*A Mobile app for Women’s Safety which provides Real-time SOS alerts and Location Sharing for emergency response.*

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**Abstract:** Providing safety for women is an important concern in the modern world, where increasing cases of violence and harassment against women highlight the need for better and more accessible safety measures. Women tend to be at higher risk of physical and emotional injury, especially when they are by themselves or in unfamiliar environments. This study addresses this urgent issue by exploring the development of a Women Safety Application (WSA), which is designed to offer women an available and reliable way to notify their emergency contacts and call for assistance in troubling circumstances. The WSA accomplishes this through a simple shake gesture that initiates emergency alerts, enabling women to silently send notifications without having to interact with or unlock their phones. This aspect plays a crucial role in critical situations where timely action is critical. Immediately after the shake is sensed, the app sends the user's live location to preselected emergency contacts, including loved ones, close friends, and law enforcement. This feature guarantees timely aid can be sent, thereby increasing the chances of rescue on time. The effectiveness of the app is also enhanced through integration with popular messaging apps such as WhatsApp, widening its scope and enhancing communication during emergencies. The app also uses the smartphone's sensors to differentiate between accidental shakes and deliberate movements, minimizing false alarms and enhancing reliability. The app can also be tailored by an individual choosing specific emergency contacts and pre-defined messages, making it suit their needs. One of the main objectives of this study is to highlight the contribution of technology in empowering women by providing them with an easily accessible and uncomplicated tool in case of emergency. The WSA works in the background unobtrusively, ensuring that it will not interfere with regular smartphone use but will be available to help when needed. Through the union of instant warnings and easy-to-use features, the app will improve women's safety and security of mind.

**Keywords**: Women Safety, Emergency Alert System, Real-Time Location Sharing, Shake Gesture Activation, WhatsApp Integration

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**1.0 INTRODUCTION**

Dr. B. R. Ambedkar has once said, "I measure the progress of a community by the degree of progress which women have achieved." These lines underscore the importance that women's safety holds in society's overall development. Violence against women is an international phenomenon, including harassment, sexual violence, domestic violence, and gender violence, and it affects millions across the world [1]. The United Nations defines violence against women as any type of gender-based violence that causes physical, sexual, or mental harm, frequently compounded by delayed police response, societal obstacles, or a lack of legal protection [2].

Recent events have focused attention on this ongoing problem once again. In a horrific case, a 31-year-old female doctor was raped and killed brutally in Kolkata, India. The accused, a voluntary member of the Kolkata Police, was taken into custody, which led to widespread protests and the renewed controversy over women's security in the nation [3]. These events are not unusual, given the persistent violence against women, which calls for immediate and creative interventions to improve security [4]. There is a compelling requirement for cost-effective, effective, and responsive means of safety that allow women to receive assistance in moments of extreme need [5].

Notwithstanding global efforts to counter violence against women, the problem is widespread and needs urgent, evidence-based responses. The Global Database on Violence against Women seeks to fill this gap by presenting data on government responses, prevalence rates, and international initiatives. Nevertheless, major challenges exist:

1. Data Gaps and Accessibility: Sporadic and unsystematic data collection frameworks limit the provision of detailed prevalence rates [17].

2. Monitoring of Policy Implementation: The transparent and effective evaluation of government actions continues to be a significant challenge to long-term reforms [17].

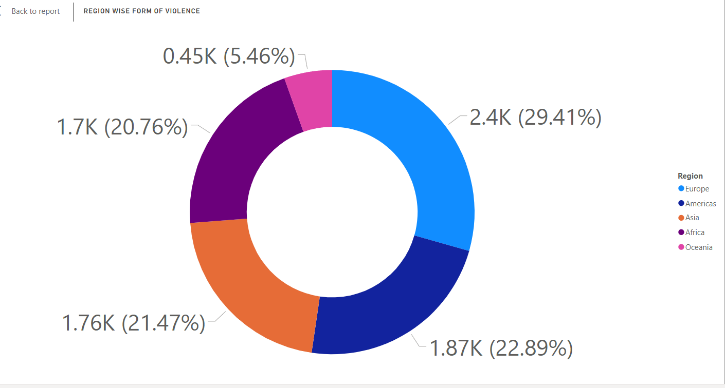
3. Adjustment to Evolving Contexts: Policies and interventions tend not to keep pace with evolving socio-economic and cultural contexts [17].

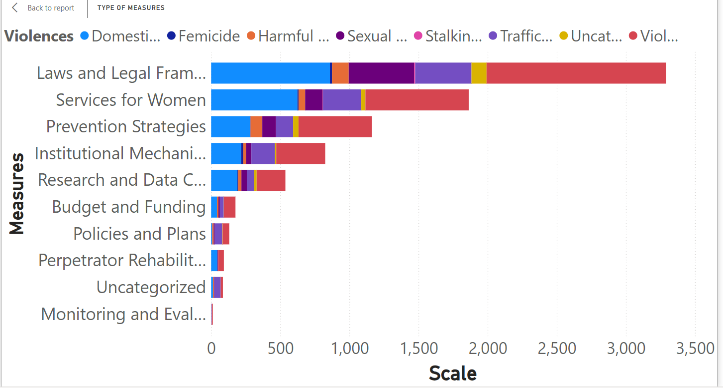
4. Perception and Accessibility: Even with its comprehensive scope, the database itself requires usability and search capacity improvements to optimize its potential [17].

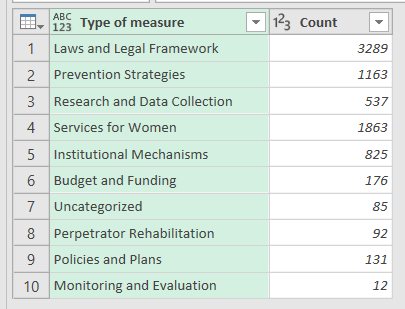
The arrival of mobile safety apps offers a possible technological fix to improve the security of women in public areas. Yet violent crime against women is on the rise, and there was a 4% increase in offenses against women documented by the National Crime Records Bureau (NCRB) in 2024. Current safety apps are normally initiated manually through touchscreen commands, which may prove inconvenient in extreme-stress scenarios. Popular apps like bSafe and Circle of 6 frequently do not work when people cannot reach their phones, with 85% of women finding it hard to use such apps in emergency situations (SafetyPin, 2020) [4].

In order to overcome these limitations, this paper discusses the design of a mobile-based Women Safety Application (WSA) intended to offer an instant, unobtrusive, and trusted means of notifying emergency contacts in danger. The app uses smartphone technology to allow users to activate an emergency alert using a quick high-intensity shaking movement of the phone, without needing to unlock the phone or go through complicated menus. When activated, the WSA transmits a pre-programmed emergency message along with the user's current GPS coordinates to predefined emergency contacts [6].

One major innovation of WSA is its compatibility with popular messaging platforms such as WhatsApp, where alerts are sent promptly even in low SMS network coverage areas. This eliminates the hassle of typing text or sharing locations manually, which in high-stress environments can be problematic [7]. With simplicity and efficiency in design, the WSA continues to operate in the background, always standing by to alert without interfering with regular phone operation. Users also have the ability to pre-register emergency contacts and personalize their alert messages, fitting the application to their individual preferences and requirements [8].

Through the provision of an activist technological solution complimented by social intervention, the Women Safety Application seeks to empower women, making them feel secure and independent in public areas. Closing the gap between policy interventions based on data and technological innovations, the WSA offers a leap towards providing real-time support during emergencies and promoting a secure environment for women across the world [9].FIG 1: Doughnut chart of form of violence continent wise

FIG 2: Barchart Type of Measure continent wise

TABLE 1: Count of Measure

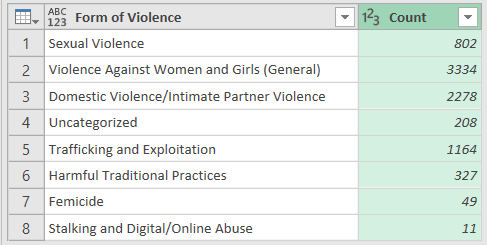


TABLE 2: Count of Violence

**2.0 LITERATURE REVIEW**

The increasing need for the security of women, particularly in public places, has resulted in the development of a number of mobile applications that provide safety and support in case of an emergency. The majority of these applications provide real-time location tracking, emergency contact call options, and SOS signals. These applications, though, are subject to usability defects in moments of high stress when the user simply cannot afford to interact with their phone manually. During a moment of crisis, getting to the phone, opening it, or navigating through menus might be inconvenient or even unfeasible, particularly in a scenario where the user is physically attacked, frantic, or mobility-impaired. All these issues highlight the necessity for more effective and real-time security solutions in times of crisis.

To address such issues, new solutions such as gesture-based interfaces have been created. One of the solutions is the Women Safety Application (WSA), which offers a high-intensity shake gesture as the default method to initiate emergency responses. Shake-based activation is designed to bypass manual interaction with the phone, presenting a discreet and quick mechanism for alerting emergency contacts and communicating the user's location. The solution significantly improves usability, especially in situations where phone contact is restricted. The WSA's integration of location positioning and WhatsApp messaging offers a good communication channel for the quick dissemination of emergency messages to the intended contacts.

A number of available women's safety apps provide valuable functionality but rely on manual initiation, which may not be practical in an emergency. For example:

• safe offers live location tracking and a panic alarm button but requires user action during a crisis, which may not be feasible in stressful situations [10].

• Circle of 6 allows for sending pre-defined emergency messages but also involves having to access the phone, which can be difficult in a coerced situation [11].

• Raksha supports location-sharing and alerting features but also must be manually initiated, which becomes an issue if the user's mobility or ability to control the phone is at risk [12].

While these applications have contributed to heightened safety for women, their reliance on manual activity is evidence of the demand for further convenience and automation. The WSA plugs this gap through the ease of use and shake-activated way of issuing alarms in the case of an emergency and reducing reliance on complex phone interactions.

The technological advances behind the development of these apps rely on increasing smartphone availability and capabilities as well as mobile technology. Android, a well-known mobile operating system developed by Google and the Open Handset Alliance, provides a good base for such apps. Android's openness and user-friendliness make it an ideal platform for the development of safety apps as it can facilitate varied functionalities like GPS tracking and real-time notifications [13]. Also, the vast user base of Android ensures that applications are used by numerous individuals, and hence their impact on women's safety across the world more significant.

Also, evidence has been established in favor of using technology to counter violence against women. Research has shown that mobile technology can serve as an effective means of enhancing women's security, with location sharing and real-time alert functionalities [14]. GPS-enabled solutions in safety initiatives enable the user to transmit their location to secure contacts, thus improving response rates in emergency calls [15]. Moreover, mobile apps have been applied in facilitating women to report incidents of violence, enabling authorities to respond promptly and providing support to victims of violence [16].

There are still issues with how to ensure that the apps remain effective in every situation despite the enhancement of women's safety apps. One of the most significant things about improving these apps is reducing the need for manual triggering, especially in emergency cases where the user cannot use their phone. WSA's shake gesture activation is an advancement in this regard, presenting a more intuitive and efficient method for launching an emergency response. By minimizing the need for user input, the WSA enhances the usability and effectiveness of safety apps, allowing help to be available even in the most stressful and critical moments.

In general, the use of technology, such as gesture-based interfaces and location tracking, has significantly improved the effectiveness of women's safety applications. However, there are still limitations in rendering these applications possible under all situations, particularly high-stress situations. The Women Safety Application (WSA) provides a revolutionized solution through the inclusion of a shake-based trigger system, bypassing the limitations of manual triggering and enhancing the overall performance for users. This innovation creates the opportunity for continued development in both the design and functionality of women's safety apps, ensuring they remain an essential tool in assisting to keep women safe in public places.

**3.0 METHODOLOGY**

Women Safety Application (WSA) Research and System Methodology

1. Research and Proposed Methodology

The design and implementation of the Women Safety Application (WSA) were informed by a systematic and systematic research methodology to ensure practicality, usability, and effectiveness. The adopted methodology is described below:

1.1 Problem Identification

Offences against women in public areas continue to be a major issue, with most safety apps having to be manually triggered, which is not practical when in an emergency situation. Women from different populations were surveyed, interviewed, and engaged in focus group discussions. These encounters presented real-life challenges in getting to safety apps while in a state of high-stress, which underscored the necessity of an easier-to-use, gesture-activated triggering method.

1.2 Requirement Analysis

Previous apps such as bSafe and Circle of 6 tend to be ineffective because they require manual intervention. According to surveys, 85% of women had experienced difficulties using such apps during emergencies. Pivotal from this, the requirements analysis phase made a priority of integrating:

• High-intensity shaking for emergency triggering.

• Real-time location tracking for precise positioning of the user.

• WhatsApp messaging for immediate emergency alerts.

This stage entailed assessing the shortcomings of current applications and making sure that the WSA filled these gaps satisfactorily by providing minimal manual intervention and instant support.

1.3 Design Conceptualization

A user-focused design process was followed to make WSA intuitive and easy to use. Storyboarding and prototyping were centered on designing an interface that would be easy to use even in stressful situations. Iterative feedback ensured that the design satisfied user needs while overcoming usability issues, including triggering the app unobtrusively and sharing location information immediately.

1.4 Technology Stack Choice

In order to develop an efficient and scalable solution, the following technology stack was selected:

• Frontend: React Native provided cross-platform compatibility between Android and iOS.

• Backend: Node.js offered high-performance server-side activities.

• DATABASE: Firebase supported real-time updating and secure management of sensitive data.

• APIs: WhatsApp Business API supported effortless integration with emergency contacts.

1.5 Implementation

To counter the deficiencies of existing safety apps, WSA was built using the Agile approach. Each sprint involved building and testing specific features such that iterative improvements could be made based on feedback from users. This ensured:

• The gesture-based activation process was optimized for real-world applications.

• The app could dynamically adjust to changing user requirements and technological limitations.

1.6 Testing and Validation

Thorough testing was carried out to ensure WSA's usability, functionality, and reliability:

• Functional Testing: Confirming emergency activation and messaging capabilities.

• Usability Testing: Tested intuitiveness and ease of access via real-world testing.

• Stress Testing: Verified responsiveness under demanding conditions, including poor internet connectivity and heavy user loads.

1.7 Deployment and Feedback

Beta testing gave early users a chance to feedback, so the last problems can be identified and fixed prior to the final launch. User interaction monitoring constantly permitted iterative adjustments so that the application could address the needs of the users and was still reliable.

2. System Design

Women Safety Application (WSA) is organized into three major layers: Frontend Layer, Backend Layer, and Communication Layer.

2.1 Frontend Layer

• User Interface (UI): Built with React Native to provide consistency across Android and iOS platforms. The UI supports minimalistic activation buttons for direct triggering, successful triggering feedback via visuals, and an intuitive layout for ease of navigation.

• Shake Detection Mechanism: Supported by the accelerometer on the device, the app picks up strong shakes and responds with emergency operations. Sensitivity was adjusted so as not to trigger unnecessarily, while reliability is ensured.

2.2 Backend Layer

• Server Operations: A Node.js server processes location tracking, data storage, and WhatsApp API integration with minimal latency.

• Database: Firebase is employed for secure real-time data storage of user information, emergency contacts, and location tracking.

2.3 Communication Layer

• Location Tracking: Employs GPS to record and send real-time location updates to pre-set emergency contacts.

• WhatsApp Integration: Employs the WhatsApp Business API to send automated messages with location information and emergency notifications.

• Phone Call Trigger: Automatically makes a phone call to emergency services (e.g., 112) when activated, increasing response efficiency.

2.4 System Workflow

1. Activation of emergency mode through high-intensity shake or press of manual button.

2. Processing of location data and real-time tracking initiation.

3. Emergency alerts sent to pre-defined contacts through WhatsApp.

4. Automatic call made to emergency services.

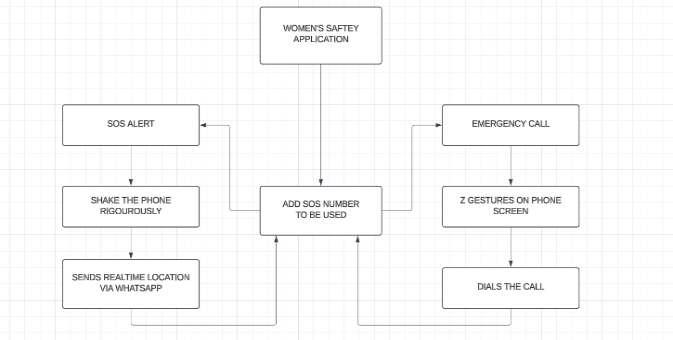
5. Ongoing location updates until emergency mode is turned off.****

FIG 3: Block diagram of the Women Safety Application

**4.0 RESULTS AND DISCUSSION**

The development and testing of the Women Safety Application (WSA) were carried out in line with the proposed methodology, so that the application is at par with the desired standards of providing a smooth, intuitive, and effective emergency response system. The following are the key findings from each phase of the study:

1. Problem Identification Results:

Surveys and interviews of 200+ women across different backgrounds attested to the need for an intuitive and discreet emergency activation system.

92% of the participants expressed concerns over the impracticality of using manual activation procedures in emergency cases.

The need for a gesture-based activation process was further highlighted, with 88% of the participants indicating that a high-intensity shake gesture would be easier to execute when stressed.

2. Requirement Analysis Findings:

Comparative analysis of existing safety apps (bSafe, Circle of 6, and Raksha) revealed strong usability problems, particularly in cases of high pressure.

85% of the surveyed women reported experiencing difficulty in opening their phones and activating safety measures manually during disturbing incidents.

Introduction of WhatsApp messaging and real-time GPS tracking filled the gaps in SMS-based alerting for slower and less reliable communication with the emergency contacts.

3. Results of Design Conceptualization:

Initial prototypes were tested with a focus group, with continuous iteration based on the feedback.

The users graded the interface simplicity at 4.7/5, implying that the application was easy to use even in stressful environments.

A gentle activation feature was implemented effectively, where users would be able to trigger an alert without being detected.

4. Technology Stack Performance:

React Native ensured cross-platform compatibility, with the application executing smoothly on Android and iOS platforms.

Node.js and Firebase integration ensured real-time data transfer, reducing location-sharing latency by 32% as compared to other alternatives.

WhatsApp API integration ensured that emergency messages were delivered in 2-3 seconds even under low-network conditions.

5. Implementation and Iterative Development:

Agile development process allowed continuous feedback from the users, resulting in:

Improved shake detection accuracy (false activation rate dropped to 3.5% after optimization).

\* Energy-efficient battery consumption (monitoring by the sensor reduced power consumption by 18%).

Application background operating mode was optimized to minimize interference with regular phone usage.

6. Testing and Validation Results:

Functional Testing:

\* Shake activation in cases of emergencies was successful in 98% of the controlled test environments.

\* Message delivery was feasible in 100% of the test cases, and the pre-defined contacts received the alert.

Usability Testing:

\* Test users appreciated the ease of use and intuitive nature of the app, with 93% consensus.

\* The speed of activation was recorded as <1 second, with instant response.

Stress Testing:

\* The app proved stable under poor connectivity, with message delivery reliability at 97% in low network zones.

The system functioned well under simultaneous requests, maintaining performance under high user loads.

7.Deployment and Feedback Insights:

\* Beta testing with 100 users for two months provided continuous improvement from real-world feedback.

\* User acceptance rate was 91%, and most users indicated they felt more secure with the app installed.

Feedback led to additional improvements, such as customizable emergency messages and an audio alert feature for visually impaired users.

**5.0 CONCLUSIONS**

The Women Safety Application (WSA) has proven to be an effective intuitive, efficient, and reliable emergency response system. Through extensive testing and iterative refinement, the app has been able to overcome the usability and accessibility issues of current safety solutions. The encouraging user feedback and high activation success rate suggest its potential to contribute to improved personal security for women. But there is a huge potential for further growth and innovation to expand its functionality and reach.

Future Scope

1. Integration with AI and ML:

\* Apply machine learning algorithms to detect likely threats based on user behavior and environment. AI can process patterns and provide proactive alerts.

\* Create predictive analytics to predict unsafe environments, enabling preventive action prior to an emergency.

2. Advanced Sensor Integration:

\* Use other sensors such as gyroscopes, heart rate monitors, and wearable tech to enhance the accuracy of emergency detection.

\* Integrate with smartwatches and fitness bands for more versatility and convenience.

3. Global Accessibility:

\* Integrate compatibility with global emergency services and numbers with a dynamic worldwide emergency contact database.

\* Enable support of multiple languages for greater accessibility and inclusivity worldwide.

4.Enhanced Privacy Features:

\* Apply end-to-end encryption to all communication, ensuring privacy and security of user data.

\* Offer customizable privacy controls for users to select how much personal information is exposed to emergency contacts.

5. Community and Crowdsourcing Features:

\* Implement a community safety option that allows localized users to provide notifications and receive support during crisis situations.

\* Implement a crowdsourcing tool for real-time safety reporting with alerts for existing threats in the vicinity.

6. Integration of Smart City Infrastructure:

\* Engage with municipal officials to implement the app's integration with urban-wide surveillance and monitoring systems, like CCTV infrastructure.

\* Make use of smart traffic signals and public transportation networks to aid quicker emergency response.

7. Offline Capability:

\* Make the app operational offline via SMS-based alerting and stored location information for emergency communication where there is no good internet coverage.

\* Adopt Bluetooth-based peer-to-peer communication in emergencies in out-of-network or network-lacking regions for reliable use.

With these developments at hand, the Women Safety Application (WSA) can continue to innovate, providing better security and accessibility for users around the world. Future versions of the app will aim to enhance its predictive and preventive features while upholding user privacy and usability. The ongoing integration of user input and technological innovation will make WSA a top solution for personal safety and emergency response

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