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WOMEN'S SAFETY APPS: USAGE, TRUST, AND ACCESSIBILITY BARRIERS

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Abstract: *In a metropolitan city like Mumbai, the budding trust on mobile applications has made digital safety tools gradually pertinent for women. Various apps such as MySafetipin, bSafe, Abhiyaykti, I'M Safe, Himmat,112India, Raksha, MERS112, Satark India etc., offer features like SOS alerts, real-time tracking, and emergency contact integration. As these apps become more broadly accessible across smartphones, they aid as vital digital companions for women navigating the city. The efficiency of app depends on usability, reliability, and the trust. This study explores that despite strong awareness, real usage depends on trust, usability, emergency help, and privacy, while the obstacles like connectivity issues, battery worries, and lack of language options persist. The study suggests improved design, verified emergency integration, and digital safety awareness to increase the efficacy of safety apps.*

Keywords: Women's safety apps, Digital security, Mumbai, User trust, Accessibility barriers, Mobile technology, Emergency response, Urban safety, Privacy concerns.

INTRODUCTION

Ensuring women's safety has become an increasingly important issue in metropolitan environments, and Mumbai—one of India's busiest and most densely populated cities—presents unique challenges in this regard. Daily travel through crowded railway stations, bus stops, marketplaces, and isolated areas often creates situations where women seek additional layers of protection beyond traditional safety measures.

Over the last decade, several apps such as Himmat, MySafetipin, Mahila Suraksha, Raksha, Nirbhaya etc., have introduced features like live location sharing, panic buttons, safe-route guidance, and emergency alerts to assist women during risky situations. These apps are designed not only to offer immediate help but also to provide a sense of control and reassurance while navigating urban spaces. However, despite the technological advancements, important questions remain about how frequently these tools are used, whether women trust their features, and what limitations prevent them from becoming reliable safety companions. This exploration is essential for identifying how digital safety tools can be redesigned or integrated into broader safety systems to create a more secure and supportive environment for women in Mumbai.

REVIEW OF LITERATURE

Sharma (2018), "Effectiveness of Mobile Applications in Supporting Women's Safety in India" has studied the role of SOS alerts, GPS tracking, and emergency contact features in safety apps, concluding that while these tools upsurge apparent safety but real time responsiveness remains inconsistent.
Kulkarni (2017), "Barriers to Mobile Technology Adoption among Women Users in India", in his study tinted the challenges such as inadequate digital literacy, network uncertainty, and high battery usage, which restrict regular app usage among women.
Gupta & Yadav (2019), "Privacy Concerns in Women's Safety Apps: A User Perception Study "The authors found that fear of data misuse, location sharing, and lack of transparency significantly decrease women's faith in safety apps.
Borker (2020), "Understanding the Role of Mobile Safety Applications in Enhancing Women's Security" in his study stated that many apps fail during emergencies due to deferred alert activation and poor GPS correctness, upsetting user self-confidence.
Roy & Chatterjee (2020), "Safety Perceptions and Mobile App Usage Among Metropolitan Women Commuters" This study revealed that women in metro cities prefer apps offering safe-route guidance and quick help features, but usage declines due to technical issues in crowded transit zones.
Patel & Desai (2021), "User Experience and Interface Design in Safety Mobile Apps for Women" Their research emphasized the need for simple interfaces, fewer steps for SOS activation, and large, accessible buttons to improve usability.
Rahman & Sultana (2022), "Digital Literacy and Mobile Safety Tools Among Urban Women" The study showed that limited understanding of app features and poor onboarding instructions prevent women from using apps effectively.

Fernandes & George (2022), "Mobile-Based Safety Innovations for Women: A Comparative Study of Indian Apps" The authors compared leading apps and found imperative disparity in reliability, language support, and emergency connection, indicating a lack of calibration.
Pradhan (2023), "Women's Perceptions of Digital Safety Tools in Public Transportation" in his study he stated that women depend on safety apps during travel but often encounter connectivity blackouts, reducing the utility of real-time tracking.
Kamath & D'Souza (2023), "Technology-Based Safety Solutions: An Analysis of Usage Barriers Among Young Women" The study found that concerns about false alarms, slow interface loading, and doubts about police response discourage consistent use.

SIGNIFICANCE OF THE STUDY

This study holds substantial value as it studies how women in Mumbai engage with safety applications, the level of trust they place in these apps, and the barriers that prevent consistent usage. By identifying gaps in awareness, technical accessibility, and confidence in app reliability, the research provides crucial insights for policymakers, app developers, and law enforcement agencies. The findings can guide the improvement of digital safety solutions, enhance user-centric features, and support initiatives intended at strengthening women's safety in urban spaces. Ultimately, this study contributes to creating a more secure, responsive, and technology-enabled environment for women in Mumbai.

OBJECTIVES OF THE STUDY

To examine the level of awareness and usage patterns of women's safety apps among women in Mumbai.
To analyse the degree of trust women's place in the reliability, privacy, and emergency responsiveness of these apps.
To identify key accessibility barriers such as technical issues, language limitations, and usability challenges that affect regular app usage.
To assess user satisfaction with existing safety app features and their perceived effectiveness in real-life situations.
To provide recommendations for improving the design, accessibility, and adoption of women's safety apps to enhance urban safety in Mumbai.

HYPOTHESES OF THE STUDY

H_{01}: Awareness and trust-related factors have no significant influence on the usage of women's safety apps among women in Mumbai.
H_{02}: Accessibility, usability, and design-related barriers do not significantly affect the adoption and regular use of women's safety apps.
H_{03}: User satisfaction does not significantly influence perceptions of the effectiveness and continued use of women's safety apps.

OVERVIEW OF MUMBAI

Mumbai, with its busy urban landscape and extensive transport networks, sees millions of women commuting daily for work, education, and personal responsibilities. Although the city is often regarded as comparatively safer, challenges such as harassment, late-hour travel, congested public spaces, and uneven surveillance continue to impact women's sense of safety. These concerns influence how women plan their routines, choose their routes, and navigate public spaces. In response, many have turned to mobile safety applications that provide SOS alerts, live location sharing, and quick emergency communication as an added layer of protection during their daily movements.

RESEARCH METHODOLOGY

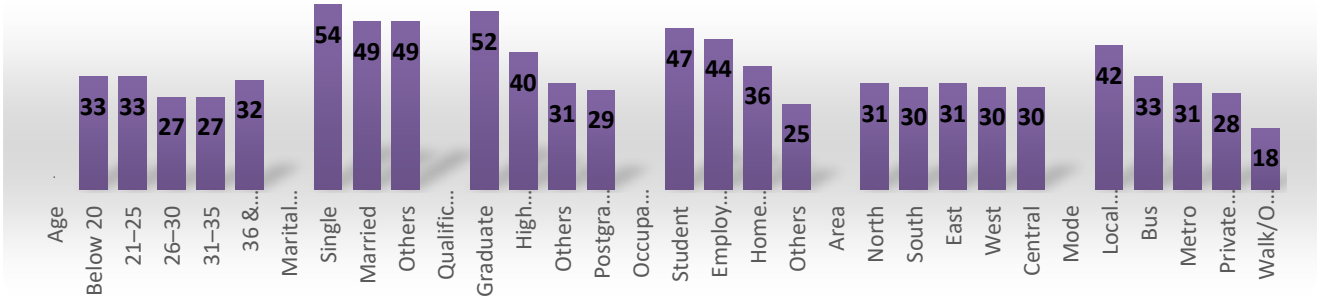
Research Design: Descriptive research design to study usage, trust, and accessibility barriers of women's safety apps.
Population and Sample Size: Women living, studying, or working in Mumbai; 152 respondents selected through convenient sampling.
Data Collection Method: Primary data through a structured questionnaire; secondary data from journals and official reports.
Variables of the Study: Independent Variables: Awareness, trust, accessibility barriers, app features, satisfaction, Dependent Variable: Usage of women's safety apps.
Data Analysis Techniques and Statistical Tools: Frequency, percentages, mean scores, charts, correlation, and cross-tabulation.
Scope of the Study: Focus limited to women's experiences with mobile safety apps in Mumbai.
Ethical Considerations: Voluntary participation, informed consent, and confidentiality ensured.
Limitations of the Study: Limited sample size and convenient sampling may restrict generalization; findings based on self-reported data.

DATA ANALYSIS AND INTERPRETATION

Demographic Information

The demographic profile of the respondents provides useful context to the patterns observed in awareness and usage of women's safety apps, Factors such as age, marital status, qualifications, occupation, area of residence in Mumbai, and daily commuting habit explains variations in user behaviour and engagement with the safety apps.

Graph. 1- Demographic profile of the Women living, studying, or working in Mumbai;



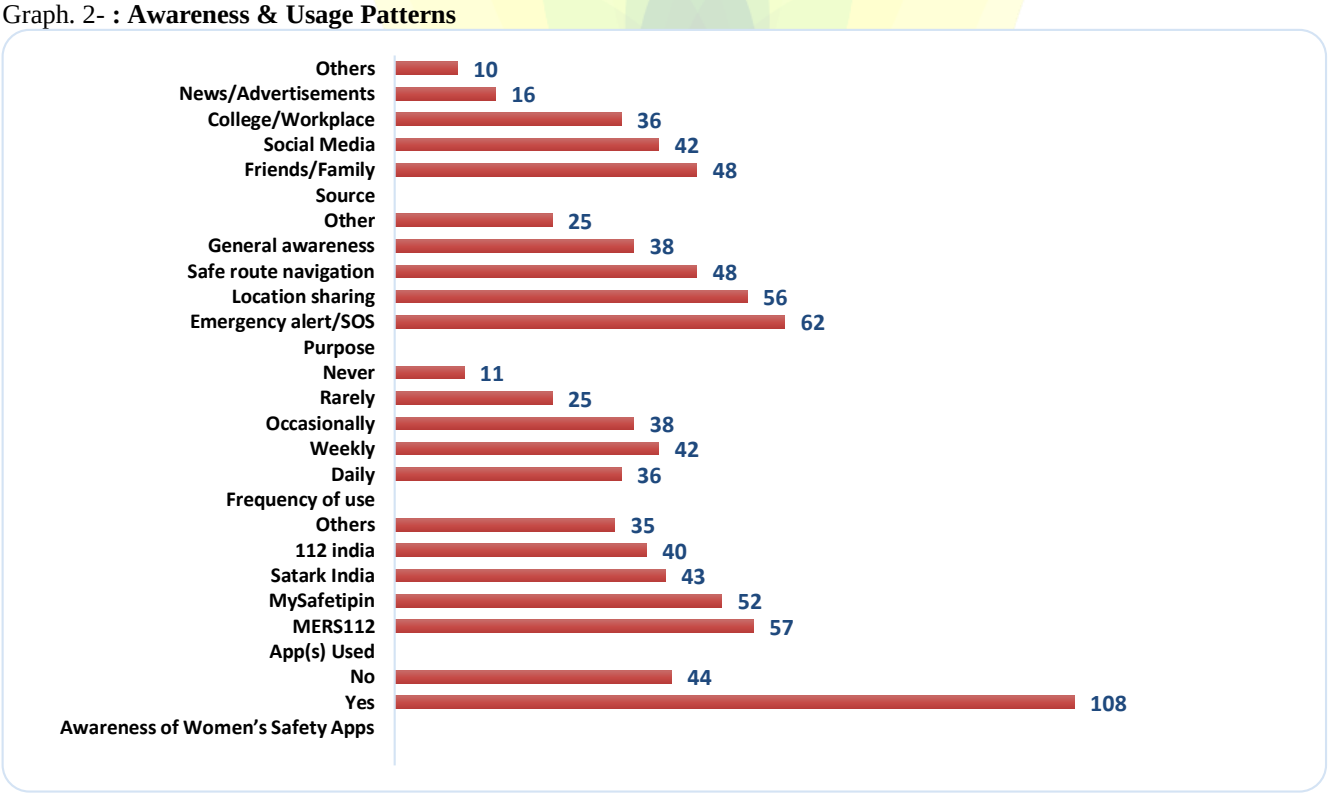
Source- Computed from primary data.

Interpretation: from the above graph, the age distribution appears balanced across groups—Below 20 years: 33 respondents, 21–25 years: 33 respondents, 26–30 years: 27 respondents, 31–35 years: 27 respondents, and 36 years & above: 32 respondents showing participation from both younger and older women. Marital status is diverse, with 54 respondents are single, 49 respondents who are married, and 49 respondents belong to others category. Educational levels vary as 52 respondents are graduates, 40 respondents are high school pass-outs, 31 respondents in other categories, and 29 respondents are postgraduates. Occupationally, the sample includes 47 respondents are students, 44 respondents are employed, 36 respondents are homemakers, and 25 respondents to the others group. Respondents are from all regions of Mumbai, North 31 respondents, South 30 respondents, East 31 respondents, West 30 respondents, and Central 30 respondents ensuring geographical diversity. The commuting modes include use of local trains 42 respondents, buses 33 respondents, metro 31 respondents, private vehicles 28 respondents, and walking/other modes 18 respondents.

Awareness & Usage Patterns

The parameters related to awareness & usage patterns aid in assessing women's awareness of safety apps and preferred applications. It also highlights the frequency, purpose of usage and how users first come to know about such apps aids a inclusive understanding of user behaviour, acceptance trends, and factors influencing the usage of women's safety apps.

Graph. 2- **: Awareness & Usage Patterns**



Source-Computed from primary data.

Interpretation: The data shows high awareness, with 108 respondents familiar with women's safety apps. The most used apps are MERS112 with 57 respondents, MySafetipin with 52 respondents, and Satark India with 43 respondents. In terms of frequency, 42 respondents use these apps weekly, 38 respondents use them occasionally, and 36 respondents use them daily, suggesting need-based usage.

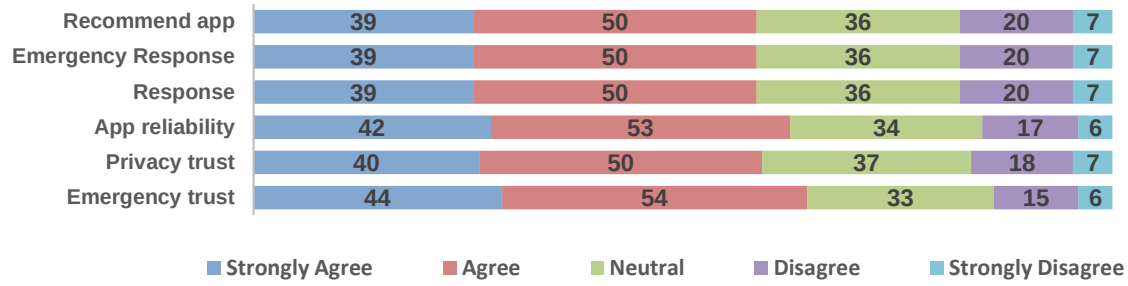
62 respondents used for emergency alert/SOS, location sharing by 56 respondents, and safe route navigation by 48 respondents. Awareness comes through friends and family to 48 respondents, through social media 42 respondents followed by colleges/workplaces 36 respondents whereas through news and advertisements reach only to16 respondents.

Overall, awareness is high but usage remains moderate and situational, indicating the need for stronger promotion to encourage consistent use.

Trust in Apps

The parameters reflect users trust in the app by gaging its emergency utility, privacy, safety, reliability, responsiveness, and the prospect of recommending it. Together, they show how confident and satisfied users feel while using the app.

Graph. 3- **Trust in Apps**



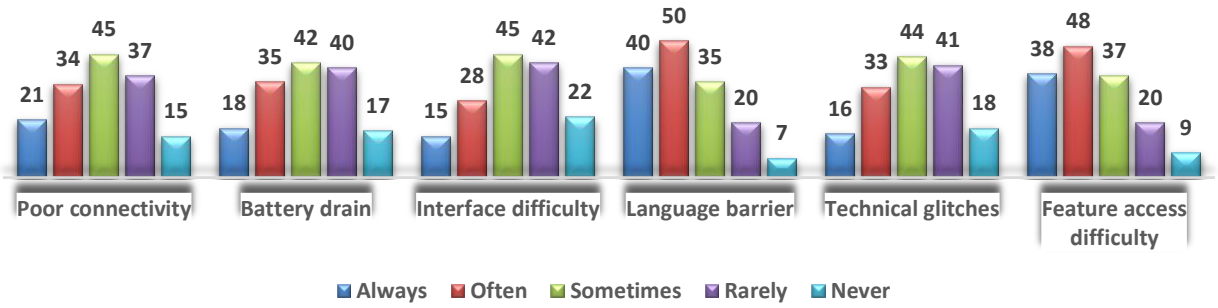
Source- Computed from primary data.

Interpretation: The chart depicts a strong positive perception for the app with respect to emergency trust 98 respondents express confidence, privacy trust scores high with 90 respondents. App reliability receives the strongest support with 95 respondents. The app's response and emergency response both have 89 respondents expressing satisfaction. 89 respondents are willing to recommend the app. Neutral responses remain moderate (33–37 respondents), and negative responses are low (21–25 respondents across categories). Overall, most respondents trust the app, find it reliable, and are satisfied with its emergency features.

Accessibility Barriers

The accessibility barriers reflect practical challenges faced by the users such as connectivity issues, battery drain, interface difficulty, language limits, technical glitches, and hard-to-access features that affect ease of use and overall app experience.

Graph. 4- **Accessibility Barriers**



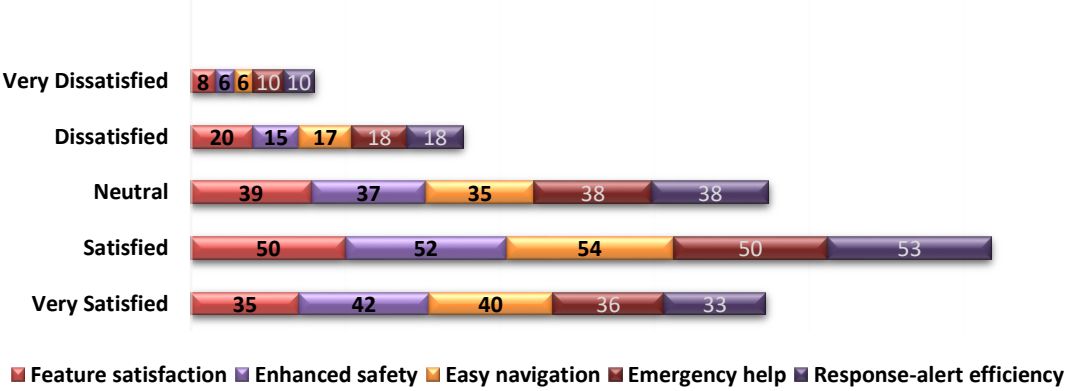
Source- Computed from primary data.

Interpretation: The chart shows that users experience multiple accessibility barriers while using the app. For Poor connectivity, 21 respondents always, 34 respondents often, and 45 respondents sometimes face this issue. Battery drain affects 18 respondents always, 35 respondents often, and 42 respondents sometimes. Interface difficulty is moderate, with 15 respondents always, 28 respondents often, and 45 respondents sometimes struggling with the interface. The Language barrier a common challenge, with 40 respondents always and 50 respondents often facing it. Technical glitches are reported by 16 respondents always, 33 respondents often, and 44 respondents sometimes. access difficulty remains high, with 38 respondents always, 48 respondents often, and 37 respondents sometimes. Overall, language issues, feature access, and technical glitches are the most reported barriers among respondents.

User Satisfaction & Effectiveness

The parameters reflect how satisfied users are with the app features, including feature satisfaction, enhanced safety, ease of navigation, emergency support, and the efficiency of alerts. Together, they show how well the app meets users needs and supports them during grave situations.

Graph. 5- **User Satisfaction & Effectiveness**



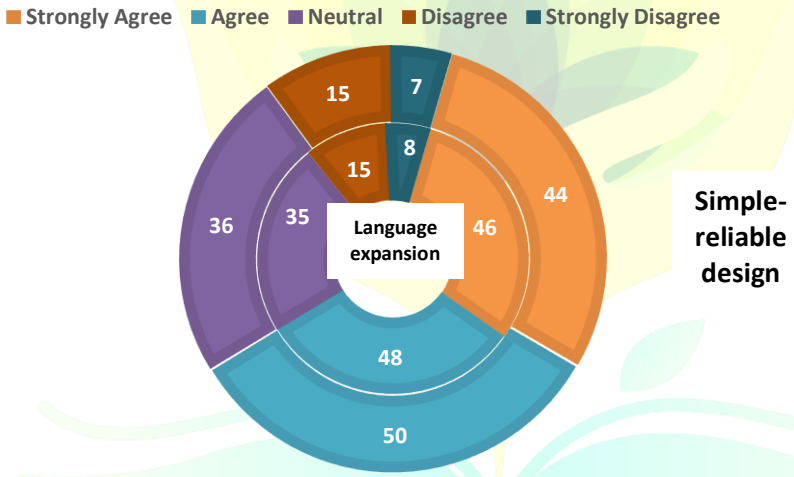
Source- Computed from primary data.

Interpretation: from the above chare it is revealed that most users are satisfied with the app across all features. For feature satisfaction, 85 respondents were satisfied, enhanced safety and easy navigation had 94 satisfied responses, emergency help had 86 satisfied responses and response-alert efficiency also had 86 satisfied responses. Neutral responses ranged from 35 to 39, while dissatisfaction was highest for emergency help and response-alert efficiency (28 respondents each). Overall, the app is well-perceived, improving alert sensitivity and emergency support could boost user satisfaction.

Recommendations & Improvement

This parameter assists in making the app accessible to a wider, multilingual audience through language expansion. A simple and reliable design ensures users can quickly and confidently use features, especially in emergencies. Together, these improvements enhance usability, trust, and overall satisfaction.

Graph. 6- Recommendations & Improvement



Source- Computed from primary data.

Interpretation: The chart showed strong support for app improvements. For Language Expansion, 94 respondents consider it important, while Simple-Reliable Design is supported by 94 respondents. Neutral responses were given by 35 respondents for language expansion and 36 respondents for simple-reliable design, while disagreement was reported by 23 respondents and 22 respondents respectively. This indicates that users clearly prioritize both language accessibility and a simple, reliable interface to enhance usability and trust.

RESULTS OF HYPOTHESES TESTING

Hypotheses of study was validated with the help of Chi-Square test, Mann–Whitney U Test and Spearman's Correlation

Hypothesis 1: Awareness & Trust Factors

H_{01}: Awareness and trust-related factors have no significant influence on the usage of women's safety apps among women in Mumbai.

H_{11}: Awareness and trust-related factors have a significant influence on the usage of women's safety apps among women in Mumbai.

Test Applied- Chi-Square Test of Association (Considering Data safety)

Table 1: Observed Frequency Table (O)

Trust Level	Regular Users	Irregular Users	Total
High Trust	60	38	**98**
Low Trust	18	36	**54**
Total	**78**	**74**	**152**

Expected Frequency (E)

Trust Level	Regular (E)	Irregular (E)	Total
High Trust	(98×78)/152 = **50.26**	(98×74)/152 = **47.74**	**98**
Low Trust	(54×78)/152 = **27.74**	(54×74)/152 = **26.26**	**54**
Total	**78**	**74**	**152**

Source- Computed from primary data.

Chi-Square Calculation $\chi^2 = \sum \frac{(O-E)^2}{E}$ = 10.91

Degrees of Freedom: (2−1) (2−1) = 1

Level of Significance (α) = 0.05 **and** Critical χ^2 value (df = 1) = **3.84**

Decision rule: $\chi 2 calculated(10.91) > \chi 2 table(3.84)$, the null hypothesis is **rejected**.

Table 2: Chi-Square Results of awareness and trust factor based on frequency of usage

Sr. No.	Factor Tested	χ^2 Value	p-Value	Decision
1	Awareness of women's safety apps	68.52	< 0.001	Reject H_{01}
2	Trust in app response	10.91	< 0.01	Reject H_{01}
3	Perceived data safety	14.88	< 0.001	Reject H_{01}
4	Network connectivity issues	27.64	< 0.001	Reject H_{01}
5	Satisfaction with app features	35.21	< 0.001	Reject H_{01}

Source- Computed from primary data and https://www.statskingdom.com/.

Decision- H_{01} is partially rejected.

Interpretation- Among awareness and trust factors, data safety significantly influences the usage of women's safety apps, while other factors do not show a significant impact.

Hypothesis 2: Accessibility, Usability & Design Barriers

H_{02}: Accessibility, usability, and design-related barriers do not significantly affect the adoption and regular use of women's safety apps.

H_{12}: Accessibility, usability, and design-related barriers significantly affect the adoption and regular use of women's safety apps.

Test Applied-Mann–Whitney U Test (Considering Language limitation)

Independent Variable: App Installed (Yes) = 95, App Installed (No) = 57

Test Variable: Language limitation (5-point Likert scale)

Coding of Responses: Strongly Agree (5), Agree (4), Neutral (3), Disagree (2), Strongly Disagree (1)

Ranking the Data: scores combined from both groups**,** Rank from lowest (1) to highest (5) and assigning of average ranks in case of ties

Sum of Ranks:

Table:3 Mean rank and sum of ranks

Group	Sample Size (n)	Mean Rank	Sum of Ranks
Installed	95	82.10	7800
Not Installed	57	64.35	3668

Source- Computed from primary data and https://www.statskingdom.com/.

Mann–Whitney U Formula: $U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1$, $U_2 = n_1 n_2 - U_1$

Where: $n_1 = 95$, $n_2 = 57$, $R_1 = 7800$

$U_1 = \mathbf{2175}$,$U_2 == 3240$ Considering the smaller **U value = 2175**

Z-Value Calculation $= \frac{U - \frac{n_1 n_2}{2}}{\sqrt{\frac{n_1 n_2 (n_1+n_2+1)}{12}}} = \mathbf{-2.04}$

Decision Rule: Significance level (α) = 0.05**,** Critical Z value = ±1.96**,** Since calculated |Z| value 2.04 > than the critical Z value of ±1.96, the null hypothesis (H_0) is rejected.

Table 4: Barrier-wise Results accessibility and usability

Barrier	Z-value	p-value	Result
Language limitation	−2.04	0.041	Significant
Network connectivity	−0.88	0.379	Not Significant
Battery drainage	−0.51	0.611	Not Significant
Difficulty understanding app	−1.64	0.101	Not Significant
Language limitation	−2.04	0.041	Significant
Technical glitches	−1.12	0.263	Not Significant
Difficulty accessing features	−1.79	0.073	Not Significant

Source- Computed from primary data and https://www.statskingdom.com/.

Decision-H_{02} is partially rejected.
Interpretation- Among all accessibility and usability barriers, language limitation is the only factor that significantly affects app adoption.

Hypothesis 3: User Satisfaction & Effectiveness

H_{03}: User satisfaction does not significantly influence perceptions of the effectiveness and continued use of women's safety apps.
H_{13}: User satisfaction significantly influences perceptions of the effectiveness and continued use of women's safety apps.

Test Applied- Spearman's Rank Correlation

Table 5.1: Coding of Likert Scale

Response	Score
Strongly Agree / Very Satisfied	5
Agree / Satisfied	4
Neutral	3
Disagree / Dissatisfied	2
Strongly Disagree / Very Dissatisfied	1

Table 5.2: Calculation of Mean Scores

(a) User Satisfaction

Response	Frequency	Score	Score × Frequency
Very Satisfied	35	5	175
Satisfied	50	4	200
Neutral	39	3	117
Dissatisfied	20	2	40
Very Dissatisfied	8	1	8
Total	152		540

Mean Satisfaction Score = 540/152 = 3.55

(b) Composite Effectiveness Score

Factor	Mean Score
Sense of safety	3.70
Ease of navigation	3.74
Help during emergencies	3.62
Response time satisfaction	3.60
Increased adoption	3.80
Total	18.46

Average Effectiveness Score = 18.46/5 = 3.7

Table 5.3: Ranking of Variables

Variable	Mean Score	Rank
Composite Effectiveness	3.70	1
User Satisfaction	3.55	2

Table 5.4: Calculation of Rank Differences

Variable	Rank (X)	Rank (Y)	d	d^2
Satisfaction vs Effectiveness	2	1	1	1

Source- Computed from primary data and https://www.statskingdom.com/.

Spearman's Rank Correlation Formula = $1-6\sum d^2/\, n(n^2-1) = 0.95$

Decision: At the 5% level of significance, the calculated Spearman's rank correlation coefficient ($r_s = 0.95$) is greater than the critical value ($r_s = 0.90$) for n = 5. Therefore, H_{03} is rejected.
Interpretation- A strong positive relationship exists between user satisfaction and perceived effectiveness, indicating that higher satisfaction leads to greater confidence and continued use of women's safety apps.

Table: 6 Overall Summary of Hypothesis Testing based on 152 respondents

Hypothesis	Statistical Test	Result
H_{01}	Chi-Square Test	Partially Rejected
H_{02}	Mann–Whitney U Test	Partially Rejected
H_{03}	Spearman's Correlation	Rejected

FINDINGS

The study revealed that most of the respondents are young below 25 years, single 54 respondents, graduates 52 respondents, and mainly students 47 respondents or employed women 44 respondents, with local trains being the most common commuting mode among 42 respondents. Awareness of women's safety apps is high, with 71 percent /108 respondents being aware about the app, mainly MERS112 used by 57 respondents, MySafetipin by 52 respondents, and Satark India by 43 respondents. App usage is largely situational rather than regular, with most respondents using the apps weekly or occasionally, particularly during late-hour travel or in unfamiliar areas, for SOS alerts by 62 respondents, location sharing by 56 respondents, and safe route navigation by 48 respondents. Trust in app features is generally strong, as 96 respondents are willing to recommend these apps; however, concerns related to privacy, data security, and reliability affect consistent usage. Accessibility barriers such as network issues reported by 45 respondents, battery drainage, technical glitches, and language limitations affecting about 90 respondents further restrict regular adoption. Overall satisfaction remains high, with 85 respondents reporting that they are satisfied or very satisfied, and respondents strongly emphasized the need for more reliable, user-friendly, and multilingual safety applications to enhance women's sense of security in public spaces.

CONCLUSIONS AND SUGGESTIONS

The study concludes that awareness and adoption of women's safety apps in Mumbai are reasonably high, largely driven by social networks and digital media. Strong trust in app functionality and emergency responsiveness encourages continued usage among existing users. However, technical constraints such as network and battery issues, along with limited language options, hinder wider and more effective adoption. Although users are generally satisfied with current features, there is a clear demand for better usability and reliability. Enhancing multilingual support and simplifying app design can significantly improve user experience. Addressing these gaps has the potential to increase adoption and strengthen the role of safety apps in promoting women's security.

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