age group and willingness to use shows that younger respondents are generally more willing to try menstrual cups compared to older respondents. This highlights a generational difference in openness towards adopting menstrual cups.

3. The Chi-Square test of age group and actual usage confirms that actual adoption levels remain very low, even among the more aware and willing respondents. This shows a clear gap between awareness, willingness, and real behavior.

4. The Chi-Square test of age group and family/social restrictions shows that restrictions are present across all age groups, but there is no strong significant variation. This means that
social barriers exist for many women, regardless of age.

5. The Binary Logistic Regression analysis demonstrates that willingness to use is the strongest predictor of actual usage. Respondents who expressed willingness were many times more likely to be actual users.

6. Education level also emerged as a significant factor in the regression. Higher education increases the likelihood of adopting menstrual cups, showing that education plays a crucial role in changing attitudes and behaviors.

7. Age group itself was also a significant predictor in the regression, indicating that menstrual cup adoption patterns vary across different age categories. This suggests that targeted awareness programs for different age groups may be necessary.

8. Hygiene perception was found to be a significant predictor in the regression model. Respondents who considered menstrual cups as hygienic and safe were more likely to use them. This underlines the need to address myths and provide training on hygiene.

9. On the other hand, awareness and family/social restrictions were not statistically significant in the regression model. This shows that while they are important in shaping opinions, they do not independently drive adoption once factors like education and willingness are considered.

4.3 RECOMMENDATIONS

- Strengthen awareness programs: Awareness drives should go beyond just giving information. They should also address myths and practical doubts, especially among young women, to encourage them to adopt menstrual cups with confidence.

- Reduce social stigma: Social restrictions must be tackled through open conversations at the family and community level. Involving parents, teachers, and peer groups in menstrual health education can help normalize discussions about menstrual cups.

- Promote eco-friendly benefits: Menstrual cups should be promoted as cost-effective and environmentally friendly alternatives to disposable products. Government and NGOs can play a role by providing subsidies or distribution programs, especially in rural areas.

- Governments should focus on improving water and sanitation facilities, especially in public spaces, to make the use of menstrual cups more feasible and hygienic and hygienic.

- Conduct further studies on the health impacts, cost-effectiveness, and long-term benefits of menstrual cups compared to other menstrual hygiene products, focusing on diverse populations.

- Implement culturally sensitive programs to address resistance from older generations and traditional communities, providing tailored education to align with local beliefs and practices.

- Offer incentives, such as tax reductions or rewards, for adopting sustainable menstrual products like menstrual cups encouraging their usage and reducing menstrual waste.

Healthcare guidance: Doctors, nurses, and gynecologists should be encouraged to give proper guidance on menstrual cup use. Training women on safe insertion, removal, and comfort can build trust and reduce hesitancy.

- Programs should focus on improving willingness and positive hygiene perception through education and practical demonstrations, as these factors most strongly influence actual adoption

BIBLIOGRAPHY

- Van Eijk, A.M., et al. (2019). Menstrual cup use, leakage, acceptability, safety, and availability. The Lancet Public Health.
- Deshpande, T.N., Patil, S.S., et al. (2018). Menstrual hygiene among adolescent girls. Journal of Family Medicine and Primary Care.
- Howard, C., Rose, C.L., & Trouton, K. (2011). Flow: Comparing menstrual cup to tampons. Canadian Family Physician.
- Oster, E., & Thornton, R. (2011). Menstruation, sanitary products, and school attendance. AEJ: Applied Economics.
- North, B.B., & Oldham, M.J. (2011). Clinical and post marketing experience with a menstrual cup. Journal of Women's Health.
- Stewart, K., Powell, M., & Greer, R. (2009). Acceptability of the menstrual cup in South Africa. Int. J. Gynecol Obstet.
- World Health Organization (2022). Menstrual health and hygiene.
- UNICEF (2021). Guidance on Menstrual Health and Hygiene.
- Government of India (2020). Menstrual Hygiene Scheme (MHS).
- UNFPA (2021). Menstrual Health Management: Breaking the Silence.
- Plan International (2018). Menstrual hygiene management in schools.
- WaterAid (2019). Menstrual Hygiene Matters.

A-ANNEXURE

Section A

Demographic information

1.Age group *

- ◯ 15-25
- ◯ 25-35
- ◯ 35-45
- ◯ 45+

1.location *

- ◯ Rural
- ◯ Urban

3.Education level *

- ○ School level
- ○ Undergraduate
- ○ Postgraduate or higher

4.Occupation *

- ○ Student
- ○ Employed
- ○ Homemaker
- ○ Other
- ○ Other: _____

5. What do you currently using during menstruation? *

- ○ Pads
- ○ Tampons
- ○ Menstrual cup
- ○ Cloth
- ○ Other
- ○ Other: _____

6. Approximately how much money do you spend on menstrual products per month ?

- ○ Less than 100
- ○ 100-200
- ○ 200-300
- ○ 300-400
- ○ 400 and above

7.Do you think the menstrual cup is cost effective compared to other products in the long run? *

- ○ Yes
- ○ No

8. Have you heard about menstrual cup? *

- ◯ Yes
- ◯ No

9.Where did you first hear about menstrual cup? *

- ◯ Social media
- ◯ Friends/ relatives
- ◯ Doctor/nurses
- ◯ Advertisements
- ◯ Educational institutions
- ◯ Other
- ◯ Other: _____

10.Do you know how to use a Menstrual cup?

- ○ Yes
- ○ Somewhat
- ○ No

11. How would you rate your current knowledge about menstrual cup? *

- ○ Excellent
- ○ Good
- ○ Poor
- ○ No knowledge

12. How easily available are menstrual cups in your locality? *

- ○ Very easily available
- ○ Somewhat available
- ○ Not easily available
- ○ I don't know

13. Do you believe menstrual cups can cause infection or harm? *

- ○ Yes
- ○ No
- ○ Not sure

14.How hygienic do you think menstrual cups are compare to pads? *

- ○ More hygienic
- ○ Less hygienic
- ○ About the same
- ○ Not sure

15.Are you currently using Menstrual cup? *

- ○ Yes
- ○ No

16.Have you ever used a menstrual cup? *

- ○ Yes
- ○ No

17. If Yes, how long have you been using Menstrual cup?

- ○ Less than 6 months
- ○ 6 months -1 year
- ○ 1-2 year
- ○ More than 2 years

20.Do you face any family or social restrictions regarding the use of menstrual cup? *

- ○ Yes
- ○ No

21. Would you consider trying a menstrual cup in future?

- ○ Yes
- ○ No

22. What factors would encourage you to try one?

- ○ More information or education
- ○ Recommendations from friends/doctors
- ○ Cost effective
- ○ Free trail /sample
- ○ Seeing others use it confidently

23.Do you consider them hygienic and safe? *

- ○ Yes
- ○ No

24. What is your perception of menstrual cup? *

- ○ Hygienic
- ○ Unsafe
- ○ Comfortable
- ○ Uncomfortable
- ○ Difficult to use

