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Reviewing Android-Based Women Safety Apps: A Look at What Works, What Doesn't, and Where We Go Next

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***Abstract* - Women's personal safety has been a long-standing concern, but the problem has grown harder to ignore as crime statistics keep climbing year after year. Interestingly, the same mobile phones that people carry everywhere have quietly become one of the more practical tools for addressing this issue. This paper takes a close look at four Android-based safety applications developed between 2018 and 2024, each tackling the problem from a slightly different angle. Rather than treating them as isolated works, we examine them side by side — what each one does well, where it falls short, and what the combination of all four tells us about the state of this field. The apps studied here cover a range of approaches: GPS-based SOS alerts, offline location tracking using mobile network data, direct connectivity to nearby police stations, WhatsApp-based emergency broadcasting, sensor-driven automatic detection, and police admin dashboards. After mapping out these differences, we put forward a design framework that tries to bring the best of each system together. The paper also raises some honest questions about what these apps still cannot do, and where researchers should probably focus their energy next.**

***Index Terms*—Women Safety App, Android, GPS Tracking, SOS Alert, Emergency Contact, Offline Tracking, Police Station Detection, Personal Security**

I. INTRODUCTION

Ask most people what they think the biggest safety challenge for women is, and they will likely mention the gap between when something goes wrong and when help actually arrives. That gap — sometimes a matter of minutes, sometimes longer — is where a lot of harm happens. Police response times are constrained by geography, by limited information, and sometimes simply by not knowing an incident is occurring at all. Victims, on the other hand, often cannot make a phone call openly or even unlock their screen without drawing attention to themselves.

This is not a new problem, but it has become a more solvable one. India's National Crime Records Bureau reported over 405,000 registered cases of crimes against women in 2019 — a 7.3% jump from the year before [2]. The breakdown is telling: roughly 31% involved cruelty by a husband or his relatives, about 22% were assault cases, and kidnapping accounted for nearly 18% [2]. These numbers represent real situations where faster communication between a victim and emergency services could have made a difference.

What has changed in recent years is the near-universal presence of smartphones. GPS-capable phones went from being owned by roughly 3% of the population to over 80% within about eight years [2]. That shift opened up a practical avenue for building safety tools that people already carry with them. Researchers and developers noticed, and a wave of women's safety applications followed.

This paper looks at four of those applications — published between 2018 and 2024 — and tries to make sense of them together. Each one was built by a different team, in a different context, with a different set of priorities. Taken individually, each has real strengths and real blind spots. Taken together, they sketch out a fairly complete picture of what this category of software can and cannot currently do.

The goals here are straightforward: understand what each system actually does, compare them honestly, identify the gaps that none of them fully address, and suggest a direction for what a more complete solution might look like. The paper is organized as follows — Section II covers earlier work in this space, Section III walks through each of the four systems in detail, Section IV compares them directly, Section V proposes an integrated design, Section VI discusses what still needs work, and Section VII wraps things up.

II. BACKGROUND AND RELATED WORK

Work on technology-assisted women's safety goes back at least a decade. Some of the earlier efforts were fairly simple — an app called ABHAYA, for instance, sent the user's GPS location to a list of saved contacts every five minutes when activated [1]. It was not sophisticated, but it worked, and it established a template that many later systems followed. Around the same time, S-ZONE took a similar approach but framed it more explicitly around helping emergency services locate a victim quickly [1]. SHIELD went a step further by pushing

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location updates to a website in near real-time, with changes reflected within half a second [1].

These early systems shared a common assumption: the most important thing was getting the victim's location to someone who could help. That assumption is not wrong, but it turned out to be incomplete. Sending a location URL to a family member is only useful if that family member sees the message quickly, understands what it means, and is in a position to do something about it. In practice, that chain of events often breaks down.

Later work tried to address some of these gaps. Mandapati and colleagues built an app called I Safe Apps that added more user-facing features [2]. Gadhave's team experimented with embedding safety functionality into wearable clothing [2]. Khandelwal and others brought IoT sensors and machine learning into the picture [2]. On the hardware side, Sharmila's group tried weaving conductive thread into garments so that a physical disturbance would automatically trigger an alert [3]. Kolte's team worked on algorithms that could recognize distress patterns without the user having to press anything [3]. Each of these contributions moved the needle in some direction. But looking across all of them, a few persistent gaps stand out. Almost every system requires an internet connection. Almost none of them contact the police directly — they notify personal contacts instead, and hope those contacts can escalate. And very few of them think about what happens when the victim cannot interact with their phone at all. The four systems reviewed in this paper each take a different run at these problems, with varying degrees of success.

III. THE FOUR SYSTEMS UNDER REVIEW

A. Women Safety App — Sakure et al. (2022)

The app developed by Sakure and colleagues at Terna Engineering College [1] is probably the most feature-complete of the four in terms of what a user can actively do in a crisis. It bundles four distinct tools into a single interface: an SOS alert system, a siren, a voice recorder, and a helpline directory. The SOS function is the core of it. Once triggered, the app grabs the phone's GPS coordinates and sends a message containing a location link to whoever the user has registered as emergency contacts. It does this every 30 seconds, not just once — which matters, because a victim who is moving needs to be tracked continuously, not just pinpointed at a single moment. The message keeps going until the user manually hits stop.

The siren feature addresses a different kind of problem. GPS alerts help people who are far away find the victim. A siren helps people who are nearby notice that something is wrong. It plays a loud police-style sound through the phone's speaker, which can startle an attacker or draw attention from bystanders. Voice recording serves a different purpose entirely — it is about what happens after the incident rather than during it. Audio captured during an attack can be used as evidence, and having that recording automatically saved to the phone means the victim does not have to think about it in the moment.

The helpline directory rounds things out by giving users one-tap access to police, ambulance, fire services, and women's safety helplines. On the technical side, the app uses MongoDB as its backend database and follows a standard client-server architecture.

Where this system falls short is connectivity. Everything depends on having an active internet connection and GPS signal. There is no fallback for situations where neither is available. The app also does not reach out to police directly; it relies entirely on the user's personal contacts to escalate the situation.

B. Innovative Women Safety Application — Patel (2024)

Patel's system [2] takes a noticeably different approach. Where Sakure's app is built around what the user does, Patel's is partly built around what the phone's sensors detect. The idea is that in some emergencies, the victim may not be able to interact with the app at all — so the app should be able to figure out that something is wrong on its own.

The sensor monitoring works by reading the phone's accelerometer and microphone in the background. Sudden sharp movements or unusually loud sounds can trigger an alert automatically, without the user pressing anything. This is a meaningful step forward, though it comes with the obvious risk of false positives.

The app also introduces an admin layer that the others lack. An administrator can push emergency notifications to all users in a given area. If there is a known threat in a neighborhood, users get notified proactively rather than waiting until they are already in danger. The panic button can be triggered by pressing the power button three times or shaking the phone three times in quick succession — either method works without unlocking the screen.

Architecturally, the app uses a five-module structure covering admin functions, user management, contact handling, threat alerting, and background sensor monitoring. Local data is stored using Android's Shared Preferences, while the webfacing component uses MySQL. The two are not synchronized in real time, which creates some awkward situations. The main gap here is the same as System 1: no direct police contact.

C. Android-Based Woman Safety App — Sarma et al. (2023)

The work by Sarma, Ahmed, and Bezbaruah at Gauhati University [3] stands out for one reason above all others: it is the only system among the four that actually calls the police. Not a personal contact who might then call the police — the nearest police station directly.

To make this work, the app uses the Haversine formula to calculate the straight-line distance between the user's current GPS coordinates and each police station in its database. It then identifies the closest one and displays the result with a colorcoded indicator — green if the station is within 4 km, yellow between 4 and 8 km, and red beyond 8 km. The user can

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see at a glance how close help is, and tap a single button to call that station's emergency line.

The app also integrates with WhatsApp in a way that none of the others do. When an emergency is triggered, the user can set their WhatsApp status to an emergency message that includes their live location. This reaches everyone in their contact list simultaneously — not just the handful of people registered in the app. The location update frequency is notably high — every 5 milliseconds. The app is built in Kotlin using Android Studio, with Firebase handling backend services.

The limitations are real, though. The police station database has to be manually maintained. The app needs internet access throughout. And the Haversine formula gives straight-line distance, not travel time. The team's user survey found that about 77% of respondents believed technology could make them safer, and roughly 54% thought an app like this could reduce crime.

D. WoS App — Bhanushali et al. (2018)

The WoS (Women's Safety) App [4] is the oldest of the four systems reviewed here, but it addresses a problem that the newer systems still have not fully solved: what happens when there is no internet connection and no GPS signal?

The answer the team came up with is to use the mobile network itself as a location source. Every phone connected to a cellular network has access to parameters called LAC (Location Area Code) and CID (Cell ID), which identify the specific cell tower the phone is connected to. By sending these values to an external API — the Unwired Labs service — the app can get an approximate latitude and longitude even without GPS or data connectivity.

This three-mode location system — GPS when available, internet-based geolocation as a fallback, and LAC/CID-based tracking as a last resort — is the most robust approach to location tracking among the four systems. Activation is handled by pressing the power button twice, which works even when the phone is locked. Once activated, the app sends SMS messages with location data to registered contacts every minute.

The system also includes a police admin panel — a web interface where law enforcement can see active distress cases and the victim's location in real time. One genuinely useful feature is temporary referral contacts: in addition to permanent emergency contacts, users can add temporary contacts for a specific outing and remove them afterward. The main weaknesses are the lower accuracy of offline tracking and the absence of social media integration or direct police station calling.

IV. COMPARING THE FOUR SYSTEMS

S1 = Sakure et al. [1]; S2 = Patel [2]; S3 = Sarma et al. [3]; S4 = Bhanushali et al. [4]

Looking at Table I, a few things jump out. First, the basics are consistent across all four — GPS tracking, SOS alerts, SMS notifications, and continuous location updates are universal. These are clearly the non-negotiable features.

Second, each system has something the others do not. System 1 is the only one with a siren and voice recorder. System 2 is the only one with sensor-based automatic detection. System 3 is the only one that calls the police directly and uses WhatsApp. System 4 is the only one that works offline. This is actually a healthy sign — the field is exploring different directions rather than just copying each other.

TABLE I
FEATURE COMPARISON OF REVIEWED WOMEN SAFETY APPLICATIONS

Feature	S1	S2	S3	S4
GPS Location Tracking	✓	✓	✓	✓
SOS / Panic Alert	✓	✓	✓	✓
SMS Alerts to Contacts	✓	✓	✓	✓
Continuous Location	✓	✓	✓	✓
Siren / Audio Alert	✓	–	–	–
Voice Recording	✓	–	–	–
Helpline Directory	✓	✓	–	–
Nearest Police Station	–	–	✓	–
Direct Police Call	–	–	✓	–
WhatsApp Integration	–	–	✓	–
Admin / Police Panel	–	✓	–	✓
Sensor Auto-Detection	–	✓	–	–
Offline Tracking	–	–	–	✓
Power Button Trigger	–	✓	–	✓
Temporary Contacts	–	–	–	✓

Third, the connectivity problem is only partially solved. Three of the four systems require internet access throughout. Only System 4 has a genuine offline fallback, and even that has accuracy limitations.

Fourth, direct police engagement is surprisingly rare. Only System 3 actually contacts law enforcement proactively. There is a meaningful difference between pushing an alert to a police station and hoping someone checks a dashboard.

Fifth, social media as an amplification tool is almost entirely unexplored. System 3's WhatsApp integration is the only example, and it is genuinely novel.

V. TOWARD A MORE COMPLETE SYSTEM

After going through all four systems, it becomes fairly clear what a more complete solution would look like. The pieces are already there across the four apps — the challenge is putting them together sensibly.

A. Overall Architecture

A three-tier structure makes the most sense. The userfacing Android app sits at the front. A cloud backend handles alert routing, the police station database, and user account management. A hybrid data layer uses Firebase for realtime location data and a relational database like MySQL for persistent records.

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B. Activation Methods

A single activation method is not enough. Different emergencies call for different approaches. A well-designed system should support: a manual SOS button, power button shortcuts (double or triple press), shake detection via the accelerometer, and background monitoring that can trigger automatically if sensor data looks alarming. Users should be able to configure which methods are active and set sensitivity thresholds for automatic detection.

C. Location Tracking

System 4's three-mode approach is the right model. GPS when available, internet-based geolocation as a backup, and LAC/CID-based offline tracking as a last resort. The system should switch between these automatically. Location updates should go out every 30 seconds to a minute and continue until the user explicitly cancels the alert.

D. Alert Distribution

A complete solution should send alerts through multiple channels simultaneously: SMS to registered contacts, push notifications through the app, a WhatsApp status update and broadcast message, a direct call to the nearest police station, and a notification to a police admin dashboard. Running them in parallel means that at least some will get through regardless of conditions.

E. Active Safety Features

Beyond alerting, the app should give users tools they can use in the moment: a loud siren to deter attackers and attract bystanders, automatic voice recording for evidentiary purposes, and a helpline directory organized by situation type.

F. Privacy and Security

Location data should be encrypted in transit and at rest, stored only for the duration of an active alert, and deleted automatically afterward. The police admin panel should require authenticated login and log all access. Users should have full control over who is registered as a contact.

VI. WHAT STILL NEEDS WORK

A. Remaining Problems

The most fundamental limitation is device dependency. All four apps assume the victim has their phone, can reach it, and can interact with it. In situations where the phone is taken away or the victim is incapacitated, none of these systems help.

Battery life is a related concern. GPS and background sensor monitoring are both power-hungry. An app that drains the battery quickly is less useful in extended emergencies.

False alarms from sensor-based detection are a real operational problem. If an app sends distress alerts every time someone drops their phone, emergency contacts will start ignoring them. Getting the sensitivity calibration right is genuinely difficult and probably needs to be personalized to individual users.

The police station database needs to be kept current. Police stations open, close, and change their emergency numbers. A database that was accurate at release may be significantly out of date a year later.

Finally, adoption matters. An app that only a handful of people use is much less effective than one that is widely installed. Community-based features only work if there are enough users in the area to make the network meaningful.

B. Future Research Directions

Wearable devices are the most obvious answer to the device dependency problem. A smartwatch or small clip-on device with GPS and cellular connectivity could trigger an alert with a single button press, even if the user's phone is not accessible [1].

Machine learning applied to sensor data could significantly improve automatic detection accuracy. Rather than using fixed thresholds, a trained model could learn what normal activity looks like for a specific user and flag deviations more reliably [2].

Community-based response networks are an underexplored idea. If a distress signal could alert nearby users of the same application, it would create a distributed first-responder network — an idea that survey respondents in Sarma et al.'s study found genuinely appealing [3].

Real-time video streaming to police and emergency contacts would add a dimension that audio recording alone cannot provide [4]. Crime hotspot mapping — overlaying historical crime data on the user's map view — would shift the app from purely reactive to genuinely preventive [3]. Multi-language support is a practical necessity in multilingual countries like India, where English literacy is not universal.

VII. CONCLUSION

Four teams, four different approaches, one shared problem. Looking at these systems together, what stands out is not how different they are but how complementary. Sakure's team built the most feature-rich user-facing experience. Patel added sensor intelligence and institutional oversight. Sarma's group solved the police connectivity problem and brought social media into the picture. Bhanushali's team tackled the offline scenario that everyone else ignored.

None of them got everything right, and none of them claimed to. What they collectively show is that smartphonebased safety tools have moved well beyond simple location sharing. The field now has working examples of automatic threat detection, direct police station calling, offline tracking, and social media broadcasting. The next step is not to keep building isolated systems but to start combining these capabilities into something more unified.

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There is also a broader point worth making. Technology can reduce the gap between when something goes wrong and when help arrives. It can give victims a way to communicate when speaking openly is not safe. But it cannot change the underlying conditions that make women unsafe in the first place. The apps reviewed here are tools, and useful ones — but they work best as part of a larger response that includes education, policy, and cultural change.

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