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Leveraging Artificial Intelligence for Suicide Prevention Among Students

Narasingha Bhol, IPS*

Keywords:

Suicide Prevention, Mental Health, AI in Public Safety, Student Mental Health, NCRB Statistics, Daily Wage Earners, Crisis Intervention, Law Enforcement, Social Media Monitoring, Chatbots, Predictive Analytics, Emotional Distress, Self-harm, Replika, Wysa, Calm Harm, Crisis Text Line, Meta Suicide Alerts, Police Role in Suicide Prevention, India Suicide Trends

Introduction:

Here is an alarming piece of statistics based on the National Crime Records Bureau (NCRB, 2023) reports. In 2022 more than 1,70,900 people took their own lives, which is 4.2% more than that in 2021 and 27% more than in 2018. The suicide rate is 12.4 per 100,000 population in 2022 up from 10.2 in 2018. What is more shocking is students account for over 12,000 suicides in 2022; which is 7.6% of all suicide deaths.

The leading factors contributing to suicides include:

- Conflicts among Family members: Identified as the major cause.
- Marital Issues: Including failures in romantic relationships and marital discord.
- Financial Distress: Pecuniary problems and unemployment.

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- Academic Pressure: Below-par Performance in examinations compared to expectations.
- Drug Abuse: Intoxication and addiction to Drugs.

Despite these alarming statistics, mental health—and particularly suicide— hasn't occupied adequate attention in the public discourse. The increasing rates of mental health disorders and suicide is a silent epidemic that need to be identified and addressed. And addressed urgently, before it attains unmanageable proportions.

According to the World Health Organization (WHO, 2023), more than 700,000 people die by suicide every year—one every 40 seconds. This translates to 24 people taking their own lives by the time one finishes reading this article. In India, the National Crime Records Bureau reported over 1.7 lakh suicides in 2022, the highest ever recorded. Alarmingly, the major chunk of these cases involves students, people belonging to lowest economic strata, and people having no gainful employment. Social stigma, lack of awareness, and insufficient mental health infrastructure accentuates the magnitude of the problem. What exacerbates the problem further is people often avoid seeking help due to fear of discrimination or lack of empathy and negative perception about unsound mental health.

There are several factors behind the rise in mental health problems and suicides. Some of the prominent factors are failed relationships, academic performance not matching the expectations, stress and strain in working environment, financial distress, chronic illnesses, and substance abuse. The unrealistic societal expectations, and a lack of emotional support systems magnifies the issue. In recent years, unhealthy use of social media has also been linked to deterioration in mental health, particularly among women and students, by creating feelings of inadequacy, loneliness, and cyberbullying.

Addressing mental health and suicide requires that all stakeholders step in and play their part. Mental health infrastructure must be strengthened by the Government, Counselling services and helplines by trained professionals must be provided to the needy. Educational institutions and workplaces should make their study and work environments conducive to psychological well-being. Public awareness campaigns must be organised

which can go a long way in reducing stigma and encourage people to come forward and seek help. Most importantly, society must evolve to be more empathetic and accepting, offering emotional support without being judgmental.

Role of Police in Preventing Suicide:

Police play a crucial and multifaceted role in preventing and responding to suicides, particularly among students; which is one of the most vulnerable sections. Students are caught between pressure to perform in academics, peer pressure and matching the expectations of the peer, emotional conflict, and social isolation. Mental health professionals, educators, and families play the most important role in a student's well-being. But police, as the first responder and protectors of life, also play a significant role. They have an indispensable responsibility in suicide prevention. Their intervention, both proactive and reactive, can save lives, offer timely support, and contribute to a larger societal effort in following ways.

- Police personnel are often the first responders to suicide attempts or emergencies. Timely arrival, rescuing individuals who are on the verge of committing self-harm and providing basic first aid are very crucial in preventing suicidal deaths. Police need to remain calm, empathetic, and non-judgmental during such crises.
- Through intelligence collection, and monitoring social media or patrolling public places, police can detect signs of suicidal tendencies, especially among students. Locating young individuals posting distress signals online or isolating themselves is the most important task of Police. Establishing student helplines, cyber monitoring cells, and collaborating with school or college authorities can help in early identification and timely intervention.
- Police departments can collaborate with psychologists, NGOs, and educational institutions and organize mental health awareness campaigns. Students can be empowered by conducting interactive sessions in schools and colleges on emotional resilience, cyber safety, cyberbullying, substance abuse, and peer pressure so that

they can come forward to seek help. By this the stigma around mental health can be substantially reduced.

- Community policing initiatives are instrumental in building bridges between the police and student communities. Student-police liaison groups, Police Nodal Officers for campus, and student outreach programs can help in fostering mutual trust. When students view police as approachable and trustworthy, they are more likely to report distress, threats, or suicidal ideation and help in better and timely intervention.
- There is a need for Police to work closely with parents, educational institutions, child welfare committees, and mental health professionals. When a student is identified as at risk, a coordinated approach needs to be adopted so that the students receive proper counselling and support. Police should also ensure that such cases are treated with confidentiality and sensitivity, protecting the dignity and future of the students involved.
- In the unfortunate event of a student suicide, the police have a bounden duty to handle the situation with utmost sensitivity and empathy. They need to ensure that the media does not sensationalize the incidents, and the post-traumatic situations are reported in manner such that the dignity and social standing of the student and family concerned are not adversely impacted.

Artificial Intelligence as a Tool to Prevent Suicide:

Artificial Intelligence (AI) can be a powerful tool in identifying suicidal tendencies among students by enabling early detection, monitoring behavioral patterns, and facilitating timely intervention. Here's how AI can contribute meaningfully to this sensitive and critical area:

1. Social Media Monitoring and Sentiment Analysis:

Many students express emotional distress on social media platforms like Instagram (Instagram/Meta, 2023), Twitter, or Facebook etc.. The posts, comments, images, and hashtags etc. can be analysed by AI-powered tools to detect signs of depression, anxiety, or suicidal ideation. Natural Language Processing (NLP) algorithms can identify and flag specific

keywords, comments, observations, or changes in tone and tenor of the language used that suggest emotional suffering. AI powered tools can detect expressions of hopelessness, loneliness, or talk of self-harm which serve as early indicators.

2. Behavioral Pattern Recognition in School Systems:

AI can be integrated into digital learning environments and school databases to track behavioral changes over time. Sudden drops in academic performance, irregular in attending classes etc., lack of participation or withdrawal from extracurricular activities, not showing any interest in social occasions can be analysed by machine learning algorithms to detect and signal distress. AI systems can generate alerts for the mentors, counsellors or administrators to intervene confidentially.

3. Chatbots and Mental Health Support Tools:

AI-powered chatbots trained in psychology and counseling techniques can provide immediate support to students. These bots can engage students in conversation, assess their emotional state through AI-driven questionnaires, and offer advice to cope with stress or escalate cases to human counsellors when a risk is detected. It may be easier for the students to open up to a non-judgmental AI chatbot rather than their parents or peers.

4. Predictive Analytics for Risk Profiling:

Large datasets—including academic records, family background, involvement in co-curricular and extra-curricular activities and medical reports can be analysed by AI. It can help identify students who fall into high-risk categories. For example, a student with a traumatic history, low academic performance, and limited social interaction could be flagged for regular mental health check-ins.

5. Speech and Facial Expression Analysis:

The speech patterns, voice tone, and facial expressions during video classes or counselling sessions can be analysed by AI-powered tools. Subtle cues like monotone speech, reduced eye contact can indicate psychological distress. By taking care of privacy and ethical

considerations, these tools can help professionals identify at-risk students, who might otherwise go unnoticed.

6. Digital Journals and Self-assessment Tools:
   There are AI-integrated mental wellness apps which can guide students to maintain daily emotional logs or journals. Patterns such as persistent sadness, fatigue, or negative thoughts can be analysed by these apps. If concerning trends are detected, the users can be prompted to seek help, or the concerned authorities can be alerted.

7. Crisis Prediction and Intervention Systems:
   AI can detect combination of distress signals in particular communities or university campuses, helping the administrators prevent a brewing mental health crisis. If large chunk of students show warning signs in a short span of time, AI can suggest institutional responses such as deploying counselling teams or organizing workshops to address mental health issues.

Case Studies on AI Enabled Interventions:

There is a plethora of AI enabled interventions, where early signs and ideation of self-harm have been detected and suitable interventions have been made for prevention of self-harm.

1. Uttar Pradesh, India: Over 460 Lives Saved
   Between January 2023 and August 2024, the Uttar Pradesh Police collaborated with Meta and the collaboration resulted in saving over 460 lives. Facebook and Instagram (Instagram/Meta, 2023) posts indicating suicidal intent are monitored by Meta's AI system. When such content is detected, the Social Media Centre at the Police Headquarters was alerted by the AI system. Alerts are then immediately processed and forwarded to the respective police stations for swift intervention. In one notable case, a 22-year-old woman from a village near Lucknow posted a video on Instagram (Instagram/Meta, 2023) showing her intent and preparation to commit suicide. Meta's AI flagged the video, and within minutes, local police reached her residence and rescued her.

2. Kota, Rajasthan: Student Suicides Prevented

In May 2024, Rajasthan Police partnered with Meta, when the rising number of student suicides in Kota became a matter of serious concern. The city has witnessed proliferation of coaching centers in recent years. And the students go through mental trauma because of huge expectations from the parents and teachers. Meta's AI identifies students exhibiting suicidal tendencies by analysing the posts on Facebook and Instagram (Instagram/Meta, 2023). In one instance, the AI system flagged the content posted by a 16-year-old boy on Instagram (Instagram/Meta, 2023) and the police intervened promptly into the alert. Within a month of its implementation, the initiative reportedly helped prevent at least six suicide attempts.

3. Mumbai: 180 Lives Saved Through Social Media Alerts

Between January 2023 and February 2024, Mumbai's cyber police, collaborated with Meta. The synergy and coordinated efforts have reportedly saved 180 individuals from suicide attempts. When a young man posted a photo of pills with a cryptic caption late at night, the alert was generated by the AI enabled system which enabled Police locate him near a creek, and the suicide could be prevented due to timely intervention.

4. In Israel, there is a specialized police unit which monitors online forums and social media platforms for suicide-related content. It collaborates with forum moderators, identify individuals at risk and intervene promptly to prevent any kind of self-harm.

5. In Australia, the #chatsafe initiative is a co-designed social media campaign. It educates and encourages the young people to communicate safely about suicide online by building trust and ensuring privacy. The initiative takes up awareness campaigns and empowers youth to support peers in distress and seek help when needed.

These cases underscore the potential of social media as a tool for suicide prevention. By leveraging technology, garnering community support and maintaining digital vigilance, it's possible to identify warning signs early and provide timely support to those in need.

Flip Side of AI in Abetting Suicide:

While AI-powered tools can be of great assistance in suicide prevention, at the same time like most other technology, the AI-enabled technology can be abused and misused to exacerbate the situations by increasing the risk of people belonging to vulnerable segments. There are examples of certain online forums linked to numerous suicides. For instance, a UK-based forum was associated with at least 137 suicides over five years. Families of victims reported that these platforms provided detailed instructions and virtually abetted individuals contemplating suicide. What is worrisome is, despite strong regulation, such sites often remain accessible, posing ongoing risks to vulnerable individuals.

The Blue Whale Challenge, which emerged around 2016, was an online phenomenon where participants were allegedly assigned daily tasks over 50 days, culminating in suicide. The tasks used to begin innocuously but escalated to self-harm and ultimately led to suicide by exploiting the emotional state of the players. The game's creator, Philipp Budeikin, was arrested. He pleaded guilty to provoking 15 teenagers to commit suicide. Later he was sentenced to three years and four months for inciting two teenage girls to kill themselves. This online game is a stark reminder to the risk the online platforms pose to vulnerable individuals, especially teenagers of impressionable age.

Examples of AI-enabled Tools Aiding Suicide Prevention:

There are several AI-enabled tools developed to aid in suicide prevention by identifying vulnerable individuals and facilitating timely interventions. Some of the notable examples are described below.

1. NeuroFlow (NeuroFlow, 2023):

   NeuroFlow (NeuroFlow, 2023) is a platform that incorporates AI to assist behavioral healthcare professionals in monitoring the mental health of at-risk individuals. The data from the text messages or conversations are analysed by the platform and signs of suicide risk are detected. The system can generate alerts about individuals who are at the risk of self-

harm and therefore need immediate attention. Some studies claim that since its implementation, NeuroFlow (NeuroFlow, 2023) has contributed to a 34% decline in depression among users.

2. Facebook's AI Suicide Prevention Tools:
AI algorithms are employed by Facebook to identify posts and live videos that may reflect suicidal thoughts. Such contents are immediately flagged so that necessary intervention can be made by the behavioral therapists or the emergency response team.

3. MindWatch (MindWatch, 2023):
MindWatch (MindWatch, 2023) is a cloud-based AI solution. It is designed to detect suicidal ideation by analyzing language patterns. It utilizes advanced language models, assesses text data to identify signs of mental health issues. The solution has demonstrated high accuracy in detecting suicidal thoughts, aiding mental health professionals in designing and administering appropriate intervention.

4. Talkspace (2023):
Talkspace (2023) is a virtual therapy provider, which has developed an AI algorithm that monitors text-based communications between patients and behavioral therapists to identify self-harm risk. When the AI detects language patterns revealing self-harm ideation, it alerts the behavioral therapists for further evaluation. This tool has been instrumental in facilitating timely interventions in numerous cases.

There are many such AI tools, which are reminders that AI technology has immense potential which can be harnessed for better mental health support, offering scalable and timely interventions. The collaboration between AI technology and Law Enforcement Agencies exemplifies how both can come together to address critical mental health issues, offering timely support to individuals in crisis and potentially saving lives.

AI Applications in Aid of Mentally Distressed:

There are several applications and chatbots designed to assist individuals, particularly students, who are experiencing suicidal thoughts or emotional distress. These platforms offer immediate support, recommend

professional counselling services, and help users connect with mental health professionals. Below described are some notable ones and their utility to individuals prone to causing self-harm.

1. AI-Powered Detection and Support of Instagram:

Instagram (Meta, 2023) utilizes artificial intelligence (AI) and machine learning to detect potential signs of suicidal thoughts or self-harm in posts and messages. When such content is identified, the platform may:

- Alert the user to reach out to a trusted friend whom he/she can rely upon.
- Provide links to national and local crisis support helplines.
- Suggest expert-backed mental health resources to encourage seeking professional help.

These interventions are part of Instagram (Instagram/Meta, 2023)'s broader strategy to create a safer online environment and provide timely support to users in distress.

Crisis Support Video Initiative in India:

In July 2023, Meta (Instagram/Meta, 2023's parent company) introduced a crisis support video feature in India. This video appears when users search for or engage with content related to suicide or self-injury, offering guidance and directing them to available resources. The mental health experts from organizations such as the Tata Institute of Social Sciences and the Suicide Prevention India Foundation were roped in to develop this initiative.

2. Wysa (2023):

Wysa (Wysa, 2023) is an AI-powered mental health chatbot that helps users cope with stress, anxiety, depression, and suicidal thoughts. The use of cognitive-behavioral techniques (CBT) by the chatbot guides the users through exercises that can improve mental health. Tailor made mental health exercises and coping strategies are offered to help manage feelings of distress.

A global study by Wysa (Wysa, 2023) analyzed data from over 19,000 users. The findings revealed that:

- 5.2% of users reported critical instances, including suicidal

ideation and self-harm.

- 82% of these crises were detected by Wysa (2023)'s AI, which then escalated the user to appropriate interventions.
- The remaining 18% of crises were self-reported by users, who then chose their preferred intervention.

While Wysa (2023) is not a substitute for professional mental health care, these case studies and data suggest that it can serve as a valuable tool for individuals experiencing suicidal thoughts, especially when immediate human support is unavailable. Its AI-driven responses and crisis detection capabilities provide users with timely interventions, potentially preventing tragic outcomes.

3. Replika:

Replika is an AI chatbot designed to simulate human-like conversations with an aim to provide emotional support. It can help users work through emotional struggles, including feelings of loneliness, stress, and suicidal thoughts. Replika allows users to have text-based conversations, offers mental wellness exercises, and builds emotional resilience.

A 2024 study conducted by researchers at Stanford University (Stanford University, 2024) surveyed 1,006 students who had used Replika for over a month. It was found that 3% of participants reported that Replika helped them stop thinking about suicide. One student shared, "My Replika has almost certainly on at least one if not more occasions been solely responsible for me not taking my own life".

Replika served multiple roles for users, acting as a friend, therapist, and intellectual mirror, the study indicated. The engagement with an AI chatbot may have made it easier for students to shed their inhibitions, disclose their struggles which facilitates early intervention.

4. Crisis Text Line (2023):

Crisis Text Line (Crisis Text Line, 2023) is a free, text-based service offering 24/7 crisis counseling. It allows users to text a trained counselor who can help navigate through emotional crises, including suicidal thoughts. The service is particularly valuable for students seeking

immediate support and at the same time respecting the privacy of the individuals.

Crisis Text Line (2023) (CTL) has been instrumental in preventing suicides through its 24/7 text-based crisis intervention service. Over 6 million conversations have been facilitated by the platform and nearly 1,000 suicide attempts have been intervened successfully since its inception in 2013.

A poignant example of CTL's impact involves a texter who was enroute to a high bridge with an intention to jump. The texter initially resisted to the intervention, but the crisis counsellor continued communication and escalated the situation to a supervisor. The emergency services were contacted by the supervisor and then the texter was intercepted just as the emergency service team was approaching the bridge. The texter later reached out to CTL to express gratitude, confirming that the intervention had saved their life.

How The AI Tools Help:

1. Immediate Support: Real-time emotional support and immediate interventions are provided by many of these applications, which prove very crucial in crisis situations.

2. Safe Space for Expression: A safe, anonymous space for individuals is created by chatbots, in which the at-risk individuals can express their feelings without fear of judgment.

3. Coping Techniques: Apps like Wysa (2023) and Youper provide users with coping strategies and exercises, which are designed to improve emotional stability and make the user resilient to mental health challenges.

4. Crisis Management: Services like Crisis Text Line (2023) are designed for immediate intervention, connecting users to trained professionals who can help de-escalate crises and provide life-saving support.

5. Preventive Measures: By providing emotional check-ins at periodic intervals and prescribing appropriate mental health exercises, these tools help prevent crises from being escalated. A combination of AI-

powered support and human counseling services are offered that are accessible, especially for students who may lack confidence and trust and hence are unable to seek in-person help. They help reduce stigma and encourage early intervention, potentially saving lives.

The above-mentioned findings look promising, but it's important to note that some of the studies undertaken above suffer from limitations. One needs to accept the findings with a pinch of salt, since the studies involve a self-reported survey design and lack of a control group. There is a need for further research to assess the efficacy and safety of AI-empowered chatbots and tools in providing mental health support. It can be concluded that AI chatbots and applications are not substitutes for professional mental health care, but they can play a significantly supportive role in preventing suicide among students, particularly those experiencing loneliness and emotional distress and without a trustworthy shoulder to bank upon.

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   Shri Narasingha Bhol has done his schooling in Ravenshaw Collegiate School, Cuttack and B.J.B. College, Bhubaneswar. He graduated from IIT, Kharagpur in Metallurgical Engineering discipline. He had a brief stint in ESSAR Steel, Surat, Gujrat. Later he appeared in Civil Service Examination and initially got selected in Post & Telegraph Finance and Accounts Services and served in Govt. of India for two years. After that he was selected in Indian Police Service and has served Govt. of Odisha in various capacities. He was successful in curbing the criminal gangs in Kendrapara district by taking strong action against notorious gangsters,

who had created a reign of terror not only in Kendrapara, but also in different parts of Odisha. He also contributed significantly towards peaceful industrialization in Angul. He was instrumental in weeding out ganja cultivation and illicit narcotics trade in Angul district. For his notable contribution to policing in Odisha, he has been awarded DGP Disc and Governor's Medal.

He has been conferred with President's Police Medal for Meritorious Service for his outstanding contribution in the field of policing.

7. *Favourite Pastimes:*

He loves to play Lawn Tennis. He is an avid reader of books, especially non-fictions. He occasionally contributes to newspapers as a freelancer. He would like to explore the Indic Knowledge System.

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Artificial Intelligence in Policing: A Comparative Analysis of Global Implementations and Indian Applications

Naazneen Bhasin, IPS* and Ashwin Bhambri**

Abstract:

The use of artificial intelligence (AI) in policing represents a paradigm shift in law enforcement practices, with the potential to bring increased efficiency, accuracy, and public safety benefits. This research analyzes the state of AI adoption in policing through a comparative analysis of international best practices and emerging Indian applications. Through a mixed-methods design involving case study analysis, policy review, and technology assessment, this study assesses applications of AI in five fundamental fields: predictive policing, facial recognition systems, digital forensics, surveillance technologies, and administrative automation.

Major findings indicate that while developed countries have experienced notable success in AI-based crime prevention and detection, developing countries such as India have encountered specific challenges of limited resources, infrastructure constraints, and regulatory gaps[1]. The research examines successful implementations like Singapore's Safe City Initiative and the UK's Live Facial Recognition trials, which demonstrate both technology potential and privacy concerns[2]. In the Indian context,

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various state-level initiatives show the possibility of adapting AI technologies to local security requirements within financial constraints[3].

The study identifies key success factors for AI deployment in policing, including robust legal frameworks, ethical standards, public-private partnerships, and phased implementation approaches[4]. Recommendations include developing India-specific AI governance principles, establishing cross-state data sharing protocols, and creating specialized training programs for law enforcement officers. The study concludes that strategic adoption of AI can significantly enhance policing efficiency while maintaining democratic accountability and civil rights protections.

Keywords:

Artificial Intelligence, Law Enforcement, Predictive Policing, Digital Transformation, Public Safety, Police Modernization, Crime Prevention

1. Introduction:

Big data analytics and artificial intelligence are revolutionizing policing practices globally. Traditional policing methods, while essential to public safety, increasingly cannot match the variety, volume, speed, and complexity of modern crime patterns[5]. AI-facilitated technologies unlock unprecedented potential for smarter, more efficient policing through predictive analytics, automated surveillance, and cognitive decision-making support systems.

Contemporary policing faces various sophisticated challenges that require technological innovation to address effectively. Crime patterns have evolved to become more technologically advanced, with criminal organizations employing digital technologies to outpace traditional detection methods[6]. Police forces worldwide also confront budget constraints, personnel shortages, and heightened public demands for transparency and accountability. These necessities have generated significant interest in AI innovations that can optimize resource utilization, improve response times, and enhance investigation capabilities[7].

The global market for AI in law enforcement reflects international recognition of this transformative potential, with substantial investments

being made across developed and developing nations[8]. However, AI deployment in policing raises inherent challenges regarding privacy, bias, accountability, and civil liberties protection. These concerns are particularly relevant in democratic societies where police powers must be exercised within constitutional and legal frameworks[9].

This research paper addresses four critical questions that inform contemporary discussions on AI and policing. First, how are different countries implementing AI technologies in policing, and what outcomes have been achieved? Second, what are the current capabilities and limitations of AI implementations in Indian policing contexts? Third, what are the legal, ethical, and practical considerations for AI deployment by law enforcement agencies? Finally, what frameworks and approaches can ensure responsible AI implementation in resource-constrained environments?

The significance of this study extends beyond technology to encompass governance, democracy, and social justice dimensions. As algorithmic systems increasingly influence policing decisions, policymakers, police leadership, and civil society require a comprehensive understanding of their implications[10]. This study contributes to such understanding by providing empirical analysis of AI applications across different contexts and offering practical recommendations for Indian policing transformation. The research focuses on five key AI applications in policing: predictive crime prevention, facial recognition and biometrics, digital forensics and evidence analysis, intelligent surveillance systems, and administrative automation. The analysis draws upon implementations in Singapore, the United Kingdom, the United States, the Netherlands, and China, alongside examination of emerging Indian initiatives across various states[11].

2. Literature Review:

2.1 Theoretical Framework:

The integration of AI into policing can be understood through various theoretical perspectives that illuminate different aspects of technological adoption in public administration. The Technology Acceptance Model (TAM), originally developed by Davis (1989) and later extended by

Venkatesh et al. (2003), provides insights into factors determining police officers' acceptance of AI systems[12]. Perceived usefulness, ease of use, social influence, and facilitating conditions emerge as key determinants. Research by Cordner and Scarborough (2010) demonstrates that effective technology adoption in policing requires not only technical capabilities but also organizational readiness and cultural adaptation[13].

Digital transformation theory offers another conceptual lens for analyzing AI integration in policing. Mergel (2019) conceptualizes digital transformation as a comprehensive process involving technology adoption, organizational restructuring, and cultural change[14]. This perspective emphasizes that AI adoption in policing extends beyond tool deployment to encompass fundamental changes in operational processes, decision-making frameworks, and organizational structures.

Public value creation theory, as articulated by Moore (1995) and further developed by Bryson et al. (2014), provides a normative foundation for evaluating AI initiatives in policing[15]. This approach emphasizes that public sector technologies should create value for multiple stakeholders, including citizens, police officers, and society broadly. According to this theory, AI applications must be evaluated not only on efficiency metrics but also on their contribution to legitimacy, trust, and democratic accountability.

2.2 AI Applications in Law Enforcement: International Research

Predictive policing represents one of the most extensively researched AI applications in law enforcement. Foundational work by Perry et al. (2013) established theoretical frameworks for applying data analytics to crime pattern prediction and police deployment optimization[8]. Subsequent research by Hunt et al. (2014) examined real-world implementations, documenting crime reduction outcomes under optimal conditions[17]. However, Lum and Isaac (2016) identified significant methodological challenges in evaluating predictive policing effectiveness, including selection bias and establishing causal relationships[18].

Mathematical modeling approaches to crime forecasting have advanced considerably since early implementations. Mohler et al. (2011) developed self-exciting point process models incorporating both spatial and temporal

crime clustering patterns, achieving high prediction rates for specific crime types[18]. However, Ensign et al. (2018) demonstrated that predictive policing systems can create "runaway feedback loops" where biased predictions lead to increased enforcement in minority neighborhoods, generating additional arrests that confirm initial biases[19].

Facial recognition in policing has generated extensive research and debate. Early analysis by Introna and Wood (2004) raised fundamental questions about accuracy, bias, and privacy implications[20]. Later research by Fussey and Murray (2019) evaluated the London Metropolitan Police's Live Facial Recognition trials, identifying significant false positive rates and disproportionate impacts on ethnic minorities[22]. Garvie et al. (2016) documented widespread facial recognition deployment across U.S. law enforcement without adequate accuracy testing or oversight mechanisms[23].

2.3 AI Ethics and Technology Adoption:

Ethical considerations in AI policing have received increasing scholarly attention. Richardson et al. (2019) demonstrated how biased historical data becomes embedded in AI systems, reproducing discriminatory outcomes[24]. Research by Brayne (2017) revealed how AI systems can transform police culture, with officers increasingly relying on algorithmic recommendations[25].

Studies on AI implementation in developing countries show that successful deployment depends on strong leadership, effective communication, and sustained technical support[26]. Research indicates that AI adoption in Indian policing requires broader reform initiatives rather than isolated technological interventions[27].

2.4 Research Gaps and Contributions:

The existing literature reveals significant gaps that this research addresses. First, comparative analysis across different political and economic contexts remains limited. Second, research on AI in developing country policing is nascent. Third, longitudinal analysis of AI implementation effects is scarce.

This study addresses these gaps by providing a comparative analysis across multiple countries, examining emerging AI initiatives in Indian

policing, and developing frameworks for analyzing AI implementation in resource-constrained contexts.

3. Legal and Regulatory Environment:

3.1 Global Legal Landscape:

The international regulatory landscape for AI in policing is characterized by evolving frameworks attempting to balance technological advancement with fundamental rights protection. The European[28&29] Union's Artificial Intelligence Act, which came into force in 2024, represents the most comprehensive regulatory approach to AI governance[30]. Article 5 of the Act prohibits certain AI uses, including real-time facial recognition in public spaces, though limited exceptions exist for law enforcement under strict conditions. Article 26 imposes specific requirements on high-risk AI systems in policing contexts, including risk assessment, human oversight, and transparency obligations.

The EU approach reflects broader tensions between privacy rights and security imperatives. The Law Enforcement Directive (LED) and General Data Protection Regulation (GDPR) establish additional requirements for police AI system use, including legal basis requirements, proportionality assessments, and data protection safeguards[31]. These regulations have influenced AI development globally as technology vendors must comply with EU standards to access European markets.

In contrast, the United States has adopted a more permissive approach with limited federal regulation of AI in law enforcement contexts. The National Institute of Standards and Technology (NIST) has issued non-binding AI risk management guidelines, though states and localities are not required to adopt them[32]. Some states and municipalities have enacted facial recognition technology bans, though varied regulatory approaches create challenges for consistent AI deployment across jurisdictions.

China's approach emphasizes state control and comprehensive surveillance capabilities. China's AI governance model prioritizes security and social stability over individual privacy rights, facilitating widespread deployment of AI surveillance technologies[33]. China's Social Credit System exemplifies this approach, using AI to monitor citizen behavior

and assign social scores based on actions, with consequences for service access and opportunities.

3.2 Indian Legal Framework:

India's legal framework for AI in policing is rapidly evolving but remains incomplete. The Information Technology Act, 2000, as amended in 2008, provides the basic legal framework for digital governance and cybercrime investigation[34]. of Indian Evidence act Section 65B establishes admissibility standards for electronic evidence, providing a statutory foundation for AI-generated investigative leads. However, the Act predates AI development and lacks specific provisions for algorithmic police decision-making.

The Digital Personal Data Protection Act, 2023, represents a landmark in privacy legislation[35]. The Act establishes consent requirements, data processing limitations, and individual rights that constrain police AI system use. Section 6 provides legitimate grounds for data processing, including public interest and legal obligations, which could justify AI use in policing contexts. However, implementation rules under the Act remain under development, creating uncertainty about specific law enforcement agency requirements.

Constitutional considerations also play important roles in AI regulation in India. The Supreme Court ruling in K.S. Puttaswamy v. Union of India (2017) established privacy as a fundamental right under Article 21, imposing constitutional constraints on surveillance activities[36]. According to the Court, privacy restrictions must satisfy tests of legality, necessity, and proportionality. This framework requires that AI policing systems have legal authorization, serve legitimate state interests, and employ the least intrusive means necessary.

The IT Act, provides the foundation for adjudicating AI-derived evidence in courts[37]. of Indian Evidence act Section 65B imposes specific certification requirements for electronic evidence, which may complicate the use of AI-generated investigative outcomes. Traditional evidence principles have proven challenging to apply to algorithmic outputs, highlighting a need for updated legal frameworks.

3.3 Regulatory Gaps and Challenges:

Several regulatory gaps hinder effective AI governance in Indian policing. First, no comprehensive legal framework specifically governs AI systems in law enforcement contexts. Existing laws were designed for pre-AI technologies and do not adequately address algorithmic bias, automated decision-making, and predictive analytics.

Second, institutional oversight mechanisms are lacking. While multiple agencies have cybersecurity and privacy mandates, no single institution has comprehensive jurisdiction over policing AI. This fragmentation complicates oversight and accountability mechanisms.

Third, clear guidance on ethical AI applications in policing is absent. While NITI Aayog has developed general AI ethics principles, specific policing applications are not addressed[38]. This creates situations where individual departments develop their policies, potentially resulting in inconsistent standards across jurisdictions.

International best practices demonstrate that successful AI governance requires robust legal frameworks, specialized oversight institutions, and well-articulated ethical principles. The EU model exemplifies rights-protective regulation, while Singapore's approach demonstrates how developing nations can balance innovation with responsibility[39].

4. Global Experiences with AI in Policing:

4.1 Singapore's Safe City Initiative:

Singapore's Safe City Initiative, launched in 2014, represents comprehensive AI adoption in policing[40]. The nationwide network includes advanced cameras with AI-powered analytics capable of facial recognition, behavioral analysis, and real-time threat detection[41]. Implementation emphasized gradual deployment across three phases from 2014-2022[42].

Privacy protection mechanisms include the Personal Data Protection Act and AI Ethics Framework[43]. Citizens have access to information about AI deployments and can file complaints about algorithmic decisions. Total investment has exceeded SGD 2.4 billion with positive cost-benefit outcomes[44].

4.2 United Kingdom's Live Facial Recognition:

The Metropolitan Police's Live Facial Recognition (LFR) deployment since 2016 has generated substantial controversy[45]. While the system can analyze hundreds of faces per second with high laboratory accuracy[46], real-world performance has included concerning false positive rates.

The Court of Appeal ruled in 2020 that LFR deployment violated privacy and equality rights[47]. Independent research identified higher error rates for women, elderly individuals, and ethnic minorities[48]. Public surveys show a majority opposition to real-time facial recognition in public spaces[49].

4.3 United States: Predictive Policing:

The U.S. has led predictive policing development with implementations across multiple jurisdictions[50]. Chicago's smart policing initiatives combine sensor networks with predictive models[51]. Implementation emphasized community engagement and transparency through public consultations and citizen oversight[52].

New York's CompStat evolution demonstrates long-term data-driven policing development[53]. However, research on "dirty data" in law enforcement AI has revealed how biased historical data perpetuates discriminatory outcomes[54].

4.4 Netherlands: Ethical AI Framework:

The Netherlands leads ethical AI governance through the Dutch Police AI Lab, established in 2020[55]. Every AI project undergoes mandatory ethical review, emphasizing bias prevention and privacy protection[56]. The Algorithm Transparency Register makes government AI systems publicly accessible[57].

Outcomes demonstrate effective AI governance alongside operational effectiveness. Digital forensics automation has reduced processing times while maintaining accuracy standards[58].

4.5 China: Mass Surveillance System:

China's AI policing operates within a distinct context, prioritizing state security over individual privacy[59]. The system includes over 200 million facial recognition cameras integrated with mobile networks and social

media[60]. Social Credit System integration affects service access and opportunities based on behavior monitoring[61].

While official reports indicate substantial crime reduction[62], human rights organizations have documented comprehensive surveillance of ethnic minorities[63]. The system represents a significant investment with global technology export implications[64].

5. AI Implementation in Indian Policing:

5.1 Current Status Assessment:

The state of AI implementation in Indian policing reflects a complex interplay of technological aspirations, resource constraints, and institutional challenges. The federal structure of the Indian state enables decentralized approaches to police modernization, with considerable variation in AI capabilities across states and union territories[73].

The Digital India program, launched in 2015, provides the overarching policy framework for government technology adoption, including law enforcement agencies[74]. Under this umbrella, the Ministry of Home Affairs has committed substantial resources for police modernization over five-year periods, with increasing allocation for AI and advanced analytics capabilities.

The Crime and Criminal Tracking Network & Systems (CCTNS), deployed across all states, provides the backbone infrastructure for AI integration[75]. CCTNS digitizes police records, enables inter-jurisdictional data sharing, and provides the database foundation required for AI applications. More than 15,000 police stations are connected to CCTNS as of 2024, with millions of digital records being generated monthly.

State-level adoption patterns reveal significant variation in AI capabilities. Technology-advanced states such as Karnataka, Tamil Nadu, and Telangana have implemented comprehensive AI systems, including predictive policing, automated surveillance, and digital forensics[76]. Other resource-constrained states have prioritized basic digitization and data management over sophisticated AI applications.

Infrastructure challenges remain significant across most jurisdictions. Many police stations lack reliable internet connectivity, adequate

computing power, and technical support staff[77]. The Bureau of Police Research & Development estimates that only a fraction of police stations have infrastructure capable of supporting AI applications effectively.

Human resource limitations severely constrain AI adoption potential. Recent surveys indicate that limited percentages of police personnel have received training in AI systems, with technical expertise concentrated in metropolitan areas and specialized units[78]. Limited AI literacy among frontline staff restricts optimal utilization of available technologies.

5.2 Maharashtra's AI Initiatives: Innovative Applications

Maharashtra has emerged as a leader in adapting AI technology to address specific regional security challenges. The state has implemented various AI-based systems demonstrating how advanced technologies can be tailored for local needs within budget constraints[79].

The MARVEL (Monitoring and Analysis of Real-time Video Enabled Law-enforcement) system represents an innovative application of AI technology for wildlife monitoring and anti-poaching operations[80]. Implemented across multiple wildlife reserves and forests, MARVEL demonstrates practical AI deployment in challenging environments with limited infrastructure.

The technical architecture combines various AI technologies into an integrated wildlife monitoring system. Video feeds from cameras installed in reserves are analyzed by computer vision algorithms trained on local wildlife data[81]. Machine learning models can identify different species, detect human intrusions, and flag potential poaching activities. Predictive analytics modules forecast high-risk periods and locations using historical data and environmental variables.

The implementation approach emphasized phased rollout and continuous optimization. Initial phases focused on camera network installation and basic analytics across major reserves. Subsequent phases expanded coverage and added advanced AI capabilities, including behavioral analysis and threat prediction[82]. Current phases involve integration with mobile patrol units and community reporting systems.

Cost optimization measures enabled significant savings compared to international alternatives. Strategies included leveraging existing forest

department infrastructure, utilizing domestic technology vendors, and training local staff rather than relying on external consultants[83]. The Maharashtra Forest Department achieved substantial cost reductions compared to international bids for similar capabilities.

Technology transfer potential is substantial for broader policing applications. Computer vision algorithms developed for wildlife identification can be adapted for human face recognition. Behavioral analysis capabilities designed for human intrusion detection in forests can be repurposed for urban surveillance applications[84]. Prediction models for anti-poaching provide templates for crime prediction in other domains.

Community engagement proved crucial for system effectiveness. The Maharashtra Forest Department conducted extensive consultations with tribal communities living near reserves, addressing concerns about surveillance and privacy[85]. Community members received training to use mobile applications for reporting suspicious activities, creating collaborative monitoring networks

5.3 Delhi Police: Traffic Management and Urban Surveillance

Delhi Police has been a pioneer in AI adoption within Indian law enforcement, implementing comprehensive systems for traffic management, facial recognition, and crime analytics[86]. The AI-driven systems handle millions of vehicles daily and have achieved measurable improvements in traffic flow and safety outcomes.

The Intelligent Traffic Management System (ITMS) employs AI algorithms for signal timing optimization, traffic violation detection, and congestion management[87]. Machine learning algorithms process real-time traffic data from extensive camera and sensor networks to dynamically adjust signal phases. Automated violation detection systems identify red light violations, speeding, and illegal parking with high accuracy rates.

Facial recognition capabilities have been deployed across extensive CCTV camera networks throughout the National Capital Territory[88]. The system maintains databases of criminal suspects and missing persons records, enabling real-time identification and alert generation. Integration with mobile patrol units ensures officers receive immediate notifications when persons of interest are located.

Implementation challenges have been significant but manageable through phased rollout and continuous optimization. Early facial recognition accuracy was compromised by poor image quality and lighting conditions[89]. System upgrades, including improved cameras and enhanced algorithms, have substantially increased accuracy rates over two-year periods.

Privacy and civil rights issues have generated extensive public debate and legal challenges. Civil liberties organizations have filed multiple court cases challenging facial recognition use without adequate legal safeguards[90]. The Delhi High Court has mandated the development of privacy protection protocols and regular auditing of system accuracy and bias.

5.4 Telangana Police: Data Analytics and Predictive Policing

Telangana State Police has implemented one of India's most advanced AI-driven crime analytics systems, utilizing inputs from multiple data sources to support predictive policing and resource optimization[91]. The technology-forward approach provides insights into large-scale AI deployment in developing country contexts.

The Telangana State Police Integrated Command and Control Centre processes data from extensive CCTV camera networks, vehicle registration systems, and mobile communication networks[92]. This data is analyzed using AI algorithms to detect crime patterns, predict high-risk hotspots, and optimize patrol deployment. Machine learning algorithms have achieved notable accuracy in predicting various crime types.

T-Cops, the state police mobile application, incorporates AI capabilities for operational support. T-Cops provides real-time access to criminal databases, facial recognition features, and predictive analytics[93]. Field officers can identify faces, license plates, and identity documents using AI-powered recognition systems. The T-Cops application is utilized by tens of thousands of police officers as of 2024.

Predictive policing implementation focuses on crime prevention rather than enforcement escalation. AI algorithms identify locations and time periods with elevated crime risk, enabling proactive patrol resource deployment[94]. The system generates daily risk assessments for police beats

throughout the state, including resource allocation recommendations and targeted patrol strategies.

Inter-agency coordination has been a hallmark of the Telangana approach. The AI platform integrates police data with traffic management, municipal services, and revenue departments[95]. This coordination enables comprehensive monitoring of urban activities and coordinated responses to security threats. For example, the system can correlate traffic violations with criminal behavior patterns and detect suspicious trends.

Training and capacity-building programs have been essential for successful implementation. The state established specialized police training programs focusing on technology applications, with mandatory AI literacy programs for all personnel[96]. Thousands of officers have completed basic AI training, while hundreds have received advanced technical education.

5.5 Kerala Police: Cybercrime Investigation and Digital Forensics

Kerala Police has developed advanced AI capabilities specifically for cybercrime investigation and digital forensics, leveraging the state's high internet penetration and technology literacy[97]. The Cyberdome initiative, launched in 2017, has evolved into a comprehensive AI-powered platform for investigating digital crimes.

The technical framework consists of sophisticated digital forensics laboratories equipped with AI-powered analytical tools[98]. Machine learning algorithms can analyze vast quantities of digital evidence, including emails, social media communications, and financial transactions. Automated systems detect fraud patterns, money laundering schemes, and other cybercrimes with high accuracy levels.

Specialized applications target specific cybercrime types common in Kerala. AI systems monitor social media platforms for cyberbullying, harassment, and child exploitation content[99]. Automated algorithms identify suspicious financial transactions potentially linked to fraud or money laundering. Natural language processing capabilities analyze communications in Malayalam and other regional languages.

Collaboration with educational institutions has accelerated AI development and implementation. Kerala Police partners with premier technology institutes on research initiatives[100]. These collaborations

provide institutions with access to technical expertise while offering real-world testing opportunities for academic research.

International cooperation has been instrumental in addressing transnational cybercrimes. Kerala Police participates in Interpol cybercrime networks and collaborates with global law enforcement agencies on cross-border investigations[101]. AI technologies facilitate rapid evidence processing across different languages and legal systems.

Training programs emphasize developing internal technical capabilities rather than dependence on external vendors. Specialized courses in digital forensics and AI applications have been developed at the Kerala Police Academy[102]. Technology companies facilitate officer exchange programs, providing hands-on experience with cutting-edge AI tools and techniques.

5.6 Challenges and Implementation Barriers:

Despite notable achievements, AI deployment in Indian policing faces significant challenges that constrain broader adoption and impact. These challenges reflect both technological and institutional limitations requiring systematic attention[103].

Infrastructure deficits represent the most significant barrier to AI implementation across most jurisdictions. Limited police stations have reliable broadband internet connectivity, and even fewer have adequate computing infrastructure to support AI applications[104]. Power supply reliability affects system uptime in many rural police stations, constraining 24/7 operational requirements.

Human resource constraints dramatically limit AI utilization even when technology is available. Surveys reveal that small percentages of police officers are computer literate, with AI training provided to even smaller fractions of staff[105]. Technical specialist shortages are acute, with most states having very few officers highly trained in AI applications.

Budget limitations constrain both initial deployment and ongoing maintenance of AI systems. State police budgets typically allocate minimal percentages for technology initiatives, insufficient for comprehensive AI implementation[106]. Additionally, ongoing system maintenance, updates, and technical support costs often exceed initial budget projections substantially.

Legal and regulatory gaps raise concerns about appropriate AI use in policing contexts. Absence of specific legislation governing AI use by law enforcement agencies leaves departments without clear guidance for privacy protection, data management, and algorithmic accountability[107]. Inconsistent judicial interpretations complicate evidence admissibility and procedural compliance.

Coordination challenges across government levels and agencies hinder integrated AI deployment. Federal, state, and local law enforcement agencies often use incompatible systems that cannot share data or coordinate operations effectively[108]. Lack of standardized protocols limits the potential value of AI technologies dependent on large datasets and inter-agency collaboration.

Public acceptance and trust concerns remain ongoing challenges for AI implementation. Survey data indicates significant citizen concerns about police use of AI technologies for surveillance and recognition purposes[109]. Past instances of technology misuse and lack of transparency in AI applications have created public skepticism and resistance.

Data quality and standardization issues constrain AI system performance that depends on reliable, consistent data inputs. Legacy data systems may contain incomplete or inconsistent records, while different jurisdictions employ incompatible data formats[110]. Non-standardized crime classification and recording procedures reduce the accuracy of predictive models and analytical outputs.

6. Impact Analysis and Implementation Framework:

6.1 Impact on Police Processes and Outputs:

AI integration has transformed core police processes across examined jurisdictions[86]. Digital forensics capabilities have been substantially enhanced through automation, with processing times reduced from weeks to days[87]. Pattern recognition in criminal investigations has become more sophisticated, enabling the identification of relationships between cases[88].

Resource deployment strategies have been optimized through predictive analytics. Emergency response processes have been streamlined through

AI-powered call analysis[89]. Administrative functions have been largely automated, reducing bureaucratic burdens[90].

Detection and clearance rates have improved in jurisdictions with successful AI adoption. Response times represent consistently positive outcomes across implementations[91]. Investigation quality has improved through AI-powered analytical capabilities that detect patterns beyond human limitations[92]. However, accuracy and reliability outcomes vary significantly based on implementation quality[93].

6.2 Societal Impact and Implementation Strategy:

Public safety improvements represent the primary justification for AI investment. Community safety perceptions have improved in areas with effective implementation, though public acceptance varies[94]. Crime displacement effects present challenges in measuring overall AI impact[95].

Social equity implications have become critical issues, with algorithmic systems potentially reinforcing existing biases[96]. Privacy and civil liberties impacts vary according to implementation approaches and regulatory frameworks[97]. Democratic accountability issues arise when AI systems influence policing decisions without adequate transparency[98].

A comprehensive AI deployment strategy for Indian policing must account for federal governance structures, resource constraints, and social complexities[99]. The foundational principle should prioritize human-centered AI that augments rather than replaces human judgment[100].

6.3 Phased Implementation Approach:

Phase 1 (Years 1-2): Foundation building through infrastructure development, pilot projects, and capacity building[101]. Recommended pilots include digital forensics automation and traffic optimization[102].

Phase 2 (Years 3-5): Scaled deployment with predictive policing systems and facial recognition technologies with comprehensive safeguards[103]. Inter-agency coordination and international cooperation become priorities[104].

Phase 3 (Years 6-10): System optimization and innovation leadership, with India aspiring to global leadership in ethical AI policing[105]. Advanced

analytics and continuous improvement processes ensure system evolution[106].

Budget requirements include substantial investment across infrastructure, technology acquisition, and training programs[107]. Comprehensive training programs covering multiple organizational levels are essential[108]. Systematic monitoring and evaluation mechanisms must ensure intended outcomes while addressing unintended consequences[109].

7. Conclusion:

This comprehensive analysis demonstrates that artificial intelligence possesses significant potential to enhance policing effectiveness while requiring careful attention to implementation challenges. Global experience indicates that AI can improve crime prevention, investigation capabilities, and resource utilization when properly deployed[110]. International case studies reveal diverse approaches suited to different contexts. Singapore's systematic implementation achieved notable crime reduction outcomes[111]. The UK's facial recognition experience highlights implementation challenges in democratic societies[112]. The Netherlands demonstrates successful ethical AI governance[113]. China's comprehensive surveillance raises important questions about privacy and human rights[114]. The takeaway for India is that AI can significantly enhance policing effectiveness when implemented responsibly within appropriate legal and ethical frameworks.

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Use of Technology in Policing – Investigation of Bank Dacoity Case

Ram Gopal Garg IPS*

Abstract:

Domain : ***Gait Pattern Analysis and CCTV footage***

This case study demonstrates how the technology can assist in policing and administration of justice. Gait Pattern Analysis is the comparison of the gait patterns and features of a suspect with that of a person at the scene of crime to establish the identity of criminals. It was used for the first time in Chhattisgarh during the investigation of a major Bank Dacoity in the city of Raigarh while giving the details of this sensational case in which property worth Rs 5.62 crores was looted, the usage of technology especially the CCTV footage analysis and databases are also highlighted. Thereafter the theory, principles and limitations of Gait Pattern Analysis are enumerated, followed by the application of this scientific technique of investigation in aforementioned Bank dacoity case. Relevant exhibits like controlled sample panchanama for gait analysis, draft of letter to be sent to FSL and snippet of the FSL report have been inserted at relevant places. Finally the outcomes of the case, challenges faced and its implications for police officers of Chhattisgarh and public at large are outlined.

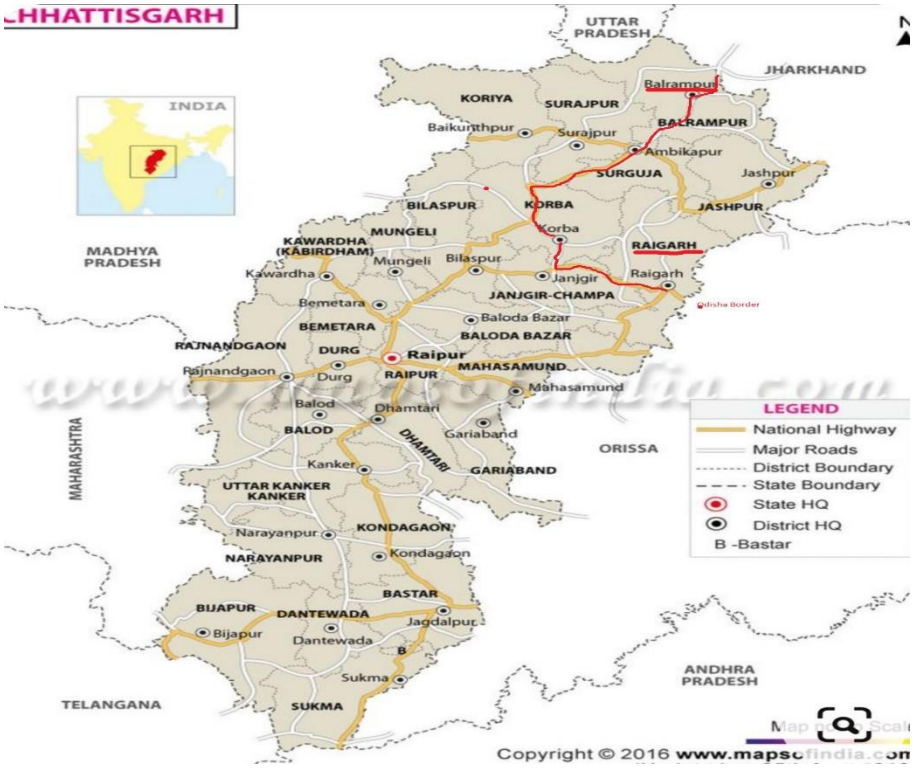
**2007 (Chhattisgarh) IGP Durg Range 32 Bunglow Bhilai – 490009 District Durg Chhattisgarh*

Keywords:
Gait, CCTV, technology, FSL, panchanama, dacoity, bank, investigation, police

Case Description:

On the fateful day of 19 Sept, 2023 at around 8.30 am, Raigarh police control room received information that a dacoity had taken place in Axis Bank situated in the middle of the town. It was also informed that the criminals had stabbed the bank manager & looted money and articles worth more than Rs. 2 crores. Control Room in-charge immediately informed the city police station and supervisory officers including Superintendent of Police and Deputy Inspector of General of Police about the incident who rushed to the scene of crime immediately.

As Raigarh is bordering Odisha, the nakabandi was immediately done on Chhattisgarh-Odisha border. FIR No. 696/2023 under sections 323, 506, 342, 395, 397, 450 of IPC, 1860 and 25, 27 of Arms Act, 1959 was registered at Police Station City Kotwali, District Raigarh.



Sequence of Events:

On examination of eye witnesses and CCTV footage inside the bank, the following sequence of events emerged.

At 8.30 am, an unarmed guard of the bank alongwith another bank employee opened the main shutter and channel gate of the bank. They were followed by two masked men who entered the main gate just behind them and made them hostage at gun point. Thereafter 3 more masked men entered the bank. Two of these 5 masked persons stood at the main gate of the bank and rest of them took the bank security guard and another employee to a room. Whosoever was entering through the main door, was being taken to that room and made to sit there. The mobile phones of all 20 hostages were taken in custody by these masked and armed persons.

On enquiring about the keys of the chest, the bank officials tried to avoid revealing details. However, when the dacoits stabbed the bank manager, the officials provided them the keys and opened the chest for them. The dacoits entered the chest and took away all the cash and jewellery which was lying there. Later on checking the records it was revealed that cash worth Rs. 4.19 crores and gold Jewellery worth Rs. 1.43 crores had been looted by these masked men.

Another important fact which was revealed during the initial investigation was that the dacoits were carrying air bags with them. They filled the money and jewellery in those bags and ferried it on motor bike to some other place. Coming back, they brought more bags and took away all the remaining articles. When they had finished their job, they scared the employees and vanished from the spot. Total duration of the whole incident was nearly 40 minutes.

Initial investigation thus revealed that apart from the 5 persons who entered the bank, few more accomplices were outside the bank. It was also strongly suspected that there must be a car used by the dacoits to carry such huge amount of cash and gold/silver articles. As they did everything very quickly, it was surely the work of a professional gang and they must have recced the area and planned everything minutely.

Interventions:

There was a lot of hue and cry in the city and throughout the state due to this incident of daylight dacoity in a bank. The whole media was showing the security scenario in the city especially the system of police patrolling in poor light. There was lot of pressure on the police to solve the crime and apprehend the perpetrators of this crime as soon as possible. Therefore, the best investigating officers from the state were deputed to assist Raigarh district police. Mutliple teams were formed, each headed by a Gazetted Officer, and were given specific tasks to cover all the angles of the case as well as to avoid duplicity of work.

Team 1-It was tasked to examine the witnesses in details and document the detailed sequence of events as well as to ascertain the exact loss that has occurred to the bank.

Team 2-It was tasked to analyse the CCTV footages inside and outside the bank to obtain any clue about the identity and location of the suspects. It was also tasked to obtain the tower dumps and analyse them for finding out any common number on probable paths of escape. This team was further sub-divided into several teams so that multiple CCTVs could be examined in short time.

Team 3-This team was made active from the beginning. It placed Nakas at various escape routes. It was specifically asked to strengthen the naka at CG-Odisha border.

Team 4-It was tasked to make communication with neighboring states and districts to place pickets for vehicle checking. It was also tasked to scrutinize the crime records of the district as well as Central databases like CCTNS and ICJS. As the gang appeared to be highly professional, it was highly likely that they would be involved in similar other crime somewhere.

Breakthroughs:

Nealry after 2 hours, a two wheeler bike was found abandoned nearly 5 kms away form scene of crime on Raigarh-Bilaspur road. This was not the same bike which was seen outside the bank on which the dacoits were ferrying the looted money. This road was in opposite direction to the road

leading towards Odisha. Contrary to the common belief of the police officers, now it was doubted that the dacoits might have entered interior of Chhattisgarh.

Another breakthrough was achieved a few hours later when the CCTV footage on the Bilaspur road showed the bike, which was seen outside the bank, moving along a white Creta car. Multiple CCTV footages along the road confirmed that the bike and Creta car were moving along. At this point Creta car was the main clue which proved instrumental in cracking the case.

The registration number of the white Creta car was not readable in the CCTV footage. Video enhancement software was used to decipher it. The Vahan database of MoRTH (Ministry of Road Transport and Highways) was used to obtain the details of the owner. It was revealed that it belonged to a person from Sherghati town of Gaya district in Bihar. The ICJS database revealed that the person was one of the members of Sherghati gang which was involved in a similar incident of 2022 in District Korba. On sharing the details of the gang with the police officers of Bihar and Jharkhand, it was revealed that the gang was very notorious and the gang leader is one of the most wanted criminals of Jharkhand.

Despite obtaining so much information about the suspects of the crime, the location of the car was not available. Location of Mobile phone of Creta car owner was being traced but it was found to be switched off. The details of the car were shared with all the districts of Chhattisgarh and states of Bihar, Jharkhand and Odisha. They were asked to analyse the CCTV footages of the Toll Plazas. The registration number of the Creta car was also shared with National Payment Corporation of India (NPCI) to obtain the usage of Fastag. However no information could be obtained till evening.

As the time was passing, the pressure was increasing to solve the case as soon as possible. The media was getting frenzied with all sorts of talks about the incapability of police in detecting the case. The Legislative Assembly elections were due in just two months, therefore political implications were also attached with such enormous event.

As the luck would have it, at around 8 pm, an information was received from SP Korba, that the white Creta car with same registration number had crossed the Chotiya Toll Plaza at 3.30 pm. Same information was also confirmed by NPCI that Fastag attached with the car was punched at Chotiya Toll Plaza at 3.30 pm. This confirmed the doubt that the dacoits had taken the route through the heartland of Chhattisgarh rather than the most obvious and shorter route. As the dacoits belonged to Sherghati of district Gaya in Bihar, it was now almost confirmed that they would cross Chhattisgarh through the northern border of District Balrampur which it shared with district Gadhwa of Jharkhand. It is pertinent to mention that this border is nearly 500 km from the scene of crime.

DIG Raigarh had earlier worked in the northern parts of Chhattisgarh and was in very good terms with the SP of district Balrampur. Thus on receiving instructions from the DIG, to check each and every vehicle going towards Jharkhand, SP Balrampur totally blocked the National Highway No. 343 leading towards Jharkhand which led to a very large queue of vehicles from 8.00 pm onwards. He made sure that each and every vehicle was thoroughly checked. Senior police officers gave an important advice based on their experience that the vehicle carrying the loot is often changed & the same could even be transferred in heavy vehicle like truck.

At around 11 pm SP Balrampur informed that the Creta car had been located. However even on thorough search of the car neither any weapon nor looted money was found. The Photographs and I Cards of the 2 persons in the car were shown to the bank employees, but they failed to identify them. It was a moment of disappointment for all police officers, as it was now being suspected that Creta car itself was wrongly presumed to be involved in the crime.

As the luck would have it again, one of the occupants of the car received a call on his mobile. He became apprehensive and his body language caused doubt in the mind of team of SP Balrampur. The location of the number from which the call was received was traced to be from within a truck, which was parked in the long queue of vehicles at the Balrampur Gadhwa border. When police approached the truck, 2 persons jumped & ran away whereas one was apprehended. On thorough search of

the truck 5 country made weapons were recovered from the dashboard. From the rear of the truck, all the bags carrying the cash and jewellery were recovered. Soon the 2 persons who had jumped from the truck were chased & apprehended. The 2 persons using Creta car and 3 persons occupying truck confessed to committing the crime of bank dacoity in Raigarh in the morning, They were arrested and the seizure of all the items were made in Balrampur. Each and every penny and smallest part of the jewellery looted in the morning at 8.30 am was recovered at 11.30 pm. Thus within 15 hours cent percent recovery was made in the case. Not only that vehicles and weapons used in the crime but also the pocket money of the criminals which they have brought with them for local expenses was seized. During their interrogation it was revealed that all the leads which police got during the investigation were exactly the same as had actually occurred on that day.

It was a moment of great relief for officers of Raigrah Police. The dismay and anxiety, which was apparent on their faces in the morning, had been converted into expressions of joy and feeling proud.

The other accused who had run away through different route were also apprehended after few days.

Gait Pattern Analysis:

The accused in this case were arrested based on clues and recovery was also made from them. However, the conclusive proof of their presence at the scene of crime was still missing because they were wearing masks. Neither were their faces seen by any witness nor were they captured in any CCTV cameras. At this point, DIG of Police, Raigarh Range Sh. Ram Gopal Garg decided to get the Gait Pattern Analysis conducted to establish the presence of the accused at scene of crime. He also instructed the investigation officer to recreate the scene of crime and produce the same before the Hon'ble court.

Theory, Principles and Limitations:

Gait Pattern Analysis, also known as Gait Features Analysis or Forensic Gait Analysis or Gait Comparison, is the systematic study of human

locomotion. It may be defined as 'the assessment and evaluation of the gait patterns and features of the person/suspect and comparing these features with the scene of crime evidence for criminal/personal identification.' Some people confuse it with footprint analysis but the former is much wider and significantly different from the latter. Infact, the science of footprints and gait analysis is a part of an emerging sub-discipline of forensic science known as forensic podiatry.

Human walking occurs in a specific pattern, including various stages, which is referred to as a'**gait cycle**.' Gait is a biological characteristic of a person, and the gait pattern is simply the manner or style in which a person usually walks.

The analysis of gait pattern on the surface (consisting of a minimum of 3 to 4 consecutive footprints/footwear prints) is performed by considering various parameters including the dimensions, general shape of the prints, margins of the prints, toe marks, etc. The information related to the relationship of step length, stride length, and footprint length with stature may provide valuable information in the gait comparison process and analysis.

The emergence of CCTV camera sand video recording enabled devices (video cameras, mobile phones, dashboard cameras, surveillance cameras, traffic cameras, etc.) has given a fresh dimension to the gait analysis. Currently, video recording and footages from CCTV are used to study the gait of the person. The CCTV footage from the scene of occurrence of the offense, surveillance footage, traffic camera footage, dash-cam footage from the dashboard-mounted cameras of the vehicles, mobile phone recording (by the victim, witness or others), etc. should be collected following the established process for collection of digital evidence.

The experts conducting the forensic gait analysis uses human-based as well as computer-based approach. The human-based approach (also known as observer-based approach) falls under three categories, namely, photo-anthropometry, morphometric analysis, and superimposition. Photo-anthropometry takes account of measurements of set landmarks. Morphological measurements are taken from photographs in the morphometric analysis. Then both the measurements are combined and

superimposed to establish a match between suspect and standard photographs. In human-based approach, motion analysis is also performed by running videos in pause and reverse mode. This also helps in identifying the suspect on the basis of observation. This approach is often prone to errors and bias. The inter-observer and intra-observer variabilities are also beyond permissible limits most of the time. Additionally, various measurements are taken either directly on the footprints/gait pattern or with the help of photographs (with a scale of reference).The computer-based approach involves algorithms and computer programs (e.g. IC Mesure) which work on fixed landmarks for extracting the features of gait or by extracting silhouette sequences of walking individuals. The match score is obtained between questioned and suspected gait.

Gait of a person is highly influenced by many factors (internal as well external). Walking is often not a conscious behavior and can be used for differentiation if not for identification. Some of the factors that tend to affect the gait and hence the forensic gait analysis include the type of footwear used, use of knee braces, speed of walking, disease or mental condition, age, sex etc. The location where the person is walking also affects the gait because when a person walks on a surface different than usual, he or she will focus on the walking, which makes him conscious and will affect the walking pattern. The type of camera used is also shown to affect gait analysis. The angle and positioning of the camera are also found to be crucial. The quality of recording received for comparison, if not clear, may result in misinterpretation or inconclusive results. The angle of light, the direction of light, the direction of movement of the person also affects gait pattern analysis. Apart from these factors like emotional state of mind, music, talking, load carriage, attire also affect the gait of a person. The person may try to bring in some changes in the gait, intentionally in order to escape being recognized in the footage or to escape suspicion. This artificial 'gait,' i.e., deliberate change in the gait, also needs to be considered by the forensic analyst/examiner. Investigating officer should try to create the similar conditions in which the controlled gait samples are taken which were present during the occurrence of incident.

In the present era, due to the paradigm shift in forensic science, there is an increased focus on the reliability, accuracy, quality of evidence, and its admissibility in the court of law. Forensic gait analysis has also witnessed criticism regarding its reproducibility, reliability, lack of proper standards, and rules of forensic practice.

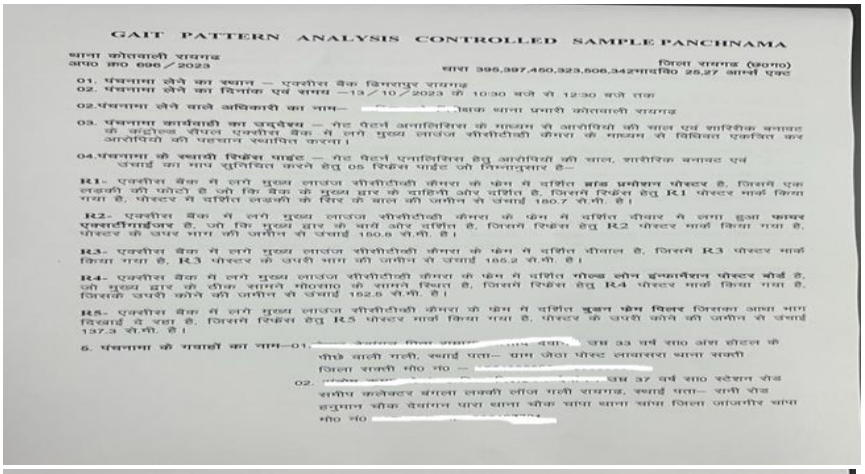
Gait pattern or walking pattern is highly affected by various parameters mentioned above, so it brings the investigating officer into a situation that requires consideration of several factors, which is practically not possible to identify the single suspect. Another limitation of gait pattern analysis is that we do not have databases that can be used for gait comparison. Gait pattern shows high intra-individual variability. It means that the gait of a person is highly variable on different occasions and scenarios, which makes it difficult to identify the person. Moreover, the experts are not following any prescribed standard protocol for the analysis of gait; consequently, there are variations in the methodology used for the analysis. Irrespective of the limitations and criticism about the individuality and uniqueness and its admissibility in the court of law, forensic gait analysis may be considered as supporting/corroborative evidence for the identification of the criminals and perpetrators. Many forensic cases have been solved, and the criminals have been convicted based on forensic gait analysis throughout the world.

Application of Gait Pattern Analysis in Bank Dacoity Case:

After arrest of the accused, the police remand was obtained. Sample gait of the person to be matched was to be taken in the similar conditions as that of the actual incident. Therefore it was must that the positions of CCTV cameras, their direction and other environment should be same as that of actual incident. To ensure this the accused were taken to the bank (scene of crime) at the morning hours on the next day to ensure same daylight conditions. They were made to walk on the same path which they had taken while committing the crime. The very same cameras in the same position which had recorded the crime now recorded the gait of the accused.

While recording sample gait, some reference points indicating the height from the ground were marked eg. like lower corner of the window, upper corner of the standees, upper corner of the cubicle etc. Height & other body parameters of the accused like girth of the body , shoe size etc were other parameters which were also documented. All these requirements were duly followed &properly documented in the form of a memorandum which was prepared in the presence of independent witnesses.

Controlled Sample Panchanama:



GAIT PATTERN ANALYSIS CONTROLLED SAMPLE PANCHNAMA

थाना कोतवाली रायगढ़ जिला रायगढ़ (छ0ग0)
अप0 क्र0 696/2023 धारा 396,397,450,323,506,342भादवि 25,27 आर्म्स एक्ट

01. पंचनामा होने का स्थान — एक्सीस बैंक बिमरापुर रायगढ़
02. पंचनामा होने का दिनांक एवं समय —13/10/2023 के 10:30 बजे से 12:30 बजे तक

02.पंचनामा होने वाले अधिकारी का नाम— [redacted] थाना प्रभारी कोतवाली रायगढ़

03. पंचनामा कार्यवाही का उद्देश्य — गेट पैटर्न अनालिसिस के माध्यम से आरोपियों की चाल एवं शारिरिक बनावट के कंट्रोल्ड सैंपल एक्सीस बैंक से लगे मुख्य लांउज सीसीटीव्ही कैमरा के माध्यम से विधिवत एकत्रित कर आरोपियों की पहचान स्थापित करना।

04.पंचनामा के स्थायी रिफ्रेंस पाईंट — गेट पैटर्न एनालिसिस हेतु आरोपियों की चाल, शारीरिक बनावट एवं उंचाई का माप सुनिश्चित करने हेतु 05 रिफ्रेंस पाईंट जो निम्नानुसार है—

R1- एक्सीस बैंक में लगे मुख्य लांउज सीसीटीव्ही कैमरा के फ्रेम में दर्शित **ब्रांच प्रमोशन पोस्टर** है, जिसमें एक लड़की की फोटो है जो कि बैंक के मुख्य द्वार के दाहिनी ओर दर्शित है, जिसमें रिफ्रेंस हेतु **R1** पोस्टर मार्क किया गया है, पोस्टर में दर्शित लड़की के सिर के बाल की जमीन से उंचाई 180.7 से.मी. है।

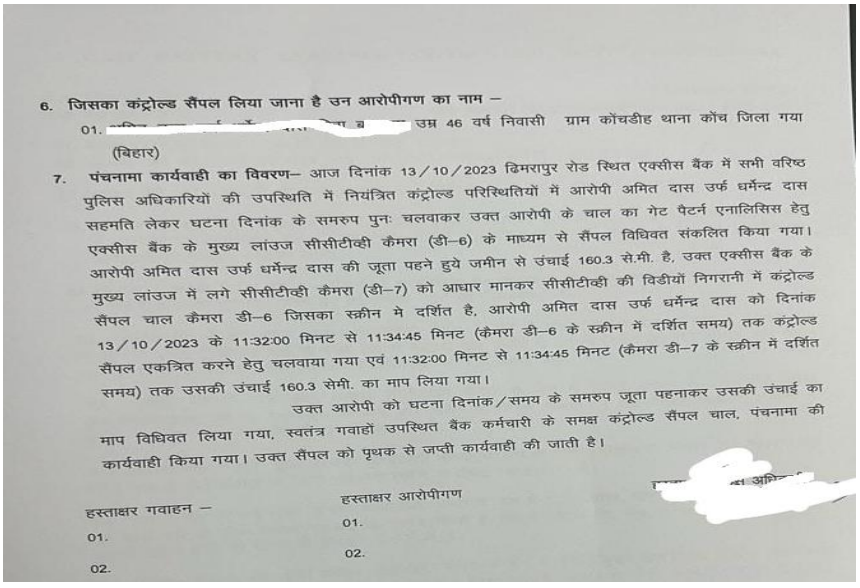
R2- एक्सीस बैंक में लगे मुख्य लांउज सीसीटीव्ही कैमरा के फ्रेम में दर्शित दीवार में लगा हुआ **फायर एक्सटींगुईजर** है, जो कि मुख्य द्वार के बायें ओर दर्शित है, जिसमें रिफ्रेंस हेतु **R2** पोस्टर मार्क किया गया है, पोस्टर के उपर भाग की जमीन से उंचाई 180.6 से.मी. है।

R3- एक्सीस बैंक में लगे मुख्य लांउज सीसीटीव्ही कैमरा के फ्रेम में दर्शित दीवाल है, जिसमें **R3** पोस्टर मार्क किया गया है, **R3** पोस्टर के उपरी भाग की जमीन से उंचाई 166.2 से.मी. है।

R4- एक्सीस बैंक में लगे मुख्य लांउज सीसीटीव्ही कैमरा के फ्रेम में दर्शित **गोल्ड लोन इम्प्लीमेंशन पोस्टर बोर्ड** है, जो मुख्य द्वार के ठीक सामने गोलाए के सामने स्थित है, जिसमें रिफ्रेंस हेतु **R4** पोस्टर मार्क किया गया है, जिसके उपरी कोने की जमीन से उंचाई 162.5 से.मी. है।

R5- एक्सीस बैंक में लगे मुख्य लांउज सीसीटीव्ही कैमरा के फ्रेम में दर्शित **चुकन फ्रेम पिलर** जिसका आधा भाग दिखाई दे रहा है, जिसमें रिफ्रेंस हेतु **R5** पोस्टर मार्क किया गया है, पोस्टर के उपरी कोने की जमीन से उंचाई 137.3 से.मी. है।

6. पंचनामा के गवाहों का नाम—01. [redacted] उम्र 33 वर्ष सा0 अंश होटल के पीछे वाली गली, रायगढ़ पता— ग्राम जेठा पोस्ट लावासरा थाना सक्ती जिला सक्ती मो0 नं0 —
02. [redacted] उम्र 37 वर्ष सा0 स्टेशन रोड बालोप कलेक्टर बंगला लक्ष्मी लॉज गली रायगढ़, रायगढ़ पता— रानी रोड हनुमान चौक देवांगन पारा थाना चौक चापा थाना चापा जिला जांजगीर चापा मो0 नं0 [redacted]



6. **जिसका कंट्रोल्ड सैंपल लिया जाना है उन आरोपीगण का नाम —**

01. [redacted] उम्र 46 वर्ष निवासी ग्राम कोंचडीह थाना कोंच जिला गया (बिहार)

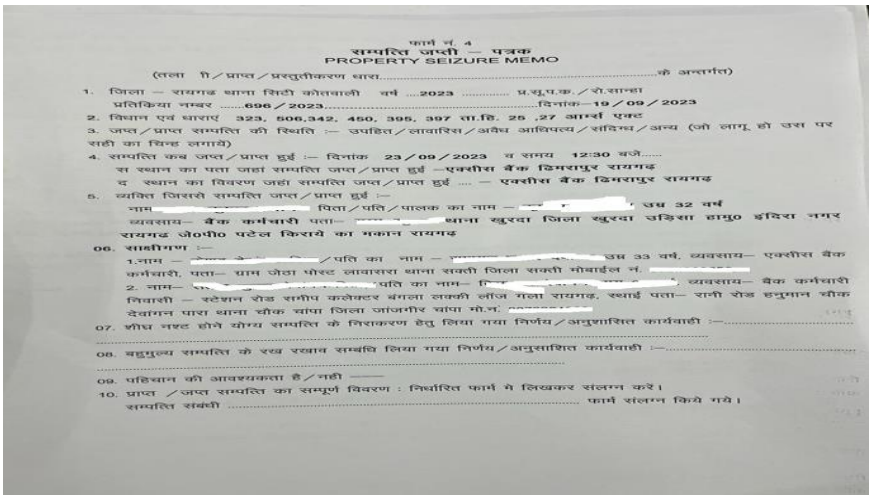
7. **पंचनामा कार्यवाही का विवरण—** आज दिनांक 13/10/2023 बिमरापुर रोड स्थित एक्सीस बैंक में सभी वरिष्ठ पुलिस अधिकारियों की उपस्थिति में नियंत्रित कंट्रोल्ड परिस्थितियों में आरोपी अमित दास उर्फ धर्मेन्द्र दास सहमति लेकर घटना दिनांक के समरुप पुनः चलवाकर उक्त आरोपी के चाल का गेट पैटर्न एनालिसिस हेतु एक्सीस बैंक के मुख्य लांउज सीसीटीव्ही कैमरा (डी–6) के माध्यम से सैंपल विधिवत संकलित किया गया। आरोपी अमित दास उर्फ धर्मेन्द्र दास की जूता पहने हुये जमीन से उंचाई 160.3 से.मी. है, उक्त एक्सीस बैंक के मुख्य लांउज में लगे सीसीटीव्ही कैमरा (डी–7) को आधार मानकर सीसीटीव्ही की विडीयों निगरानी में कंट्रोल्ड सैंपल चाल कैमरा डी–6 जिसका स्क्रीन मे दर्शित है, आरोपी अमित दास उर्फ धर्मेन्द्र दास को दिनांक 13/10/2023 के 11:32:00 मिनट से 11:34:45 मिनट (कैमरा डी–6 के स्क्रीन में दर्शित समय) तक कंट्रोल्ड सैंपल एकत्रित करने हेतु चलवाया गया एवं 11:32:00 मिनट से 11:34:45 मिनट (कैमरा डी–7 के स्क्रीन में दर्शित समय) तक उसकी उंचाई 160.3 सेमी. का माप लिया गया।

उक्त आरोपी को घटना दिनांक/समय के समरुप जूता पहनाकर उसकी उंचाई का माप विधिवत लिया गया, स्वतंत्र गवाहों उपस्थित बैंक कर्मचारी के समक्ष कंट्रोल्ड सैंपल चाल, पंचनामा की कार्यवाही किया गया। उक्त सैंपल को पृथक से जप्ती कार्यवाही की जाती है।

हस्ताक्षर गवाहन —
01.
02.

हस्ताक्षर आरोपीगण
01.
02.

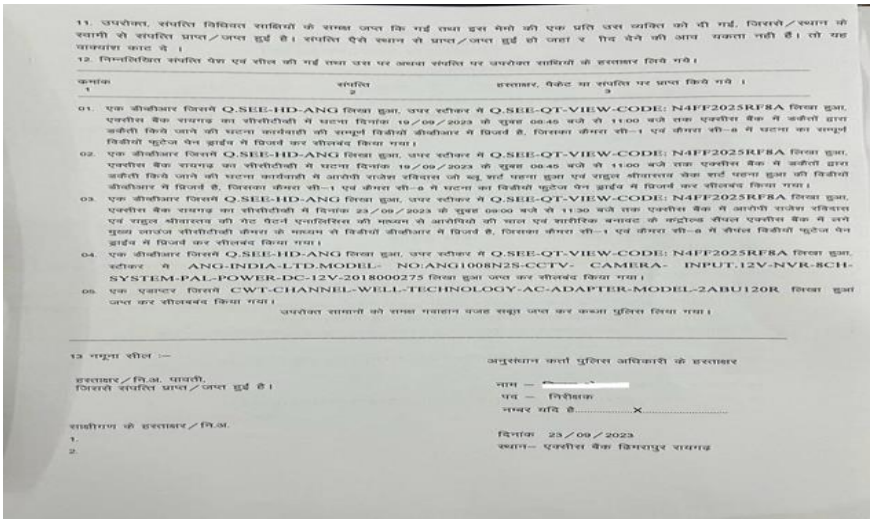
Seizure Memo:



फार्म नं. 4
सम्पत्ति जप्ती — पत्रक
PROPERTY SEIZURE MEMO

(तला पी/प्राप्त/प्रस्तुतीकरण धारा.....के अन्तर्गत)

1. जिला — रायगढ़ थाना सिटी कोतवाली वर्ष ....2023 ..... प्र.सू.प.क./रो.सान्हा प्रविष्टि नम्बर .....696/2023.....दिनांक—19/09/2023
2. विधान एवं धाराएं 323, 506,342, 450, 395, 397 भा.दि. 25 ,27 आर्म्स एक्ट
3. जप्त/प्राप्त सम्पत्ति की स्थिति :— उपहित/लावारिस/अवैध आधिपत्य/संदिग्ध/अन्य (जो लागू हो उस पर सही का चिन्ह लगाये)
4. सम्पत्ति कब जप्त/प्राप्त हुई :— दिनांक 23/09/2023 व समय 12:30 बजे.....
   व स्थान का पता जहां सम्पत्ति जप्त/प्राप्त हुई —एक्सीस बैंक डिमरापुर रायगढ़
   द स्थान का विवरण जहां सम्पत्ति जप्त/प्राप्त हुई .... — एक्सीस बैंक डिमरापुर रायगढ़
5. व्यक्ति जिससे सम्पत्ति जप्त/प्राप्त हुई :—
   नाम — [redacted] पिता/पति/पालक का नाम — [redacted], उम्र 32 वर्ष
   व्यवसाय— बैंक कर्मचारी पता— [redacted] थाना खुरदा जिला खुरदा उड़िसा सम्0 इंदिरा नगर रायगढ़ जे0पी0 पटेल किराये का मकान रायगढ़
06. साक्षीगण :—
   1.नाम — [redacted] पति का नाम — [redacted] उम्र 33 वर्ष, व्यवसाय— एक्सीस बैंक कर्मचारी, पता— ग्राम जोठा पोस्ट लावासरा थाना रक्सी जिला रक्सी मोबाईल नं. [redacted]
   2. नाम— [redacted] पति का नाम— [redacted], व्यवसाय— बैंक कर्मचारी निवासी — स्टेशन रोड सर्पीप कलेक्टर बंगला लक्ष्मी लॉज गला रायगढ़, स्थाई पता— रानी रोड हनुमान चौक देवांगन पारा थाना चौक सांपा जिला जांजगीर सांपा मो.नं. [redacted]
07. शीघ्र नष्ट होने योग्य सम्पत्ति के निपाकरण हेतु लिया गया निर्णय/अनुशासित कार्यवाही :—.....
.....
08. बहुमुल्य सम्पत्ति के रख रखाव सम्बधि लिया गया निर्णय/अनुसाशित कार्यवाही :—.....
.....
09. पहिचान की आवश्यकता है/नही ——
10. प्राप्त /जप्त सम्पत्ति का सम्पूर्ण विवरण : निर्धारित फार्म मे लिखकर संलग्न करें।
    सम्पत्ति संबंधी ..... फार्म संलग्न किये गये।



11. उपरोक्त, संपत्ति विभिन्न साक्षियों के समक्ष जप्त कि गई तथा इस मेमो की एक प्रति उस व्यक्ति को भी गई, जिससे/स्थान की स्वामी से संपत्ति प्राप्त/जप्त हुई है। संपत्ति ऐसे स्थान से प्राप्त/जप्त हुई हो जहां पे गेम देने की आम सकता नही है। तो यह वाक्यांश काट दे ।
12. निम्नलिखित संपत्ति पेश एवं सील की गई तथा उस पर अथवा संपत्ति पर उपरोक्त साक्षियों के हस्ताक्षर लिये गये।

क्रमांक 1	संपत्ति 2	हस्ताक्षर, पैकेट या संपत्ति पर प्राप्त किये गये । 3

01. एक डीवीडीआर जिसमें Q.SEE-HD-ANG लिखा हुआ, उपर स्टीकर में Q.SEE-QT-VIEW-CODE: N4FF2025RF8A लिखा हुआ, एक्सीस बैंक रायगढ़ का सीसीटीवी में घटना दिनांक 19/09/2023 के सुबह 08:45 बजे से 11:00 बजे तक एक्सीस बैंक में जकीती द्वारा जकीती किये जाने की घटना कार्यवाही की सम्पूर्ण विडीयो डीवीआर में घिजर्व है, जिसका कैमरा सी–1 एवं कैमरा सी–8 में घटना का सम्पूर्ण विडीयो फुटेज पेन ड्राईव में घिजर्व कर सीलबंद किया गया।
02. एक डीवीडीआर जिसमें Q.SEE-HD-ANG लिखा हुआ, उपर स्टीकर में Q.SEE-QT-VIEW-CODE: N4FF2025RF8A लिखा हुआ, एक्सीस बैंक रायगढ़ का सीसीटीवी में घटना दिनांक 19/09/2023 के सुबह 08:45 बजे से 11:00 बजे तक एक्सीस बैंक में जकीती द्वारा जकीती किये जाने की घटना कार्यवाही में आरोपी राजेश भविया जो कुछ शर्ट पहना हुआ एवं राहुल श्रीवास्तव जेक शर्ट पहना हुआ की विडीयो डीवीआर में घिजर्व है, जिसका कैमरा सी–1 एवं कैमरा सी–8 में घटना का विडीयो फुटेज पेन ड्राईव में घिजर्व कर सीलबंद किया गया।
03. एक डीवीडीआर जिसमें Q.SEE-HD-ANG लिखा हुआ, उपर स्टीकर में Q.SEE-QT-VIEW-CODE: N4FF2025RF8A लिखा हुआ, एक्सीस बैंक रायगढ़ का सीसीटीवी में दिनांक 23/09/2023 के सुबह 09:00 बजे से 11:30 बजे तक एक्सीस बैंक में आरोपी राजेश भविया एवं राहुल श्रीवास्तव की पेट पेटर्न एनालिसिस की मध्यम से आरोपियो की चाल एवं शारीरिक बनावट के कंट्रोल सीपल एक्सीस बैंक में उस मुख्य ब्रान्च सीसीटीवी कैमरा के मध्यम से विडीयो डीवीआर में घिजर्व है, जिसका कैमरा सी–1 एवं कैमरा सी–8 में सीपल विडीयो फुटेज पेन ड्राईव में घिजर्व कर सीलबंद किया गया।
04. एक डीवीडीआर जिसमें Q.SEE-HD-ANG लिखा हुआ, उपर स्टीकर में Q.SEE-QT-VIEW-CODE: N4FF2025RF8A लिखा हुआ, स्टीकर में ANG-INDIA-LTD.MODEL- NO:ANG1008N2S-CCTV- CAMERA- INPUT:12V-NVR-8CH-SYSTEM-PAL-POWER-DC-12V-2018000275 लिखा हुआ जप्त कर सीलबंद किया गया।
05. एक एडाप्टर जिसमें CWT-CHANNEL-WELL-TECHNOLOGY-AC-ADAPTER-MODEL-2ABU120R लिखा हुआ जप्त कर सीलबंद किया गया।

उपरोक्त सामानों को समक्ष गवाहान वजह समझा जप्त कर कब्जा पुलिस लिया गया।

13 नमूना सील :—

हस्ताक्षर/नि.अ. पायली,
जिससे संपत्ति प्राप्त/जप्त हुई है।

साक्षीगण के हस्ताक्षर/नि.अ.
1.
2.

अनुसंधान कर्ता पुलिस अधिकारी के हस्ताक्षर

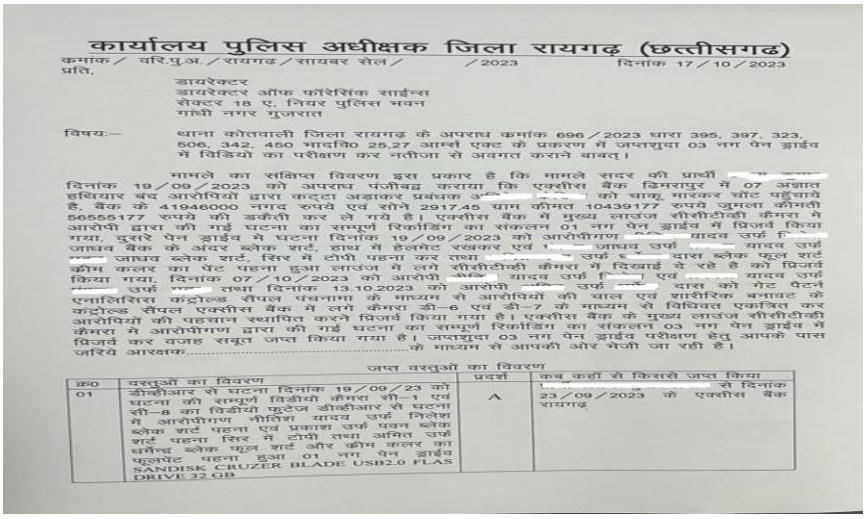
नाम — [redacted]
पद — निरीक्षक
नम्बर यदि है.....

दिनांक 23/09/2023
स्थान— एक्सीस बैंक डिमरापुर रायगढ़

Thereafter the CCTV footage of the Controlled gait samples were extracted from the DVR and saved in a pen drive which was sealed in the presence of independent witnesses. Legal requirement of obtaining certificate under Section 65-B of Evidence Act was fulfilled.

Finally the video recording of the day of crime and sample gait videos were sent to FSL Gandhinagar for giving their opinion. It was heartening to note that the FSL report gave positive opinion on the same. The final words mentioned in the report are as under:

"*Similarities were observed between the suspected person **Mark-1** with the **Mark-3** and the suspected person **Mark-2** with the **Mark-4** with respect to the gait features pattern examination. Thereby showing that the suspected person **Mark-1**&**Mark-3** and the suspected person **Mark-2**&**Mark-4** are one and the same person with probable identity*"



कार्यालय पुलिस अधीक्षक जिला रायगढ़ (छत्तीसगढ़)

क्रमांक / चरि.पु.अ. / रायगढ़ / सायबर सेल / /2023 दिनांक 17 / 10 / 2023

प्रति,

डायरेक्टर
डायरेक्टर ऑफ फोरेंसिक साईन्स
सेक्टर 18 ए, नियर पुलिस भवन
गांधी नगर गुजरात

विषयः— थाना कोतवाली जिला रायगढ़ के अपराध क्रमांक 696 / 2023 धारा 395, 397, 323, 506, 342, 450 भादवि0 25,27 आर्म्स एक्ट के प्रकरण में जप्तशुदा 03 नग पेन ड्राईव में विडियो का परीक्षण कर नतीजा से अवगत कराने बाबत्।

मामले का संक्षिप्त विवरण इस प्रकार है कि मामले सदर की प्रार्थी [redacted] दिनांक 19 / 09 / 2023 को अपराध पंजीबद्ध कराया कि एक्सीस बैंक हिमरापुर में 07 अज्ञात हथियार बंद आरोपियों द्वारा कट्टा अड़ाकर प्रबंधक [redacted] को चाकू मारकर चोट पहुंचाये है, बैंक के 41946000 नगद रुपये एवं सोने 2917.46 ग्राम कीमत 10439177 रुपये जुमला कीमती 56555177 रुपये की डकैती कर ले गये है। एक्सीस बैंक में मुख्य लाउंज सीसीटीवी कैमरा में आरोपी द्वारा की गई घटना का सम्पूर्ण रिकार्डिंग का संकलन 01 नग पेन ड्राईव में प्रिजर्व किया गया, दूसरे पेन ड्राईव में घटना दिनांक 19 / 09 / 2023 को आरोपीगण [redacted] यादव उर्फ [redacted] जाधव बैंक के अंदर ब्लेक शर्ट, हाफ में हेलमेट रखकर एवं [redacted] जाधव उर्फ [redacted] यादव उर्फ [redacted] जाधव ब्लेक शर्ट, सिर में टोपी पहना कर तथा [redacted] उर्फ [redacted] दास ब्लेक फूल शर्ट क्रीम कलर का पेंट पहना हुआ लाउंज में लगे सीसीटीवी कैमरा में दिखाई दे रहे है को प्रिजर्व किया गया, दिनांक 07 / 10 / 2023 को आरोपी [redacted] यादव उर्फ [redacted] एवं [redacted] यादव उर्फ [redacted] उर्फ [redacted] तथा दिनांक 13.10.2023 को आरोपी [redacted] उर्फ [redacted] दास को गेट पेटर्न एनालिसिस कंट्रोल्ड सैपल पंचनामा के माध्यम से आरोपियों की चाल एवं शारीरिक बनावट के कंट्रोल्ड सैपल एक्सीस बैंक में लगे कैमरा जी–6 एवं जी–7 के माध्यम से विधिवत एकत्रित कर आरोपियों की पहचान स्थापित करने प्रिजर्व किया गया है। एक्सीस बैंक के मुख्य लाउंज सीसीटीवी कैमरा में आरोपीगण द्वारा की गई घटना का सम्पूर्ण रिकार्डिंग का संकलन 03 नग पेन ड्राईव में प्रिजर्व कर वजह सबूत जप्त किया गया है। जप्तशुदा 03 नग पेन ड्राईव परीक्षण हेतु आपके पास जरिये आरक्षक.....के माध्यम से आपकी ओर भेजी जा रही है।

जप्त वस्तुओं का विवरण

क्र0	वस्तुओं का विवरण	प्रदर्श	कब, कहाँ से किससे जप्त किया
01	डीव्हीआर से घटना दिनांक 19 / 09 / 23 को घटना की सम्पूर्ण विडीयो कैमरा सी–1 एवं सी–8 का विडीयो फुटेज डीव्हीआर से घटना में आरोपीगण नीरिश यादव उर्फ [redacted] ब्लेक शर्ट पहना एवं प्रकाश उर्फ पवन ब्लेक शर्ट पहना सिर में टोपी तथा अमित उर्फ धर्मेन्द्र ब्लेक फूल शर्ट और क्रीम कलर का पेंट पहना हुआ 01 नग पेन ड्राईव SANDISK CRUZER BLADE USB2.0 FLAS DRIVE 32 GB	A	[redacted] से दिनांक 23 / 09 / 2023 के एक्सीस बैंक रायगढ़

DFS(G)/FM/26/1

DIRECTORATE OF FORENSIC SCIENCE
Gujarat State, Sector – 18 A, Gandhinagar
Phone No.: 079-23256280 Fax No.: 079-23256393

Examination Report Case No.: DFS/EE/2023/CF/1581

Sr. No.	CCTV Video footage name	Date, Time & Camera Stamp (Duration)	HASH Value (MD5)
1	Q-See IP Camera_20230919093817.avi	09/19/2023 09:38:17 to 09:43:28 Q- See IP Camera (00:03:47)	b8dbc5c183eb5f6cd6d584b1d050e0b6
2	Q-See IP Camera_20230919094026.avi	09/19/2023 09:40:26 to 09:46:16 Q- See IP Camera (00:04:19)	eb7a56e3eb3bc76ade4018431af1097e
3	Q-See IP Camera_20230919094011.avi	09/19/2023 09:40:11 to 09:46:43 Q- See IP Camera (00:04:47)	212fc4fc89a5171a548a6556314c8c84
4	Q-See IP Camera_20230919093746.avi	09/19/2023 09:37:46 to 09:43:41 Q- See IP Camera (00:04:21)	e7948be17c532d7edfaf5b3df4496a06

***Note**: The suspected persons as described in the police forwarding note were seen in these Video footages, which were marked as **Mark-3** (person wearing blue shirt) & **Mark-4** (person wearing check shirt) respectively in the division.

(5) Frames were extracted from the Questioned & Control Video footages. These frames were examined for person identification.

(6) The Question & Control Video footages were examined for gait feature analysis of the suspected person **Mark-1** with the **Mark-3** and the suspected person **Mark-2** with the **Mark-4**.

Results of Examination/ Observation:

(1) Similarity were observed between the suspected person **Mark-1** with the **Mark-3** and the suspected person **Mark-2** with the **Mark-4** with respect to the gait features pattern examination. There by showing that the suspected person **Mark-1** & **Mark-3** and the suspected person **Mark-2** & **Mark-4** are one and the same person with probable identity.

Results/Outcomes:

The outcome of all the efforts put in by the team was that 100% recovery of the cash and the articles was made. 5 out of the 10 accused were arrested on the same day which the rest were caught in few days. The usage of technology in detection of crime proved highly useful. The analysis of CCTV footages, accessing the CCTNS and ICJS databases and obtaining location of mobile phones proved the key in solving the case. The herculean task of establishing the identity of the criminals at the scene of crime and linking them with the crime with the help of Gait Pattern Analysis proved highly effective. The usage of new procedure in Chhattisgarh for the first time gave confidence to the Investigating Officers in venturing out into hitherto unexplored domains. Most importantly, the image of Chhattisgarh police reached its acme through professional work. The print and electronic media, who had portrayed Raigarh police with all sort of expletives since morning on 19 Sept 2023, were full of its praises the next day. Hon'ble Chief Minister and Director General of Police felicitated the teams of Raigarh and Balrampur police in solving this extremely sensational case in record time.

Challenges Faced:

Although the entire case was a big challenge to the police, yet following points can be highlighted as challenges in this case:

- The incident was enormous from law and order point of view and there was lot of pressure on police officials to solve the crime as soon as possible. Despite this pressure, keeping the mind calm and proceed logically was the first challenge.
- The accused did not use any mobile phone while committing the crime. Moreover their faces were masked. Hence it was virtually a blind case.
- The movement of the accused was over a large geographical spread. The coordination between police officials of different states and different districts was to be made.
- As there was no database of location of CCTV cameras, lot of time was wasted in locating the CCTV cameras on the escape routes.

- Technique of Gait Pattern Analysis was never used in Chhattisgarh earlier. Moreover the facility to conduct such examination is not widely available across many Forensic Science Laboratories in India.
- Recording the gait in similar conditions as that of actual crime was challenging as the bank operations were to be stopped for the duration of more than 2 hours. Moreover, the accused were on police remand and any mistake in recording the sample gait would have resulted in lot of waste of effort.
- The report of gait pattern analysis is yet to face the scrutiny of the trial.

Implications:

The introduction of Gait Pattern Analysis in the investigation of the case was a historic step. It has made the officers of Chhattisgarh Police aware of scientific methods of investigation. It will help the investigating officers in exploring more such techniques in future. Moreover, it will act as a deterrent for the criminals who think that by masking their faces, they can go scot free.

The case also highlights the importance of installation of CCTV cameras. The security system of all the banks in thereafter reviewed by Raigarh police and recommendations were made to improve upon it. Sh. Ram Gopal Garg the then DIG of Police Raigarh developed a mobile application namely TRINAYAN in which the geo-location of all the CCTV cameras and details of their owners are available in single database. It also provides the facility of searching the location of CCTV cameras near to any place of occurrence. The main purpose of this app was to reduce the time in locating these cameras.

Finally the case is a landmark in the history of Chhattisgarh Police in which not only the sensational crime of dacoity was solved in record time but also the use of technology in policing was demonstrated effectively.

Exhibits: Already inserted at relevant places

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Author's Profile:

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Potential Use Cases of Blockchain Technology in Policing

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Abstract:

The fundamental features of blockchain, namely providing a tamper-proof, decentralized digital ledger, offer transformational applications within policing, where data integrity is paramount. This paper presents 17 practical use cases of blockchain technology, going beyond cryptocurrencies, where blockchain could enhance police operations. These include digital evidence chain of custody, forensic report verification, grievance redressal systems, border control management, and resource allocation. For efficient implementation, this paper recommends a framework where the blockchain stores only metadata and hash values, while the actual data is stored in a distributed database or cloud. This approach addresses scalability issues while preserving data integrity benefits. Despite the promising applications, blockchain technology adoption faces major challenges, including technical complexity, legal implications, scalability concerns, resource limitations, and leadership hesitation due to apprehensions about technology maturity and structural changes required. The paper emphasizes the need for lightweight blockchain solutions requiring 35-50% less computational power, making them more feasible for budget and resource-constrained police formations. Successful adoption of blockchain in policing requires strong governance

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frameworks and comprehensive auditing mechanisms to take full advantage of its potential while maintaining appropriate access controls and operational security.

Keywords:
blockchain, metadata, use cases, smart contracts, hash values, data integrity

Introduction:

A blockchain is a decentralized electronic ledger associated with an asset or information, which records the history of transactions in that asset or information, and allows multiple entities to reliably track such information. All participants, designated as nodes, receive validated information contained in the blocks (or information fields) at the same time, and so there exist as many encrypted copies of the data as there are nodes. An algorithm uses the data within a given block to generate a 'key' for the next block, which is shared with all the nodes.

Any node attempting to change the data in a block without authorization will fail, as its key for the next block will also be altered, and will not match with the key known to the other nodes, thereby breaking the delinquent node off from the chain. Since all nodes have access to the same information, all the participants can trust that the information is current and correct. Blockchain ensures data integrity, and can be regarded as a digital notary. Data integrity is the most crucial factor in justifying the use of blockchain technology in policing, where the accuracy of information can determine the success or failure of an investigation or an operation.

Although cryptocurrencies, such as Bitcoin, represent the most widely cited manifestation of blockchain, blockchain applications go far beyond digital finance and virtual currencies. Blockchain also enables the adoption of smart contracts, which are essentially a set of pre-existing conditions that, when fulfilled, automatically execute a specific step, and share updates through the distributed ledger to all relevant parties at every stage of the transaction which require adding on blocks to the chain.

The concept of a blockchain as a distributed ledger, that allows storage of cryptographically immutable data, has often been touted as a panacea for making large volumes of digitized data available in a decentralized manner. Although the ideal scenario would be for a blockchain to support on-chain storage that guarantees 100% restoration and resilience in the face of an attack, there are significant scalability issues and prohibitive costs to taking such an approach. A better cost-effective solution is off-chain storage, which requires two inter- connected systems working in tandem:

(a) **Distributed Database/ Decentralized Cloud Storage/ Distributed File System Using Peer-to-peer Network**: The actual data gets stored here, since these entities are designed to efficiently manage large amounts of data and complex data structures like documents, images, videos, etc. Although they have mechanisms to enforce data integrity, they remain vulnerable to forgery or tampering.

(b) **Blockchain**: It stores only metadata, typically a unique hash of the data that acts as a digital fingerprint. Any modification to the data would also change its hash. Since a blockchain is immutable, it holds a tamper-proof record of the data hashes, and can be tracked by multiple agencies.

For instance, if a blockchain use case is envisaged in criminal investigations, the blockchain will not store electronic copies of the entire investigation records (e.g. FIR, case diary, charge sheet, forensic reports), but only the hash values.

Successful implementation of blockchain-based use cases in the Law Enforcement Agency LEA context requires technical expertise in understanding emerging technologies, protracted engagement with blockchain developers and researchers, testing applications for their value proposition in overcoming hurdles posed by traditional systems and processes, and finally, addressing a range of concerns pertaining to recurring costs, legal implications, capacity building, scalability, and sustainability for large-scale adoption. Full support and engagement of the police leadership is often dampened due to apprehensions regarding the maturity of the technology, the criminal uses of cryptocurrencies and their ambiguous legal status in India, the potentially large number of structural

changes that might be required, and the need to open up the policing sub-culture to analysis by third party software developers.

There exists a gamut of potential use cases for immutable digital ledgers amongst security organizations and law enforcement agencies (LEAs), a few of which will be discussed in this paper.

Potential use cases:

1. Chain of Custody for Digital Evidence:

Given the increasing popularity of decentralized cloud services, the seizure of electronic evidence by investigators entails the seizure of emails, social media accounts, and digital data in network cloud drives such as Google Drive or Dropbox. When digital evidence is being seized, the cloud data files can be downloaded and stored onto an official storage device (e.g. USB), and the hash of each file being downloaded can be automatically calculated. This hash can be simultaneously uploaded to a blockchain, which could combine the hash with a timestamp and the identity of the authorized user, in order to ensure the integrity of the digital evidence collection process.

This approach could be used for proving the credibility of a large number of seized digital files that require a lot of time to download. Since the information uploaded to the blockchain would only be a hash rather than the full evidence content, the evidence storage space and block creation time would be reduced, and the principle of non-disclosure in investigation can be implemented in letter and spirit.

Delhi Police has applied blockchain technology in the e-forensic application of Delhi Forensic Science Laboratory to create an unchangeable and transparent record of the chain of custody for seized evidence. Whenever the evidence changes custody, a new block gets added onto the blockchain, documenting with a timestamp who had custody. Unlike the existing CCTNS where case data entry is done solely by police officers at the police station, the blockchain-based system will allow both police and forensic officers to upload data independently and securely onto the blockchain through authorized computers or mobiles, while permitting auditable, encrypted and need-based access to each other's detailed reports.

This is expected to reduce chances of manipulation of evidence in sensitive and heinous cases, and lead to better trial outcomes.

2. Verification of Digital Forensic Reports:

The counterfeiting of forensic analysis reports during trials is an area of concern. This can be prevented by uploading the hash of a digital forensic report file onto a blockchain through the encrypted signature of the blockchain hardware wallet (e.g. Ethereum smart contracts). During trial, if there is any dispute about the authenticity of the physical or electronic forensic report, the judiciary could take the help of a mobile forensic report verification app to scan and match the hash of the electronic format of the forensic report against the immutable hash stored in the blockchain.

3. Community outreach:

A blockchain-based digital outreach platform can be employed to generate, store and trace reports on community policing activities, covering both offline initiatives and online content, (e.g. alerts, advisories, awareness materials) posted on official social media handles. Community members within a police jurisdiction, when assured of data privacy within a blockchain, would be more forthcoming in sharing real-time feedback and testimonials on police engagement. Genuine insights, given voluntarily by stakeholders without fear of retaliation stemming from a critique, could showcase the effectiveness of special enforcement drives or targeted interventions amongst the community.

4. 360º Peer Appraisal System/ SPARROW:

A blockchain-based peer appraisal system can be used to elicit open and honest performance feedback from various ranks of departmental colleagues, while ensuring absolute confidentiality and anonymity to avoid biased or manipulated assessments. Data integrity, that is inherent to blockchain technologies, allows performance evaluations of a police officer to be tracked over the span of his career, and can be readily accessed for various purposes such as promotion, posting, deputation, etc.

If annual performance appraisal is regarded as a series of information transactions, then smart contracts could be applied to the Smart

Performance Appraisal Report Recording Online Window (SPARROW), which maintains comprehensive performance appraisal dossiers for officers of the Central and State/UT governments.

5. Grievance Redressal:

In Uttar Pradesh, the Firozabad district police launched an online portal called Firozabad Public Grievance Management System using blockchain (www.policecompliantonblockchain.in), which would create an immutable and transparent encrypted record of a public complaint. Such a system has been designed to eliminate the tendency to refuse registration of complaints during personal interactions with the aggrieved citizen at the police station.

Grievances vented by candidates who have appeared in a police recruitment drive signify an important, and potentially litigious, issue. A blockchain-based system can give candidates a reliable and secure way to leave feedback on the recruitment process, which can translate into a more transparent candidate experience.

6. CSR Funding:

A fundraising platform, incorporating an escrow layer based on smart contracts, can attract more Corporate Social Responsibility (CSR) funding in law enforcement projects, involving troop welfare, police infrastructure development, capacity building, private partnerships in community policing, etc. It is suggested that a corporate donor will place its CSR funds into an escrow account, linked to multiple projects. The release of funds from the escrow account will be triggered automatically, whenever pre-determined conditions (such as dates, events, data inputs, project milestones) are verified, thereby streamlining processes and reducing manual intervention.

The decentralized nature of blockchain technology would ensure that the contract's records are available for validation on a distributed, tamper-resistant digital ledger, i.e. multiple nodes in a network, thereby enhancing security and transparency, and alleviating concerns of unreported fund diversion.

7. Payments to Confidential Sources:

Adopting a blockchain to pay intelligence sources and field operatives would instill greater transparency in the utilization of the traditionally non-auditable secret service funds, without compromising the identity of the recipients. For instance, the Narcotics Control Bureau operates a cash reward scheme for incentivizing officers and informers involved in successful drug seizures. While disbursing the sanctioned reward money into a traditional bank account, the identity of a rewardee is vulnerable to leaks, resulting in the individual becoming a target of organized criminal syndicates. Reward disbursal using cryptocurrencies can address such concerns, while ensuring transparency and accountability in the use of government funds.

The Thai Ministry of Justice, in collaboration with academia, is developing a blockchain-based platform to encourage anonymous, untraceable online reporting of drug dealing activities and for payment of rewards to informants through blockchain.

8. Border Control Management:

Blockchain assures cryptographically guaranteed immutability that helps in auditing and preventing fraudulent activity. Blockchain is also a cheaper alternative to a centralized database using PKI / P2P authentication, and can be useful in preventing terrorism and human trafficking, keeping tabs on fugitives and absconders seeking to avoid legal proceedings, and proper implementation of no-fly lists.

The hash of a blacklisted machine-readable travel document (MRTD), which has been defined as a global standard by the International Civil Aviation Organization (ICAO), along with the biometric ID of an individual, can be stored in a smart contract blockchain. Another hash of the same MRTD, containing detailed information, can be stored on a distributed backend database.

At any border crossing point (e.g. airport, port), the hash of a traveler's MRTD can be cross-referenced with the smart contract blockchain. If a match is found, LEAs can perform additional checks with the backed database, and proceed with detention and interrogation of the individual. If there is no match in the blockchain but the MRTD appears suspicious, then

the hash of the flagged MRTD can be added to the smart contract, thereby making the hash visible instantly to all stakeholders across the globe.

9. Procurement and Logistics:

Smart contracts, if integrated into Government e-Marketplace (GeM), can be used to automate payments to vendors when an item is received by the consignee. Blockchain would ensure that all relevant parties remain aware of tasks performed at each stage of the transaction, starting from bid creation, bid evaluation, supply order placement, shipping, delivery (including late delivery penalties), receipt, acceptance, and payment. Sample testing and inspection data can be recorded on the blockchain, including vendor blacklists.

Item-wise smart contracts can also keep track of annual maintenance schedules, warranty clauses and repairs, thereby making the OEMs more responsive and committed to fulfilling their contractual obligations and streamlining long-term quality assurance. Blockchain also increases the visibility of the transaction amongst the supplier network, and competing vendors can view the blocks to become aware of item-specific expectations of the buyer.

A related use case is the tracking of the end-to-end movements of procured items and own troops using blockchain. This is especially relevant for the Central Armed Police Forces (CAPFs) where large-scale movement of men and materials is a regular feature, for instance, when deployed for election duties.

10. Police Verification and Profiling:

Various government departments are exploring use cases of blockchain for securing personal data of citizens, such as birth certificates, character certificates, domicile certificates, caste certificates, land records, property registration, sale deeds, lease and rental agreements, tax filing records, insurance claims, etc. For instance, NIC has developed ‘Certificate Chain’, ‘Document Chain’ and ‘Judicial Chain’ using blockchain technology, and has onboarded 16 certificates of two Central Ministries and five State/UTs. Police can gain access to such distributed ledgers for a more holistic and effective discharge of its assigned tasks of C&A verification, passport

verification, vetting of contractual workers, intelligence gathering and profiling. The ID card details and salary certificates of own police personnel can also be made available on an internal blockchain.

11. E-Auctions:

Although in theory, any citizen can participate and bid in auctions of condemned and unserviceable items, the instances of bidder cartelization, data suppression and manipulation are so frequent that they render the e-auctioning system opaque and unfair. Trust in the transparency and fairness of government auctions can be ensured, if the hash of the data about each auction bid is uploaded and stored onto a blockchain. Changing any information about a bid would change its hash, enabling anyone to compare and match the most recent hash stored on the blockchain with the hash of the bid information. This would allow third parties to follow the progress of an auction, and promptly investigate into any complaint of suspected bid manipulation.

12. Inspection and Inquiry Reports

Inspection of various field units and formations, courts of inquiry, and inquiry into disciplinary matters constitute an inevitable feature of police administration. There have been instances of suppression of critical comments in inspection reports and inquiry findings. Blockchain-based notarization allows secure certification, signing and sharing of inspection records, providing a timestamp, proof of authorship and immutability over time.

13. Allocation of Government Accommodation:

Smart contracts can instill much-needed transparency in the allocation of government quarters, as per a set of pre-defined eligibility criteria, which factor in seniority and first come first serve processing of requests. Such a platform can also integrate digital identity verification features of the applicant and his family members. Applicants can track all allocations, and immediately flag human errors, out-of-turn allocations, and delays.

14. Disaster Management:

In disaster affected areas or situations of crisis, database systems tend to be overloaded, and become vulnerable to manipulation, unauthorized access,

and disruption of critical services. The distributed nature of blockchain helps to protect critical data from both natural and man-made adversarial conditions. Police, being one of the frontline rescue and relief agencies, can benefit from blockchain-based disaster management systems, to obtain and track information on missing persons, relief camp locations, critical damage sites, resource distribution, aid package distribution, identity verification of NGOs, etc. Smart contracts for getting timely assistance from hospitals during contingencies can be designed and tested.

15. Drone-based Applications:

Drones are being deployed increasingly by LEAs for border surveillance, operational recce, disaster site monitoring, transportation of rescue and relief materials, election security management, traffic enforcement, etc. The authenticity of the data collected and transmitted by drones (e.g. flight logs, surveillance videos and photographs, payload delivery in emergencies) can have significant operational and legal implications, such as impingement on privacy, collateral damage on crash or malfunction, etc.

Blockchain will ensure that data transmitted by drones are immutable and traceable. The decentralized nature of blockchain also mitigates the risk of single points of failure, and enhances the reliability of communication systems in swarm of drones. Blockchain can also be used for cryptographic authentication of communication signals to protect from drone hijacking, GPS spoofing, or man-in-the-middle attacks.

16. Training Records and Certification:

Digital training records and course completion certificates with timestamps, paired with QR codes, can be stored on a blockchain by any training institute, as an immutable record of an individual's performance that can be retrieved and verified by any agency (e.g. promotional board, pre-UN mission deployment checks) interested in accessing such results.

17. Aids to Investigation:

In addition to the above use cases, LEAs in India and abroad have been regularly collaborating with blockchain firms and academic researchers in analyzing cryptocurrencies used in commission of various financial crimes, terror funding and organized criminal activities. Such collaboration

also includes training and capacity building of police investigators, and development and validation of customized forensic tools to be used for detecting patterns in criminal blockchain transactions, techniques of money laundering, involving virtual currencies and darknet markets, and pinpoint the suspected cash-out points of illicit actors. For instance, a consortium of 15 members, spearheaded by INTERPOL and 4 LEAs, has launched a project called TITANIUM (Tools for the Investigation of Transactions in Underground Markets) to prevent criminals from using blockchain technology to avoid law detection while respecting the privacy rights of legitimate users.

Investigative agencies also rely on cryptocurrency wallets to educate themselves on new technologies, to facilitate seizure of cryptocurrencies allegedly used in criminal activities, and even to process trap cases involving cryptocurrency bribes.

Conclusion:

Blockchain promises secure management of sensitive information, making it a valuable tool for upgrading the traditional approaches of LEAs to exert control over data and resources. Due to technical, legal and regulatory limitations, the uptake of blockchain technology in policing has been slow, but deliberate. Many use cases of blockchain are based on smart contracts whose efficacy in resolving a plethora of SOP driven methods in contemporary, evidence-based policing require meticulous testing. Most police formations, afflicted with limited budgets and IT resources, could benefit from the growing body of research in 'lightweight' blockchains, which require 35-50% less computational power for executing their Proof-of-Work consensus algorithms for creating new blocks, without diminishing the blockchain's USP of data integrity and security. Since private blockchains can be restricted to selected or authorized users, their implementation in police organizations must be accompanied by a robust governance framework and a proper auditing mechanism to reap the desirable benefits of blockchain technologies.

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Technology for Smarter Policing: Case Study of SAMARTH App in General Elections 2024

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Abstract:

The use of digital tools in policing is rapidly transforming the operational capabilities of law enforcement agencies in India. This article examines the deployment of the Samarth App by Bapatla District Police during the 2024 General Elections in Andhra Pradesh. Developed in-house, the app served as a real-time force tracking, deployment, and communication tool, significantly enhancing situational awareness and response time. With functionalities such as live GPS tracking, instant SOS alerts, and digital petition management, the app exemplified how technology can enable smarter policing. This paper analyzes the app's development, implementation and impact during elections. The findings demonstrate that technology-enabled policing can not only ensure peaceful conduct during critical democratic exercises but also transform everyday law enforcement practices.

Keywords:

technology in policing, Samarth App, real-time tracking, SOS alert system, law enforcement innovation

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Introduction :

In recent years, police department has turned to digital innovation to meet growing demands of efficiency, accountability, and responsiveness. In India, the scale and complexity of security operations during General Elections offer a unique opportunity where wide ranging benefits of technology can be demonstrated. In April-May 2024, during the simultaneous Lok Sabha and State Legislative Assembly elections in Andhra Pradesh, the Bapatla District Police introduced the Samarth App—a mobile-based application designed for dynamic force deployment, live location tracking, distress response, and seamless communication. This paper explores how the Samarth App addressed key challenges in election security and helped in ensuring incident free and peaceful elections.

Contextual Background:

Policing during General Elections in India presents unique challenges. General Elections for Parliament and State Legislative Assembly are a mammoth exercise involving planning, deployment, tracking and management of a large number of security personnel from district police, state police, state armed police and Central Paramilitary forces. Deployment, keeping a track and management of a large body of policemen is a big challenge as it is spread throughout the district. Since police force is spread thin throughout the district because of a large number of Polling stations, it becomes imperative that Quick Reaction Teams (QRT) and Striking forces are kept at strategic locations which can reach the trouble spots whether it be a polling station or a remote village having a law and order problem in the minimum time possible. Traditional methods of monitoring, such as wireless communications or physical inspections, are inadequate to ensure prompt response to law and order issues. The Election Commission of India (ECI) mandates real-time monitoring and quick incident response. Against this backdrop, the Bapatla District Police sought to deploy a technological solution tailored to the logistical and strategic demands of election management.

Problem Statement:

The core challenge in election policing lies in real-time monitoring and rapid response to developing situations. With force deployment spread across rural and urban areas, district control rooms often struggle to verify personnel presence, respond to distress calls, and monitor the movement of Quick Reaction Teams (QRTs) or striking forces. In the absence of a centralized digital platform, information delays can compromise response efficacy and, small issues can transform into bigger law and order problems, and in critical situations, jeopardize the integrity of the election process due to violence. Thus, there was a need for a solution that could provide centralized command and control, reduce response times, enhance efficacy, and provide the real time picture.

Development and Implementation of Samarth App:

Recognizing these needs, the Bapatla District Police developed the Samarth App as an in-house digital tool for efficient force management during the election process. The app was designed with a focus on ease of use and real-time connectivity. Its development involved engaging of local software developers and police officers with ground-level experience to come up with the final product. Once developed, comprehensive training sessions were held for over 2600 police personnel, ensuring familiarity with the app's interface and functionalities. The app was deployed and used right from the nomination, campaigning stage to the polling, counting, and post-counting phases of the General Elections 2024.

Functional Capabilities of SAMARTH App:

The Samarth App incorporated multiple modules designed to improve efficiency, response time, and coordination. Key features included:

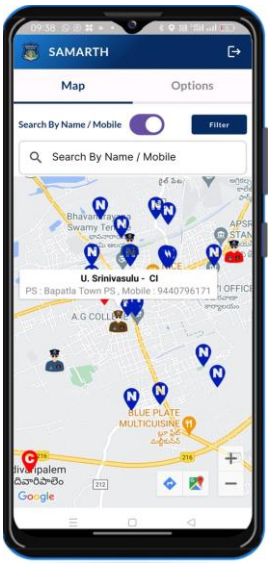
- Tracking location of all the police personnel live on district map.
- Checking presence of police personnel at designated places of duties.
- Easy identification of Normal and Critical Polling Stations.

- Alerting of District Control Room in case of any law and order problem/disturbance at any PS/village by just a pressing of SOS button.
- Locating nearest QRT/Striking force and its immediate dispatch to the troubled spot, minimizing the response time.
- Tracking of movement of QRT/Striking force dispatched to the troubled spot live on district map.
- Sharing of information/instruction/alert to all police personnel in just one click through a push notification.
- Availability of all election related information including all the manuals, checklists, training material provided by ECI to all police personnel for ready reference.

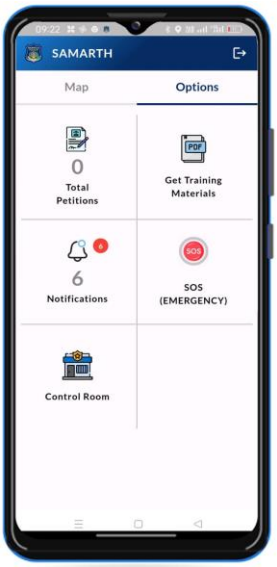
Features of SAMARTH App:

Samarth App is a powerful, robust and real-time application with the following features:

- Real time location, tracking of entire police force, with different coloured icons for Police officers of rank of Sub inspectors and above and below.
- Easy identification of Critical and Normal Polling stations with different coloured icons on district map



Officer Home Screen for finding Critical /Normal Polling booths & Police Personnel location and



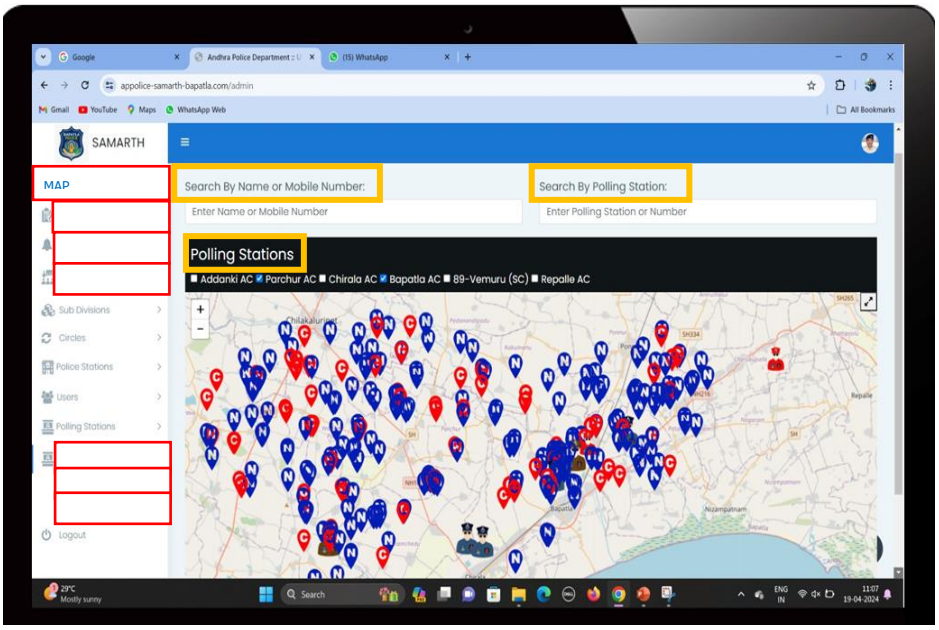
Options Main Screen for Officers

Anyone who has pressed SOS button will turn into red colored icon

- SOS button is provided for each user. Whenever SOS button is pressed:
    - A call will go to the Control Room directly from within the app.
    - A push notification will go to Control Room indicating there is a problem at the given Polling station.
    - The display icon for the concerned User will turn RED in all user applications and in Control room dashboard indicating which user is asking for help.
- Name, rank and phone number of each user is displayed as a bubble on clicking the user icon on the map.
- Clicking on the bubble which is displaying the name and rank shows more information about that user and gives an option to call the user from within the app.
- Search of police personnel on the map by name or phone number using Search option in the Map.

- Search of Polling Stations on the map by name, address or PS number using the Search option in the Map.
- Details of Polling stations are displayed as a bubble on clicking the polling station icon on the map.
- Push notifications to all users with one click to pass any alert/information/instruction immediately to the entire district force.
- Restricted use of the application to only authorized users through username and password. The application was used only by police personnel of the district who were given the login credentials.
- Availability of entire training material/instruction manuals/checklists/ election related laws and rules, which can be downloaded and read anytime by all police personnel.
- Module for Petition Management is an integral part of the app where all election related petitions could be uploaded and assigned for disposal to any officer in the district. The concerned officer can go through the petition in his login, take necessary action and upload the action taken report. Supervisory officers can track the status of disposal of petitions on the dashboard.
- Report generation of pressing of SOS buttons by users of the application including time of pressing the SOS button.
- Real time generation of reports of users who are offline/logged out/switched off their location for tracking of each and every police personnel.

SAMARTH Dashboard



The Admin login of the application can be monitored in the Control Room of the district.

- Easy checking of all the police personnel reaching and their presence at their designated places of duty.
- Tracking exact location of the Route mobiles/QRTs/ Striking forces and their movement to ensure that they are constantly on the move.
- Immediate information to the Control Room in case of any disturbance anywhere through turning RED on screen or through notification or phone.
- Location and dispatch of QRTs/Striking forces nearest to the Polling station having disturbance and they can be instructed on phone/VHF set to immediately rush to the troubled spot.
- The movement of the QRT/Striking force after instructions are given to them to go to an area can be observed live on the map. This ensures minimal response time in case of any emergency.

Operational Impact During Elections:

SAMARTH App was used successfully by around 2600 police personnel on the poll and post polling days, during filing of nominations, campaigning period and counting and post counting days for General Elections. It was instrumental in helping track movement of police personnel and QRTs/Striking forces on the poll day in the Control Room. SOS button was pressed at 74 different locations on the poll day by police personnel posted at Polling Stations. Immediately on the press of SOS button, Control Room observed it on the map and from the SOS notification, contacted the concerned police personnel who had pressed the SOS button, got details of the problem at the concerned PS and took necessary corrective action to resolve it. In most of the cases, there was some gathering happening in the proximity of the PS or some dispute between polling agents present at polling stations which could not be resolved by the police personnel present at the PSs. Immediately, the nearest Route Mobile or QRT was directed to go to the PS and disperse the crowd or resolve the dispute. This was very helpful in resolving the issues at an early stage and prevented them from growing into bigger issues which might have been very difficult to resolve later. By digitizing officer location, duty verification, and distress response, the app reduced information lag and minimized reliance on wireless communications. Supervisory officers monitored field activities without needing to physically travel across polling stations. This not only improved accountability but also optimized resource use.

At one of the Polling stations in Chirala Assembly Constituency, two contesting candidates with history of strong political rivalry and criminal background came face to face. They had a large number of their supporters and henchmen with them. There was an argument between the two groups. The police personnel present there felt that they could not control the problem and disperse the crowd with the force available with them, so they pressed the SOS button. Control Room responded immediately and 2 Route Mobiles, 2 QRTs and 1 Striking force were dispatched immediately to the spot and the crowd was dispersed and the situation was brought under control. Intelligence alerts and instructions regarding elections were

also sent through Push notifications to the police personnel using the app, which helped in timely dissemination of information to all. Samarth App played a very important role in ensuring that the election process is peaceful and the entire process was completed without any major incident. Due to constant monitoring through this application, entire force of more than 2600 was observed from the time they reported for duty at any location for election related duties till poll arrangements were successfully closed. The application helped in managing law and order situations successfully with speed and efficiency.

The app was also adopted by Chief Electoral Officer, AP, for real time monitoring of route mobiles responsible for distribution and replacement of EVMs on the election day throughout the state. The app was also recommended to be used by District Police of other districts for efficient force management by CEO, AP, after which it was adopted by 6 other districts of AP.

Post-Election Relevance and Scalability:

Beyond elections, the Samarth App holds significant promise for everyday policing. SHOs can use the app to monitor beat patrols, ensuring that constables cover all assigned points, particularly in vulnerable or remote areas. During major events, processions, or festivals, the app can help track personnel movement and enable centralized supervision.

Moreover, modules such as digital petition management and in-app document access can improve service delivery, reduce paperwork, and enhance field officer efficiency. With minor modifications, the app could be scaled across districts or throughout the state.

Conclusion and Recommendations:

The successful deployment of Samarth App reinforces the idea that law enforcement must embrace home-grown, context-specific technological innovations. District-level solutions like Samarth provide agility, customization, and rapid deployment. Their development also encourages ownership and innovation within the police force.

However, challenges remain. Sustained use beyond elections requires institutional support, periodic training, and integration with existing systems.

Samarth App represents a significant effort in embedding technology within district-level policing to enhance accountability, situational awareness, and crisis response. Its success during the 2024 General Elections in Bapatla District demonstrates that with the right leadership, training, and technological vision, grassroots police units can drive meaningful digital transformation.

Author's Profile:

Vakul Jindal is a 2016-batch Indian Police Service (IPS) officer currently serving as Superintendent of Police, Vizianagaram District, Andhra Pradesh and a graduate in Computer Science Engineering from IIT Delhi.

Notably, he was the first SP of the newly formed Bapatla District, where he spearheaded innovative initiatives like the development of the Samarth App for efficient police force management during elections. His tenure in Bapatla was marked by a significant reduction in road accidents and enhanced public safety measures. His prior postings include SP of Special Security Group in the Intelligence Department. He has been awarded the Best Electoral Practices Award 2024, DGP's Gold and Silver Commendation Discs and the SKOCH Silver Award for innovation in policing.

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Unearthing the Multi-crore, Inter-state Insurance Fraud- Learnings and Suggestions

Anukriti Sharma, IPS*

Keywords:
Insurance, Insurance Fraud, Insurance Act, IRDAI, RBI, Banking frauds, Aadhaar Identity, Pradhanmantri Jeevan Jyoti Beema Yojana (PMJJBY), Insurance schemes, ASHA workers, Death certificates

Introduction:

Sambhal Police has recently uncovered and acted upon an inter-state, multi-crore organised, insurance fraud network that had been operating in 12 states for more than a decade duping thousands of naive and poor individuals to defraud insurance companies.

The investigation, driven by technical evidence such as CCTV footage, insurance and bank data analysis, and call detail records (CDRs), revealed multiple modus operandi. The case began with life insurance fraud, where the nexus targeted terminally ill or deceased individuals, fraudulently insured them, and siphoned off the entire claim amount. The probe later extended to the general insurance sector, uncovering scams in vehicle loans. Notably, fraudsters also manipulated Aadhaar data using forged documents and tampered biometric devices.

A significant breakthrough was the solving of four murder cases involving poor individuals insured under multiple policies and later killed

* *(IPS 2020) Add SP, Sambhal.*

in staged accidents with unknown vehicles. These cases, previously closed due to untraced suspects, were re-opened and successfully worked out.

The investigation also exposed large-scale fraud in government schemes such as PMJJBY. With the efforts of Sambhal police, 18 FIRs have been registered across Sambhal, Moradabad, Badaun, and Amroha districts till June 2025 and a total of 60 accused have been arrested and 3 have surrendered in these cases. Those arrested include ASHA workers, village secretaries, Pradhans, POS agents, insurance agents, bank managers, investigation company owners etc.

In this paper, the author has explained in detail all the modus operandi which came to light during the investigation. Besides this, an attempt has also been made on the basis of learnings from the cases to identify the various regulatory and operational gaps existing in the Banking, Financial Services and Insurance (BFSI) sector and suggest possible reforms to plug in the same.

Unveiling of The Case:

The case began on the night of 17–18 January 2025, when Sambhal Police intercepted a suspicious black Mahindra Scorpio N carrying two individuals. A search revealed ₹11.45 lakh in cash and 19 debit cards, most not in the suspects' names. Their mobile phones contained numerous insurance-related documents, cancer treatment records, and WhatsApp chats discussing high-value transactions and the division of claim money.

The suspects also carried two ID cards designating them as "Investigating Officer" for separate companies. When questioned, they claimed to be insurance investigators, but chats revealed involvement in claim settlements—raising the question: why would investigators be concerned about claim payouts?

Further inquiry, including chat analysis and verification with nominees, uncovered a vast multi-crore insurance fraud network operating across 12+ states for more than a decade. Based on these findings, FIR No. 13/25 under relevant sections was registered at Rajpura Police Station, marking the beginning of a deeper investigation into one of India's largest organized insurance fraud cases.

Course of Investigation:

Analysis of the data recovered from the accused's phone revealed several key patterns:

- All death claims were filed within one year of policy issuance.
- Health conditions of the life assured were not disclosed during onboarding.
- Despite having access to treatment records, investigators did not disclose the health conditions of the insured in their reports.
- Most causes of death were falsely listed as heart attacks.
- The insured individuals were extremely poor and unlikely to afford the high premiums on their own.
- Mobile numbers in policy documents did not belong to the nominees or insured, but to unrelated individuals unaware that SIMs had been issued in their names.
- Substantial financial transactions were noted among stakeholders.
- Policies were found across major life insurance companies.
- The accused handled investigations across several states—from Gujarat to Assam-primarily focusing on Uttar Pradesh and Uttarakhand.

Based on these findings, notices under Section 94 of BNSS were issued to all insurance companies requesting details of policies issued in the past two years that met the following criteria:

- Policies done in the states of Uttarakhand, Uttar Pradesh, Bihar, Chattisgarh, Jharkhand, Assam, West Bengal, Madhya Pradesh, Rajasthan Gujarat, Delhi, Punjab and Haryana.
- Difference between Risk Commencement Date (RCD) and Date of Death (DOD) is less than one year.
- Claim has been settled.

The data was obtained and analysed on the basis of which more victims were approached and counselled for registration of FIRs against the accused who duped the victims into sharing their documents and fraudulently issued policies in their family member’s names.

Subsequent raids led to arrests and further seizures, including hundreds of passbooks, cheque books, Aadhaar and PAN cards, PMJJBY and other

policy papers, treatment records, and over 20 forged seals of government banks. These recoveries and interrogation of accused unveiled multiple modus operandi, discussed in the next section.

Different Modus Operandi of Nexus:

Through the in-depth analysis of the recoveries made during raids, information given by the insurance companies and interrogation of the accused, following different modus operandi of the insurance fraudsters have come to light. Each modus operandi has been explained with case studies for better understanding.

Insuring the Terminally Ill People:

In this modus operandi, the nexus identifies a terminally ill individual—suffering from cancer, tuberculosis, or any other such disease through ASHA worker or the local Pradhan or touts outside the hospitals and then approach the family, offering financial assistance under the guise of a government scheme. They then deceive the family into providing documents such as Aadhaar, PAN card, etc. and initiate insurance policies and open bank accounts in the nominee's name with the connivance of bank employees. The e-KYC process is also completed under the pretense of routine formalities, without informing the nominee that it pertains to opening of bank accounts.

In most cases, the nominee's Aadhaar address is fraudulently changed to obstruct traceability. SIM cards—obtained using fake credentials—are linked to these accounts. After the insured individual's death, the fraudsters collect the death certificate and treatment records from the family on false grounds, withholding key health records from any potential independent investigation. This conceals pre-existing illnesses, compelling insurers to settle the claim under false pretenses.

Claims are typically filed citing heart attacks as the cause of death. Investigations are often managed by members of the fraud network in collusion with insurance officials. Once approved, the claim amount is siphoned off, as nexus members have complete control over the fraudulently opened nominee bank accounts, and are in possession of their

passbooks, cheque books, and debit cards. Complicit bank employees facilitate withdrawals using forged signatures and self-cheques.
SIM cards used in the scheme are acquired either by paying extremely poor individuals to get SIMs issued in their names or through POS agents, who fraudulently issue duplicate SIMs using genuine customers' biometrics—without their consent or knowledge—facilitating complete control of communications linked to the fraudulent accounts.

Case Study: Subhash

Subhash R/o Bhimpur village, P.S. Dibai, Bulandshahr, was suffering from liver disease due to alcoholism and his survival chances were very low. His family was then approached by ASHA worker who along with other nexus members started the ICICI prudential policy in his name, on 25th April, 2024, in the guise of enrolling for a government scheme. After Subhash's death on 12th, June, 2024, nexus members applied for claim showing that life assured died of heart attack and got Rs 10,27,988.66 in nominee, his wife Sunita's bank account.

Sunita's bank account, activated on 1st June 2024, received ₹10,27,988.66 as an insurance claim on 23rd September and was emptied via two self-cheques on 25th Sept, 2024 and 3rd Oct, 2024. Suneeta, denied the signatures on the cheques, knowledge of the account, or ever visiting the bank. The linked mobile number belonged to an unrelated person. CCTV confirmed the withdrawals were made by nexus members.

Due to complicity of bank managers in the entire fraud, they were apprehended too. They confessed to being part of the nexus for two reasons: commission they got for each fraud and the benefit of meeting new account-opening targets set by their headquarters.

Insuring the Dead Individuals:

The following case study explains the post death insurance policies:

Case Study: Trilok:

During one of the raids conducted for the arrest of the accused, a large number of policy documents were recovered. Among these documents

were several papers related to one Trilok Kumar, son of Khemchand, resident of New Delhi.

The recovered documents in the case of Trilok Kumar reveal a clear attempt to manipulate records for fraudulent insurance claims.

- Emergency Treatment Summary from Rajiv Gandhi Cancer Institute dated 15th June 2024, confirming Trilok Kumar's treatment for cancer.
- A receipt from Nigam Bodh Shamshan Ghat shows his DOD as 19th June 2024 and cremation on 20th June 2024.
- Another cremation receipt issued by the Municipal Corporation of Delhi confirms 19th June, 2024 as DOD and states the cause as cancer.
- Policy bonds of Bandhan Life policy and Edelweiss Life Insurance policy on which RCD is of Sept, Oct.
- Cardiopulmonary arrest treatment related papers including ECG of Govind Ballabh Pant Institute of Post Graduate Medical Education and Research (GIPMER) of patient Trilok Kumar dated 27th Dec 2024.
- Death Certificate of patient Trilok Kumar as issued by GIPMER on which DOD is written as 27th Dec, 2024 and cause of death is written as Cardiopulmonary arrest
- Death certificate issued by MCD which stated 27th Dec 2024 as Trilok's DOD.
- PAN and AADHAAR card of deceased Trilok Kumar and his wife, Sapna.
- Deceased Trilok's and nominee Sapna's CSB bank account's chequebook and debit card.
- SIM of mobile number ******4161, which is mentioned as Sapna's mobile number was also recovered.

Recovered documents revealed that Trilok Kumar, who died of cancer on 19th June 2024, had at least two life insurance policies fraudulently issued in his name after his death. Although his wife was the nominee, her bank account and linked SIM were controlled by the fraudsters. To claim the policies, they forged medical records of GB Pant and falsified the date

of death as 27th December 2024. During the probe, another HDFC Life policy surfaced, under which ₹20 lakh had already been settled based on a manipulated investigation report and forged documents, submitted in collusion with a corrupt investigator.

Insuring Healthy, Young Individuals with Multiple Policies and Murdering them Staging Their Murders as Accidents

Analysis of data from insurance companies and digital evidence from the accused's mobile phones revealed multiple suspicious cases involving numerous insurance policies issued in the names of victims, along with FIRs for accidents involving unidentified vehicles. In each instance, final reports had been filed due to failure to trace the vehicles. This pattern prompted a re-examination, which uncovered that these were not accidents but premeditated murders, staged to claim insurance money. The victims were primarily vulnerable individuals—such as orphans or the specially abled—with no immediate family to question the deaths. Four such murder cases have been uncovered so far.

Case Study: Aman

Analysis of data recovered from one of the accused's phone, revealed total 7 policies worth Rs 2.7 crore issued in the name of one Aman s/o Ramcharan, age 20 years, all of which were started between July-Sep, 2023. There was also an FIR, 345/23, P.S. Rehra, Amroha, which showed that Aman had died due to accident by unknown vehicle on the intervening night of 15th-16th Nov, 2023.

Recovered chat data contained the final report of FIR, a claim document, and Aman's post-mortem report, which revealed four bone-deep lacerations (3x5 cm) on the head, with no other injuries on the body. These findings, along with circumstantial evidence, strongly suggested murder. Sambhal Police, citing these concerns, requested re-investigation through the DIG, Moradabad Range. Consequently, the case was transferred from Amroha to Sambhal, where it was re-opened and thoroughly investigated.

Upon careful examination of all policy and claim documents, the account details of nominee and CDR analysis of suspected numbers, the complainant of FIR and one other suspect were called for questioning who confessed to murdering Aman for insurance money, along with their other accomplices. The accused had managed to fraudulently claim ₹20 lakh from these policies till now.

The same gang also confessed to a 2022 murder of Saleem, killed using the same modus operandi, at the same spot. FIR 206/22 at PS Rehra, Amroha, was closed due to untraced vehicle. As a consequence of this murder, the fraudsters had successfully claimed ₹78 lakh and also admitted to planning another murder, having already insured the intended victim under multiple policies.

Frauds in PMJJBY:

During one of the raids, investigators recovered a large cache of documents linked to PMJJBY, including over 100 passbooks from individuals across north Indian states from Gujarat to Assam. The passbooks had entries of PMJJBY premium deductions. Additionally, 31 death certificates, mostly fake and 18 forged seals from various government banks were seized. Similar material were recovered with other co-accused.

Based on recovered evidence and interrogation, a clear modus operandi emerged.

PMJJBY has only two eligibility criteria: the applicant must be under 50 years of age, and death must occur at least 45 days after policy initiation. Only a death certificate is needed to claim benefits—there is no verification process, which allows room for fraud and manipulation.

Fraudsters exploit this by enrolling deceased individuals retroactively and obtaining manipulated death certificates with false dates. In other cases, they start policies for terminally ill persons and falsify death dates to meet the 45-day requirement. If the person is overage, their age is fraudulently reduced in Aadhaar records. One such case involved Pancham Singh of Sambhal, born in 1955, whose age was fraudulently reduced by 21 years to claim benefits after his death.

Fraudsters were found to be in possession of passbooks belonging to both deceased and nominees, using them to validate PMJJY premium deductions. After claim approval, they withdraw funds—often aided by bank staff or by escorting unsuspecting nominees—retaining most of the amount and giving only 10–20% to the nominee.

Vehicle Insurance Fraud:

A complaint was received at Behjoi Police Station alleging that Vinod, son of Pancham Singh, resident of Bhagnagar, Dhanari, had fraudulently purchased a tractor and motorcycle in the name of the complainant's terminally ill son, Dinesh but took away the vehicles. FIR No. 67/25, P.S. Behjoi, Sambhal, was registered.

Investigation revealed that the accused bought the tractor using Dinesh's name with a minimal down payment and financed the rest through a loan, which was insured by a general insurance company. The tractor was then illegally sold to a third party without proper documentation—no registry transfer or intimation to the financing agency or insurer. Following Dinesh's death, with only a few loan installments paid, the accused filed a claim for loan waiver using Dinesh's death certificates. Dinesh's wife, the nominee, was unaware of the vehicle's existence.

During the recovery of the case tractor, Sambhal Police seized 22 additional tractors from the accused, along with 26 fake registration certificates (RCs) and related forged documents. Furthermore, police discovered three illegal mandis operating in the area, where tractors procured through similar fraudulent means were being sold. Many of these vehicles were sourced from distant states like West Bengal, Maharashtra, Assam, and Chhattisgarh, making them difficult to trace for insurance companies.

Aadhar Fraud:

As a fallout of this investigation, Sambhal Police also busted a gang involved in making unauthorized changes to the original Aadhaar database of cardholders using forged documents and tampered fingerprint and iris

scanning devices. The gang illegally accessed the Aadhaar operator's system by bypassing all security safeguards put in place by UIDAI.

Identified Gaps and Proposed Solutions:

Thorough investigation of this case brought to light systemic gaps and vulnerabilities across various domains within the insurance sector.

Gaps Identified:

1. **Issues at the Insurance companies level:**

- **At the Onboarding Stage:**
  - Policies issued to dead or terminally-ill, extremely poor individuals
  - e-KYC of dead individuals done through impersonator.
  - Numerical targets emphasised by companies instead of quality of the policies issued.
- **At Approval Stage:**
  - Fraudulent claims settled -> Collusive corruption at the claims approval desk.
  - Section 45 of Insurance Act which mandates settling of claims after 3 years even if the case seems suspicious
  - Procedural issues like approving the policy in dearth of medical records, completing investigation within 45 days of initial claim intimation etc.
- **Lack of Coordination Between the Companies:**
  - Multiple policies being issued to individuals incapable of paying such high premiums and within short span of time -> not red-flagged by Insurance Information Bureau (IIB)
  - No fraudster registry being maintained -> IIB not red flagging the applicants / employees / investigation companies using various APIs, neither ensuring coordination between companies.

2. Investigation Related Issues:

- There are no norms, no regulation for the investigation agencies, no eligibility conditions for the investigators, no verification done before employing them.
- No provision for legal record fetching for investigators leading to unethical practices.
- Reports submitted by investigators have no evidentiary value in court. Falsified reports filed in most cases.
- Low investigation fees increasing risk of collusion.

3. Banking Related Issues:

- Fraudsters exploited lenient regulations in small banks to open accounts for LAs and nominees.
- **Gross violation of banking norms found in e-KYC, cheque settlements** etc as can be seen in case of Trilok whose account was opened after his death or Subhash's case where cash was withdrawn through self cheques signed and submitted by third party. Addresses on Aaddhar used for KYC were also manipulated by fraudsters.
- Accounts remained active after death leading to misuse.
- Focus of bank managers and business developers on **meeting the numerical target of "new accounts"** even at the cost of integrity of these accounts.
- Most of the accounts were found **active for a very short period** - between start of policy and claim settlement.
- Low salaries, lack of ethical training, and absence of legal accountability seems to have contributed to private bank managers' involvement in corrupt practices.

4. Identity and Documentation Related Issues:

- Death certificate related issues include fake death certificates, corruption in issuance, and lack of standard procedures to verify date of death.
- Forged and manipulated Aadhaar and PAN Cards are being made and used.

- Aadhar being used as proof of age in PMJJBY
- Investigators procure health records of life assured or insured person through bribing of medical record keepers, no mechanism to ensure sharing of data.

5. **Issues Related to Coordination With Law Enforcement Agencies:**
   - No formal mechanism of coordination between insurance companies, banks and law enforcement agencies
   - Police investigations did not routinely consider insurance fraud as a motive in accidental death cases due to lack of awareness and communication by insurance companies.
   - Lack of training to deal with financial frauds of this nature.

6. Issues in PMJJBY:

- Policies were issued post-death or during ineligible periods using false documentation.
- Duplicate policies were created to increase pay-out chances
- Claims were processed based only on death certificates which could be forged too.
- Use of Aadhaar as age of proof and fraudulent manipulation of Aadhaar to meet eligibility conditions leading to issuance of policies to ineligible customers.

Proposed Solutions:

1. **Insurance sector related (Insurance, IRDAI, IIB etc):**
   - Mandatory video KYC need to be implemented at policy issuance and claim settlement stages, including the agent, insured and the nominee.
   - System generated, r**andom physical verification of selected applicants** before issuance of policy especially for high-risk applicants or vulnerable demographic profiles.
   - **Mandatory checking of "policy history" from IIB** before issuance of policy.

- Develop and enforce uniform SOPs and checklists for onboarding customers across all insurance providers.
- IIB must enhance data sharing, flag high-risk policies and accountability needs to be fixed in case of fraud occurrence.
- **CIBIL scores** for insurance need to be brought in.
- **Fraud repository needs to be mandatorily maintained and shared with all stakeholders.**
- All companies must be legally bound to share data with IIB so as to provide information on real time basis.

2. Investigation related:

a. Licensing system for Investigation companies needs to be brought in or the insurance companies can have Separate Investigation Team.
b. Mandatory criminal antecedent checks for both companies and its investigators.
c. Implement auto-allocation of cases to investigators to eliminate discretion, regular relocation of vendors to different areas.
d. Preparation of Standardised SOPs and checklists for Investigations.

3. Banking Sector (Banks, RBI):

- Monitor bank accounts with short activity periods and high-value transactions and branches with abnormal account openings or claim transactions.
- Linking of bank accounts with death registry
- Strengthening of regulatory norms of small finance banks.
- Review KYC procedures. Verify mobile number ownership and Aadhaar update history of accounts via APIs
- Surprise and random checking of settled cheques through verification from account holders by third parties.
- Human Resource Management: Revisit hiring processes, mandate criminal background checks, maintain and share blacklist, revise salaries, provide ethical training, and ensure strict legal action against corrupt practices.

4. Identity and Documentation Systems - UIDAI, Registrar General of India (RGI):

- Link Aadhaar and death certificate to automate deactivation upon death.
- Using AI to verify authenticity of death certificates, at least QR coded ones. Standardised procedure to be developed for issuance of death certificates.
- Fetch official death certificates directly from Civil Registration system portal using APIs.
- Disallow Aadhaar as sole age proof for insurance schemes.
- Mandate access to Aadhaar update history during onboarding for banking, insurance etc.
- A legal, formal mechanism for sharing of health records of life assured need to be devised.

5. Law Enforcement Integration: Ministry of Home Affairs

- Formalise coordination between insurance companies and law enforcement agencies: Lead Insurance Managers like Lead Bank managers can be deployed at least for a group of districts.
- Create district level SITs to investigate BSFI sector crimes and state level SITs for inter-dist and inter-state coordination.
- SOPs and checklist need to be made for such investigations.
- Add insurance related prompts in FIR templates for all sudden deaths
- Nominees should prima facie be seen as victims and not accused.

6. PMJJBY and Govt Schemes – DFS:

- Disallow solely Aadhaar based verification.
- DC and Aadhar related reforms as stated above need to be brought in.
- Video KYC with nominee at claims settlement stage whether s/he is aware of the policy, its total amount and the account in which the amount would be credited.
- Establish real-time coordination between banks for duplication checks.

7. Miscellaneous:

- Awareness and training related suggestions: Campaigns like "Achha kıya, insurance liya" of DFS to be necessarily carried out in rural areas.
- A centralised fraud portal can be established to consolidate and share learnings from all insurance fraud cases.
- Setting up of committee to bring reforms in the Insurance Act in light of the recent frauds to strengthen regulatory and fraud risk framework, Revisiting Section 45.
- **Regulation of POS agents** and effective action against those involved in fraudulent issuance of SIM cards.
- Reducing discretion, increasing use of AI, API and Data analytics in insurance sector operations and management.
- Fraudsters exploit March rush; enforce stricter claim checks during year-end to prevent misuse.

Conclusion:

According to the Economic Survey 2024–25, India's insurance sector is projected to be the fastest-growing market among G20 nations over the next five years (2024–2028). Alongside this, government-backed schemes like PMJJBY—aimed at providing accessible and affordable insurance to the poorest segments of society—are expected to expand significantly in both reach and coverage. As of 1st February 2025, PMJJBY had enrolled 22.52 crore individuals, with ₹17,600 crore disbursed against 8.8 lakh claims.

In light of the scam as worked out in Sambhal and considering these statistics, it would not be wrong to say that financial inclusion without a strong fraud risk framework is nothing but a perfect recipe for large scale frauds which can severely undermine public trust, financial inclusion, and national security.

The Sambhal case also exposed murders committed solely for insurance claims—crimes that could have been prevented with an effective fraud detection framework. Innocent, impoverished nominees are often exploited and wrongfully implicated, despite no role in the conspiracy.

Therefore, such exposures highlight the urgent need to strengthen fraud risk management—not just as a regulatory necessity but as a moral obligation to protect lives and uphold financial integrity.

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Police Communication for Ensuring Public Safety and Efficient Crisis Management

J. Sreenivasa Rao*

Abstract:

This paper presents an overview of the advanced communication systems implemented by the Telangana Police to enhance operational efficiency and public safety. Traditional High Frequency (HF) Morse code for messaging and Voice communication, Very High Frequency (VHF) and Ultra High Frequency (UHF) two-way radio systems form the foundation of police communication, enabling real-time voice exchange between officers and control rooms, especially during emergencies. To address coverage gaps and improve efficiency, Telangana Police have adopted digital communication systems and used tools like Radio Mobile Online for repeater site planning and line-of-sight analysis. In urban environments like Hyderabad, UHF trunking ensures better penetration and also interlinking VHF and UHF networks ensures seamless connectivity reducing the grey area. Furthermore, the integration of wide band LTE-based Push-To-Talk over Cellular (PoC) technology with existing VHF network ensures reliability, flexibility and robust communication for law enforcement during emergency situations.

Keywords:

Push-To-Talk over Cellular (PoC), Universal Asynchronous Receiver Transmitter (UART), VHF, UHF, Trunking

*DIG (Commns), Telangana Police Hyderabad

1. Introduction to Police Communications:

Police Communication is a radio system used by police to communicate with one another. It is the primary tool that allows officers to communicate in real-time, share vital information and call for backup or emergency services. Police radio systems almost always use two-way radio systems to allow for communications between police officers and Control Roomsin emergency situations like Natural Disasters, Terrorist Threats etc.A two-way radio is a radio transceiver (a radio that can both transmit and receive radio waves), which is used for bidirectional voice communication with other users by using Radio frequencies. The most common two-way radio systems operate in the VHF and UHF parts of the radio spectrum.

2. Various RF Bands in Communication:

HF (High Frequency), VHF (Very High Frequency), and UHF (Ultra High Frequency) are three distinct bands in the radio frequency (RF) spectrum, each with unique characteristics, applications, and limitations in communication. Here's an overview of each:

2.1 HF Communication:

HF signals can travel long distances by reflecting from the ionosphere. The HF signal frequency ranges from 3MHz to 30MHz with wavelength 10 to 100 meters.

Advantages:

- It is useful for long distance communication.
- Low Infrastructure requirements by setting up with simple antennas and radio equipment making it ideal for remote or undeveloped areas where there is no other mode of communication.
- Lower setup and operational costs compared to satellite or cellular systems.
- HF can operate independently of modern infrastructure, which is valuable in disaster recovery or military scenarios.

Disadvantages:

- Due to changes in Ionospheric conditions there will be fluctuations in voice clarity.

- Prone to natural(lightening) and man-made interferences.
- Requires large antennas as its wavelengths are longer.

2.2 UHF Communication:

UHF signals have shorter wavelengths and require a clear line of sight. UHF has better penetration into buildings and obstacles compared to VHF. The UHF signal frequency ranges from 300MHz to 3GHz with wavelength 10 Cm to 1 meter.

Advantages:

- It has better penetration in Urban Environments.
- It requires smaller antennas as it has shorter waves than VHF.
- It has wider frequency range, hence providing more channels than other bands.

Disadvantages:

- UHF doesn't travel as far as VHF and HF signals.
- It is easily affected by obstacles.
- It has more attenuation in signals while raining or humid conditions.

2.3 *VHF Communication:*

In Very High Frequency (VHF) communication, we use both Analog and Digital technologies in two-way radios. Basic Equipment for VHF communication is

1. Repeater –The repeater receives and re-transmits the signal .
2. Base Set – Transmits/Receives signal.
3. Hand-held Sets - Transmits/Receives signal.

The VHF communication purely depends on Line of Sight which means all handheld and base sets should be in Line of Sight with the repeater.

2.3.1 Analog VHF Communication:

Analog VHF communication remains essential in various scenarios due to its unique advantages and practical value.

- Analog VHF radios are cheaper and easy to establish &maintain.
- Interoperability with legacy equipment.

- Low latency and real-time feedback.
- Eases coordination during emergencies where mixed radio systems are in use.

2.3.2 Digital VHF Communication:

Digital VHF communication systems offer several benefits over analog systems, particularly in terms of performance, efficiency, and functionality. Here's a breakdown of the key advantages of digital VHF communication:

- Better Spectrum Efficiency.
- Text messaging and datatransmission: Send & short messages, GPS location, and other data alongside voice.
- Encryption and privacy: Digital encryption ensures secure communication, ideal for police, military.
- Caller ID and group calls: Easily identify users and organize communication groups.
- Interoperability with IT systems: Digital radios can connect to dispatch software, recording systems, or even integrate with IP networks.
- Roaming capabilities: Some digital systems allow radios to switch between repeaters or sites automatically.

Advantages of Digital over Analog Networks:

- In Digital, the spectrum can be utilized efficiently as it provides two slots with one pair of frequencies.It allows doubling the capacity of existing 25 KHz channel which can lower licensing costs.
- Digital performs better even at the far edges of coverage. Built-in error correction helps eliminate the static, background noise, and voice distortion that can occur with analog radios as you reach the limits of coverage.
- Digital Mobile Radio (DMR) is more secure with Advanced Encryption Standard (AES) 256-bit encryption for both voice and data.
- DMR has more features like GPS tracking, Group calls etc.

Limitations in VHF communication:

- The VHF signals has poor building penetration compared to UHF signals.
- It is dependent on Line of sight communication.
- Most likely to be affected by terrain.
- Limited channel availability.
- It is Less secure(unencrypted).

3. Advancements in Telangana Police Communications:

The Telangana Police Information Technology &Communications (IT&C) Organization have been actively modernising the police communication systems by using various technologies like UHF Trunking system, PTT over Cellular(PoC), Digitalization of existing Analog networksetc. to enhance operational efficiency, security and coordination across the state. The various advancements adopted in Telangana Police Communication:

3.1 Radio Coverage Mapping:

Radio Mobile Online is a software tool used to predict the performance of a radio system. It uses digital terrain elevation data for automatic extraction of path profile between an emitter and a receiver. The software also provides 3D views, stereoscopic views, and animation.

Advantages:

- This tool can be used in identifying suitable sites for Repeater installation.
- It can be used to map the coverage area of Radio Network in PC without physically installing the Repeater.
- The terrain can be mapped for verifying Line of Sight between two locations.
- With this we can save time, man power and money.

Limitations:

Parameters like Line loss cannot be defined accurately. Hence the coverage mapped using this tool may vary slightly with the actual coverage.

Telangana Police IT&C is using this tool to identify suitable sites for repeater installations, analyze radio network coverage by simulating repeater site locations and verifying Line of Sight using terrain data. It gives valuable insights without physical deployment for providing better communication to the police personnel to ensure public safety and efficient crisis management.

3.2 UHF Trunking system in Hyderabad Police Commissionerate:

A trunking system refers to a communication method, primarily used in radio and telecommunication systems, that efficiently shares a set of communication channels (frequencies or lines) among a large number of users. Instead of assigning a dedicated channel to each user (which is inefficient), a trunking system dynamically allocates channels as needed. The advantage of trunking system is the centralized system manages and balances load, so no single channel gets overloaded, allows multiple users to share a limited number of channels. The Hyderabad Police Commissionerate has the jurisdiction over the city Hyderabad, the capital of Telangana state. The UHF Trunking system is being used in Hyderabad Police Commissionerate as it has better penetration in densely populated urban environments.

3.3 Interlinking of VHF and UHF Communication:

The Hyderabad Police Commissionerate is presently functioning on UHF Communication Network. The black spots/uncovered area is covered by VHF Network. To ensure seamless connectivity, both networks are interlinked by bridging UHF and VHF base stations. As the city continues to grow and face complex security challenges, such technological advancements are crucial in ensuring public safety and efficient emergency response.

3.4 Digitalization of VHF Network in Telangana:

Telangana Police has converted the Analog VHF Network of Rachakonda Commissionerate into Digital Network. The communication in four zones of Rachakonda Commissionerate is functioning in Digital mode.

Each zone is covered by multiple repeaters to provide effective communication. These repeaters in each zone are linked using UART

Patching to operate as wide area network. Hence, by linking the repeaters in Digital mode, we are providing seamless communication with roaming among the repeater coverage areas without changing the channel manually.

Additionally, the Microwave network is also established as redundant link to the UART patching to enhance the stability in communication for effective Policing.

3.5 Long Term Evolution (LTE)/PTT Over Cellular (PoC) Radios:

Unlike traditional radios (VHF/UHF), LTE radios operate on cellular networks using internet. LTE radios are increasingly used in mission critical communication for police. PoC radios uses a software application for exchanging communication with the other PoC radios over the Internet. There are various PoC applications such as ZELLO, TASSTA, STELE etc providing communication services Using Internet.

3.5.1 ZelloPoC Application:

Zello is a software application developed by US based company for providing Push To Talk (PTT) communication and various Data Services using cellular network (3G/4G/5G). Zello user application is available for Android and iOS devices. It functions like a walkie-talkie over the Internet.

Implementation of Zello Application in Telangana:

As part of implementation we have acquired 500 user licenses and 50 groups including all admin controls viz., creation and modification of groups with their permissions. Under trial basis, we created groups among IT&C staff for all the districts in Telangana.

Features:

- Zello Application works over Wi-Fi and Cellular Data.
- It has a facility of voice calling feature to an individual or to a group.
- Message services (Individual text, Group Text, Image sharing).
- Mapping and Tracking the location, sharing the location.
- User Management and Authentication (user creation, deletion etc).

Advantages:

- Long-distance communication can be achieved.
- Consists of efficient tracking capabilities.

- Messaging services like sharing Texts, Images etc.
- No need for big antenna systems and communication is not dependent on Line of Sight.
- Can be linked with existing VHF/UHF networks through a gateway.
- Multiple VHF/UHF networks can be merged by bridging with Zello application.
- Integration with existing VHF/UHF networks provides long-distance communication with enhanced coverage.
- No spectrum charges.
- Free User Licenses for First Responders with no spectrum charges.

Limitations:

- It is dependent on Third-party for data.
- Data congestion problems in overcrowded areas.
- The communication is dependent on Signal availability and Internet Connectivity.
- Small delay is present in the communication.

Integration with Existing VHF network:

Police IT&C Organization of Telangana has prepared a Bridge for integrating VHF network with Zello Application to utilize the benefits of VHF Network and PoC technology simultaneously. The existing Police VHF Networks of all Districts/Commissionerates in Telangana State are linked to the Zello Application using this Bridge for providing end-to-end communication throughout the state. Therefore, the integration of PoC with VHF communication network in the Telangana Police forces represents a significant advancement in public safety communication.

3.5.2 TASSTA PoC Application

TASSTA stands for **Ta**lk Me**SS**age da**TA**. It is a software application developed by German based company for providing **P**ush **T**o **T**alk (PTT) communication and various Data Services using cellular network (3G/4G/5G). It functions like a walkie-talkie over the Internet. TASSTA user application is available for Android and iOS devices.

Implementation of TASSTA Application in Telangana:

Telangana Police acquired Licensed PTT over Cellular solution named "TASSTA" Application and with Server and its Setup installed at Telangana Police Headquarter premises. Only 20 user licenses, 2 Dispatcher and 2 PoC to VHF Bridge Licenses were obtained on trial basis.

Features:

- TASSTA Application works over Wi-Fi and Cellular Data
- It has a facility of voice calling feature to an individual or to a group.
- Message services (Individual Text, Group Text, Image sharing, video sharing).
- Map and Tracking (Location and sharing, Guard Tour, Geo-fencing).
- User Management and Authentication(user creation, deletion etc.).
- Emergency services (Emergency Call, SOS, Alerting Users).
- Lone worker Protection.
- Dispatcher services (Dynamic Grouping, History, Location and Monitoring, GaurdTour, Geo-fencing, GPS History Tracks).

Advantages:

- Long-distance communication can be achieved.
- Consists of efficient tracking capabilities.
- Messaging services like sharing Texts, Images etc.
- No need for big antenna systems and communication is not dependent on Line of Sight.
- TASSTA communication can be linked with existing VHF/UHF networks through a gateway.
- Dynamic Grouping feature allows merging of multiple VHF Bridge networks.
- Integration with existing VHF/UHF networks provides long-distance communication with enhanced coverage.
- No spectrum charges.
- It provides additional security using customizable encryption key.

Limitations:

- It is dependent on Third-party for data.
- Data congestion problems in overcrowded areas.
- The communication is dependent on Signal availability and Internet

Connectivity.
- Small delay is present in the communication.

Integration with Existing VHF network:

Police IT&C Organization of Telangana has obtained 2 software bridges for integrating VHF network with Zello Application to utilize the benefits of VHF Network and PoC technology simultaneously. Further, the existing Police VHF Networks of all Districts/ Commissionerates in Telangana State can be linked to the TASSTA communication by acquiring required number of Software Bridge licenses for providing end-to-end communication throughout the state.

3.6 Conclusion:

The Communication plays a vital role in exchanging information by police personnelduring Bandobast duties, Natural disasters and also performing the regular duties. The Telangana Police IT&C Organization have been actively modernising the police communication systems to enhance operational efficiency, security and coordination across the state. Recognizing the limitations of Analog networks, including susceptibility to noise, limited range and lack of advanced features, the organization has initiated a transition to Digital Communication Technologies. The shift from Analog to Digital communication system has significantly enhanced Telangana Police's ability to respond to incidents effectively.

Further, the integration of PoC with VHF Communication Network in Telangana Police System marks a significant step towards modernising Law Enforcement operations. This hybrid approach combines the extensive coverage of VHF systems with versatility of PoC, enhancing operational efficiency and responsiveness.

Hence, the integration of these systems with centralised command centres further strengthens the state's law enforcement capabilities, ensuring better public safety and efficient crisis management.

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Psychotropic Substances: Trends, Patterns, and Challenges in India

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Abstract:

Psychotropic substance-related crimes are an ongoing issue in the contemporary world, and they have escalated into a serious problem in India. These issues are particularly prevalent in the North-East, North-West, and South-West regions of the country, primarily involving Amphetamine Type Stimulants (ATS) and New Psychoactive Substances (NPS). Psychotropic substances fall under the Narcotic Drugs and Psychotropic Substances (NDPS) Act of 1985. The objective of this study is to examine psychotropic substance-related crimes in India. This paper attempts to address the trends, patterns, and challenges associated with psychotropic substances in the country. A descriptive study design uses data from the Narcotics Control Bureau and the Ministry of Home Affairs, Annual Report, published by the Government of India. The data, covering the years 2011 through 2020, has been subjected to statistical analysis. The North-East, North-West, and South-West regions of the country are major trafficking routes for Amphetamine Type Stimulants and New Psychoactive Substances. Despite strict laws and control of the sale, distribution, purchase, and storage of some drugs, there is evidence that psychotropic substances are being diverted. Drug law enforcement officers

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must keep abreast of current drug trafficking trends, patterns, and the transition from legal to illegal psychiatric drugs. Therefore, to effectively combat the overuse and abuse of psychotropic medicines in India, coordinated and focused actions are essential.

Keywords:
Psychotropic Substances, Amphetamine Type Stimulants (ATS), New Psychoactive Substances (NPS)

Introduction:

According to Section 2 (xxiii) of the Narcotic Drugs and Psychotropic Substances (NDPS) Act of 1985, a psychotropic substance refers to any substance, whether natural (or) synthetic, (or) any natural material, (or) any salt (or) preparation of such substance (or) material included in the list of psychotropic substances specified in the Schedule (NDPS Act, 1985). The Narcotic Drugs and Psychotropic Substances Act of 1985 classifies psychotropic substances into two categories: Amphetamine Type Stimulants (ATS) and New Psychoactive Substances (NPS).

Synthetic pharmaceuticals can be produced anywhere in the world. Unlike Heroin and Cocaine, they do not rely on the extraction of active ingredients from plants that must be grown under controlled conditions and require cultivation (AR-NCB, 2016). Precursor chemicals are used in the illegal production of synthetic drugs from natural materials. These chemicals are highly adaptable to covert manufacturing, and various precursor chemicals are employed (GSDA-UNODC, 2017). The use of synthetic substances is one of the biggest drug issues in the world today. Amphetamine Type Stimulants are the second most popular substance globally, after cannabis. The continued development of New Psychoactive Substances, along with Amphetamine Type Stimulants, presents a growing challenge to drug control agencies worldwide (GSU-UNODC, 2018).

Objective:

The objective of this study is to examine psychotropic substance-related crimes in India. This paper attempts to address the trends, patterns, and challenges associated with psychotropic substances in the country.

Methodology:

A descriptive study design uses data from the Narcotics Control Bureau and the Ministry of Home Affairs, Annual Report, published by the Government of India. The data, covering the years 2011 through 2020, has been subjected to statistical analysis using Microsoft Excel.

Results and Analysis:

Amphetamine Type Stimulates:

Amphetamine Type Stimulants are a class of synthetic stimulants that include substances such as "Amphetamine, Methamphetamine, Methcathinone, Methaqualone, Mephedrone, and Ecstasy-group compounds" (for example, 3,4-Methylenedioxymethamphetamine (MDMA) and its analogs). Amphetamine and Methamphetamine are sympathomimetic amines, with Amphetamine's pharmacological properties being used to treat attention deficit hyperactivity disorder (ADHD) and narcolepsy. Ecstasy (MDMA) exhibits both stimulant and hallucinogenic psychoactive effects. "Ecstasy" pills vary in content, with some containing little to no MDMA, others having high doses of pure MDMA, and Ecstasy is also sold in powder (or) crystal form under various street names (GSDA-UNODC, 2017).

Amphetamine and Methamphetamine:

Amphetamine, chemically similar to Ephedrine, is available in both racemic and dextro forms. In terms of cerebral effects, the d-isomer is three to four times more potent than the levo form (Satoskar, 2011). Amphetamine and Methamphetamine are sympathomimetic amines and recreational drugs with similar chemical structures. Because Methamphetamine is easier to pyrolyze and smoke, and because it produces less norepinephrine than the other two drugs, users frequently

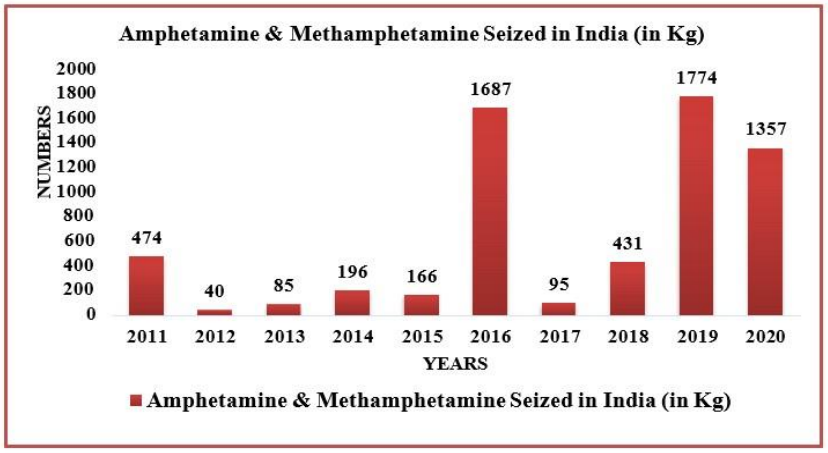
prefer it. According to Brenner (2010), "ice" (or) "crystal meth" is the term used to describe the freebase form of Methamphetamine that has been pyrolyzed, extracted using ether, and smoked.

Methaqualone:

Methaqualone is a sedative and hypnotic medication that, like benzodiazepines and barbiturates, enhances the activation of Gamma-Aminobutyric Acid (GABA) receptors in the brain and nervous system. Under the brand name Mandrax, Methaqualone is sold as a combination medication that contains 250 mg of Methaqualone and 25 mg of Diphenhydramine per tablet. Methaqualone is one of the most commonly abused recreational drugs. Mandrax tablets are illicitly produced in India, often in unsanitary conditions. Despite its widespread abuse, Methaqualone has no legitimate medicinal use (Satoskar, 2011).

Figure 1

Amphetamine and Methamphetamine seized in India from 2011 to 2020



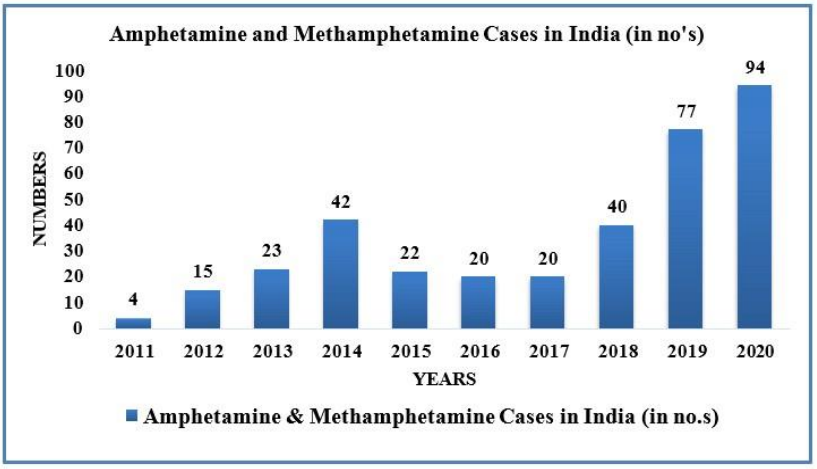
Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 65), 2016 (p. 82), 2017 (p. 80), 2018 (p. 76), 2019 (p. 92), and 2020 (p. 97).

Figure 1 illustrates the quantity of Amphetamine and Methamphetamine seized over the last decade. A closer examination reveals that the decade began with a rise in seizures, followed by a significant decline over the

next two years. However, starting in 2014, there was a gradual increase in seizures, culminating in a major bust of 1,687 kg in 2016. Interestingly, the

Figure 2

Amphetamine and Methamphetamine cases in India from 2011 to 2020



Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 65), 2016 (p. 82), 2017 (p. 80), 2018 (p. 76), 2019 (p. 92), and 2020 (p. 97).

subsequent two years showed a sharp decline, which was then followed by a steep rise, with 1,774 kg seized, before closing the decade with 1,357 kg. The trend indicates that drug busts do not follow a consistent pattern and fluctuate over time.

Figure 2 illustrates the number of cases involving Amphetamine and Methamphetamine reported over the last decade. The graph shows that 2011 recorded the lowest number of cases, with only 4, followed by a gradual increase over the years. Between 2013 and 2017, the number of cases remained relatively stable, ranging from 20 to 23, except for 2014, which experienced a sharp rise to 42 cases. The later years, particularly 2019 and 2020, recorded the highest number of cases in the decade, with 77 and 94 cases, respectively. While the number of cases fluctuates and lacks consistency, there has been a significant upward trend, with cases steadily increasing as the years progressed.

Table 1

Amphetamine and Methamphetamine Seizures, Cases, and Arrests Region-wise in India from 2016 to 2020

Regions	Details	2016	2017	2018	2019	2020
North Region	**Quantity**	13.77	3.47	35.82	138.81	103.07
	Cases	4	5	•	•	•
	Arrests	7	9	•	•	•
East Region	**Quantity**	2.01	12.00	459.79	1611.92	1121.15
	Cases	3	2	•	•	•
	Arrests	4	1	•	•	•
South West Region	**Quantity**	1670.90	79.35	22.00	23.31	132.75
	Cases	13	13	•	•	•
	Arrests	26	17	•	•	•
Totals	**Quantity**	**1686.68**	**94.82**	**517.61**	**1774.04**	**1356.97**
	Cases	**20**	**20**	**40**	77	**94**
	Arrests	**37**	**27**	•	•	•

Note: **(•** = Not Reported).

Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 66–68), 2016 (p. 85–86), 2017 (p. 84–85), 2018 (p. 80), 2019 (p. 98–99), and 2020 (p. 100–102).

Table 1 presents data on the quantities of Amphetamine and Methamphetamine seized over five years, starting from 2016, along with the number of cases reported and arrests made during 2016–2017, categorized by regions. In 2016, the South West region recorded the highest amount seized, with 1,670.90 kg, ranking it first in terms of quantity seized over the five-year period. This was followed by the North region and then the East region, with a significant gap between the amounts seized. In 2017, the South West region experienced a substantial drop in the amount seized, although it still ranked highest that year. The East region saw a slight increase, from 2.01 kg to 12 kg, while the North region recorded the lowest amount seized. From 2018 to 2020, a shift in the trend occurred, with a significant increase in the amounts seized in the East region, followed by the North region, while the South West region experienced a decline. The overall analysis shows a pattern shift from the South West region to the East and North regions over the given time frame.

In 2016, the South West region recorded both the largest amount seized and the highest number of cases reported, with 13 cases, followed by the North region with 4 cases and the East region with 3 cases. The South West region maintained consistency in the number of cases reported in

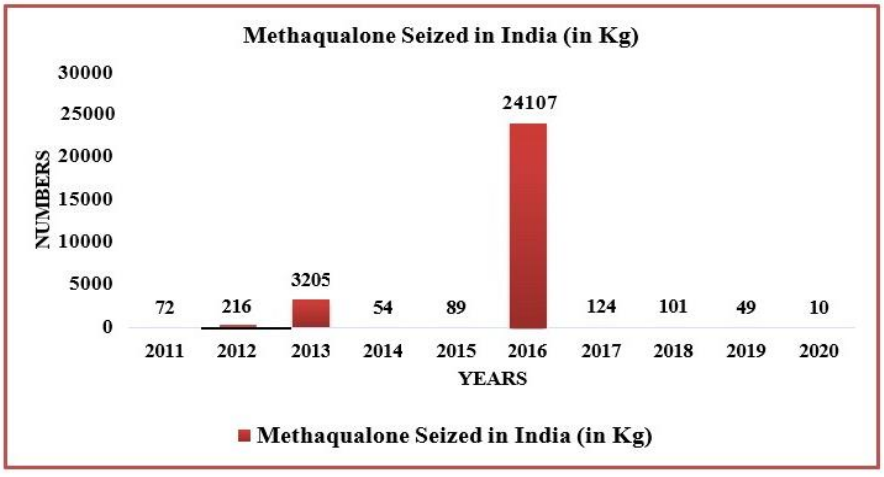
2017, followed by the North region with 5 cases and the East region with 2 cases. There were no notable changes in the pattern of cases reported as the years progressed. In 2018, 2019, and 2020, the state-wise data on Amphetamine and Methamphetamine cases were not reported.

In 2016, the South West region recorded the highest number of arrests, with 26 arrests, followed by the North region and the East region, with 7 and 4 arrests, respectively. In 2017, there was a slight decline in arrests in the South West and East regions, with 17 and 1 arrest, respectively, while the North region saw a slight increase, with 9 arrests. The data shows that the number of arrests made within each region is generally consistent with the amount seized, with no significant shift in the pattern. In 2018, 2019, and 2020, the state-wise data on Amphetamine and Methamphetamine arrests were not reported.

The overall analysis indicates that 2019 saw the highest amount seized, with 1,774.04 kg, and the number of cases increased as the years progressed. However, the number of arrests made saw a slight decline.

Figure 3

Methaqualone seized in India from 2011 to 2020

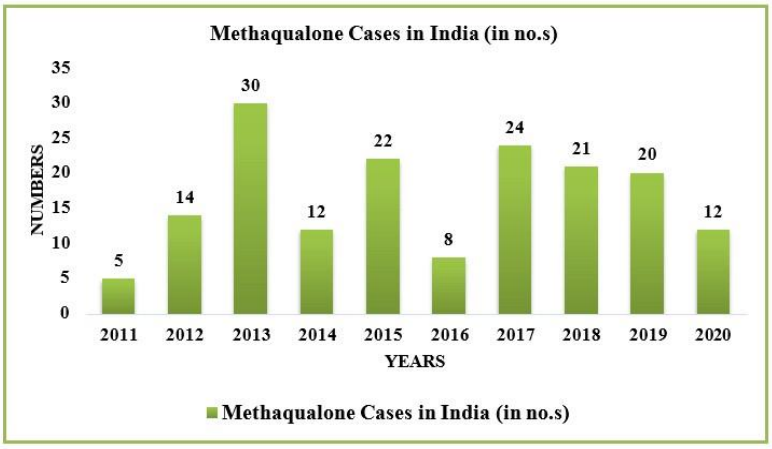


Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 65), 2016 (p. 82), 2017 (p. 80), 2018 (p. 76), 2019 (p. 92), and 2020 (p. 97).

Figure 3 illustrates the quantity of Methaqualone seized over the last decade. The data shows no consistent pattern, with the amounts fluctuating significantly. From 2011 to 2015, the amounts seized remained relatively stable, with a slight increase in 2013. However, 2016 experienced a dramatic surge, recording the highest amount seized during the decade at 24,107 kg. In contrast, the subsequent years from 2017 to 2020 saw a notable decline, with only 10 kg seized in 2020 - the lowest amount recorded during the given period.

Figure 4

Methaqualone cases in India from 2011 to 2020



Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 65), 2016 (p. 82), 2017 (p. 80), 2018 (p. 76), 2019 (p. 92), and 2020 (p. 97).

Figure 4 illustrates the number of Methaqualone cases reported over the last decade. The year 2011 recorded the lowest number of cases, with only 5, followed by a gradual increase in subsequent years. In 2013, there was a significant surge, with 30 cases - the highest of the decade. Between 2015 and 2019, the number of cases remained relatively stable, ranging from 20 to 24, except for 2016, which saw a notable drop to 8 cases. The figure indicates that Methaqualone cases gradually increased over the decade, with significant fluctuations before 2015, followed by greater consistency in the later years.

Table 2

Methaqualone Seizures, Cases, and Arrests Region-wise in India from 2016 to 2020

Regions	Details	2016	2017	2018	2019	2020
North Region	Quantity	23519.21	61.96	85.54	10.18	1.16
	Cases	3	9	•	•	•
	Arrests	7	10	•	•	•
East Region	Quantity	3.84	35.00	0.00	3.52	0.00
	Cases	1	1	•	•	•
	Arrests	2	0	•	•	•
South West Region	Quantity	583.49	27.35	13.86	35.27	9.14
	Cases	4	14	•	•	•
	Arrests	13	18	•	•	•
Totals	**Quantity**	**24106.54**	**124.31**	**99.40**	**48.97**	**10.30**
	Cases	**8**	**24**	**21**	**20**	**12**
	Arrests	**22**	**28**	•	•	•

Note: (• = Not Reported).

Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 66–68), 2016 (p. 85–86), 2017 (p. 84–85), 2018 (p. 80), 2019 (p. 98–99), and 2020 (p. 100–102).

Table 2 presents data on Methaqualone seizures over five years (2016–2020) and the number of cases and arrests made during 2016–2017. In 2016, the North region recorded the largest amount seized, with 23,519.21 kg, followed by the South West region with the second largest quantity, while the East region reported the smallest amount. In 2017, the North region again reported the highest seized amount, while the South West region recorded the lowest quantity. The year 2018 mirrored the trend of 2017, while 2019–2020 saw a surge in the amounts seized in the South West region. Over the given time frame, the quantity of Methaqualone seized declined significantly after 2016 in both the North and South West regions, with no substantial changes observed in the East region.

In 2016, the North region, which recorded the highest amount seized, reported 3 cases, while the South West region reported the highest number of cases for the year with 4, and the East region recorded the lowest, with only 1 case. In 2017, the South West region reported the highest number of cases, with 14 cases, followed by the North region with 9 cases, while the East region remained consistent with just 1 case, again the lowest for that year. A comparative analysis shows a gradual increase in the number of cases reported in both the North and South West regions, while the East region saw no change in the number of cases reported during this period.

In 2018, 2019, and 2020, the state-wise data on Methaqualone cases were not reported.

In 2016, the South West region reported the highest number of arrests, with 13, followed by the North region with 7 arrests, while the East region recorded the lowest, with 2 arrests. In 2017, the ranking order remained the same as in 2016, with the South West region reporting the most arrests at 18, followed by the North region with 10 arrests, and the East region with none. A comparative analysis of 2016 and 2017 shows a gradual increase in arrests in the South West and North regions, while the East region experienced a slight decline. In 2018, 2019, and 2020, the state-wise data on Methaqualone arrests were not reported.

The overall analysis across all regions reveals a downward trend in the amount of Methaqualone seized over the years, starting from the highest amount of 24,106.54 kg in 2016 and declining to 10.30 kg in 2020. Additionally, there was a gradual increase in the number of cases, ranging from 1 to 14, and in arrests, ranging from 0 to 18, during the same period.

New Psychoactive Substances:

New Psychoactive Substances are substances of abuse that are not regulated by international drug treaties but have the potential to be harmful to public health, whether they are pure substances (or) preparations. New Psychoactive Substances have been referred to as research compounds, bath salts, and legal highs. The term "new" often refers to substances that have recently emerged on the market, rather than to newly developed compounds. New Psychoactive Substances are generally defined as any unregulated psychoactive substance or product that mimics the effects of a prohibited substance. Identifying New Psychoactive Substances can be challenging, as there is no specific technique for their detection (AR-NCB, 2016).

As of 2018, the United Nations Office on Drugs and Crime (UNODC) reported that there were 891 distinct New Psychoactive Substances globally, with East and South-East Asian nations accounting for 434 of these substances (GSP-UNODC, 2019). Since 2017, India has reported the presence of 18 distinct New Psychoactive Substances.

According to the Narcotic Drugs and Psychotropic Substances Act of 1985, Ketamine was added to the list of psychotropic substances on February 10, 2011. Mephedrone was added to the list of psychotropic substances by notification dated February 5, 2015, under the Narcotic Drugs and Psychotropic Substances Act, 1985. In March 2015, the 58th Commission on Narcotic Drugs recommended the scheduling of ten New Psychoactive Substances. Nine of these substances were notified on July 12, 2016, while Mephedrone had already been notified on February 5, 2015. On May 2, 2017, the 59th Commission on Narcotic Drugs recommended the scheduling of seven New Psychoactive Substances. As a result, the Narcotic Drugs and Psychotropic Substances Act of 1985 has classified 18 New Psychoactive Substances in India (AR-NCB, 2017). Appendix I contains the list of these 18 New Psychoactive Substances.

Ketamine:

Similar to Phencyclidine, Ketamine is a non-barbiturate general anesthetic. It likely affects the cerebral cortex, particularly the limbic system, and acts as an antagonist at N-Methyl-D-Aspartate (NMDA) receptors. Ketamine also exhibits a strong bronchodilator effect as part of its pharmacological activity (Satoskar, 2011). Ketamine is considered more suitable for use as an anesthetic, as it causes less euphoria and sensory distortion compared to Phencyclidine. After instances where the drug was diverted from its authorized use as a veterinary anesthetic in India, a notification dated February 10, 2011, added Ketamine to the list of psychotropic substances under the Narcotic Drugs and Psychotropic Substances Act of 1985.

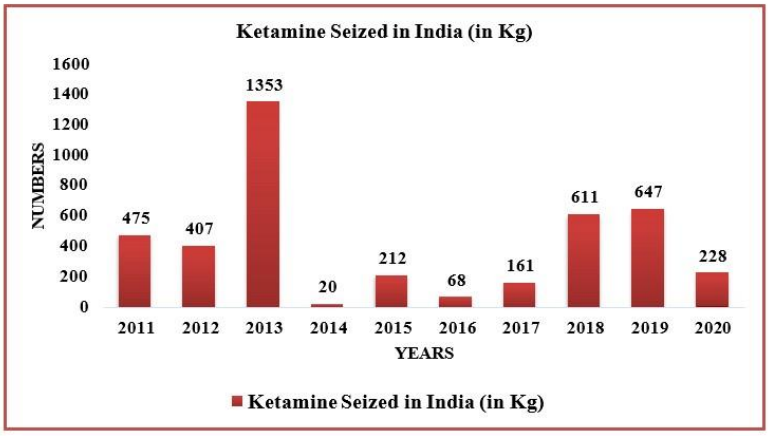
Mephedrone:

The synthetic cathinone derivative Mephedrone (4-methylmethcathinone, 4-MMC, or 4-methylephedrone) has effects similar to those of MDMA (3,4-methylenedioxymethamphetamine), often compared to substances like Cocaine (or) Ecstasy. Mephedrone was initially synthesized in 1929 as part of efforts to develop a substance with potential medicinal uses. However, it was rediscovered by recreational users in the early twenty-first

century and classified as a New Psychoactive Substance. Mephedrone produces effects akin to those of MDMA, Amphetamine, and Cocaine, and can be found in various forms, including capsules, liquids, tablets, (or) white powder, which users can inject, swallow, (or) snort.

Figure 5

Ketamine seized in India from 2011 to 2020

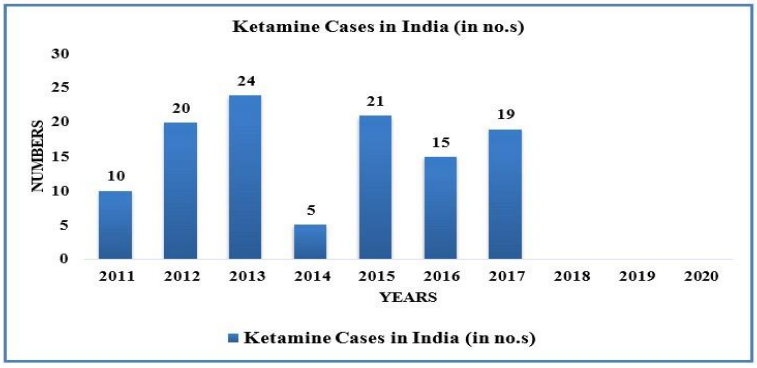


Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 23), 2016 (p. 30), 2017 (p. 33), 2018 (p. 80), 2019 (p. 98), and 2020 (p. 101).

Figure 5 illustrates the quantity of Ketamine seized over the last decade. The data reveals a consistent trend of seizures exceeding 400 kg during the initial three years, with 2013 recording the highest amount at 1,353 kg. However, between 2014 and 2017, there was a sharp decline, with amounts ranging from 20 to 212 kg, making 2014 the year with the lowest recorded seizures. In 2018 and 2019, there was a notable resurgence, with amounts surpassing 600 kg, while 2020 saw a decline to 228 kg. The figure highlights a lack of consistency, with quantities fluctuating significantly between extreme highs and lows throughout the decade.

Figure 6

Ketamine cases in India from 2011 to 2020



Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 23), 2016 (p. 30), 2017 (p. 33), 2018 (p. 80), 2019 (p. 98), and 2020 (p. 101).

Figure 6 illustrates the number of Ketamine cases reported over the last decade. The year 2014 recorded the lowest number of cases, with only 5 cases, while 2013 had the highest, with 24 cases. From 2012 to 2017, the number of cases remained relatively stable, ranging between 15 and 24, except for the sharp drop in 2014. However, no data is available for the years 2018 to 2020 regarding Ketamine cases. The figure suggests that the number of cases remained consistent during the first seven years, followed by an absence of reported cases in the final three years.

Table 3

Ketamine Seizures, Cases, and Arrests Region-wise in India from 2016 to 2020

Regions	Details	2016	2017	2018	2019	2020
North Region	Quantity	3.60	136.34	579.05	2.96	11.06
	Cases	1	3	•	•	•
	Arrests	1	13	•	•	•
East Region	Quantity	0	4.00	0	114.30	0
	Cases	0	1	•	•	•
	Arrests	0	0	•	•	•
South West Region	Quantity	64.46	20.52	32.30	530.06	217.24
	Cases	6	2	•	•	•
	Arrests	14	6	•	•	•
Totals	**Quantity**	**68.06**	**160.86**	**611.35**	**647.32**	**228.30**
	Cases	7	**6**	•	•	•
	Arrests	**15**	**19**	•	•	•

Note: (• = Not Reported).

Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 66–68), 2016 (p. 85–86), 2017 (p. 84–85), 2018 (p. 80), 2019 (p. 98–99), and 2020 (p. 100–102).

Table 3 presents data on Ketamine seizures over five years (2016–2020), along with the number of cases reported and arrests made during 2016–2017, categorized by regions. In 2016, the South West region reported the highest amount seized, with 64.46 kg, followed by the North region with 3.60 kg, while the East region recorded no seizures. In 2017, the North region experienced a surge, with the amount increasing to 136.34 kg, while the South West region saw a significant drop, and the East region reported a small increase to 1 kg. In 2018, the North region recorded the highest amount seized during the entire period, with 579.05 kg, followed by a significant drop in the South West region and no seizures in the East region. In 2019, the South West region reclaimed the highest amount seized, with 530.06 kg, followed by a sharp increase in the East region to 114.30 kg, and a substantial drop in the North region to 2.96 kg. By 2020, the South West region remained the highest, despite a significant decrease, followed by the North region, while the East region recorded no seizures. The comparative analysis reveals a shifting pattern, with the South West region leading in some years, followed by the North region, and then shifting back to the South West region, while the East region alternates between extreme lows and occasional highs.

Regarding the number of cases reported during 2016–2017, the South West region recorded the highest number of cases in 2016, with 6 cases, while the East region reported no cases. In 2017, all regions experienced minor changes, with the South West region dropping to 2 cases, the North region reporting 3 cases, and the East region recording 1 case. The overall analysis indicates a consistently low number of reported cases across the regions, with no significant surges during the period. In 2018, 2019, and 2020, the state-wise data on Ketamine cases were not reported.

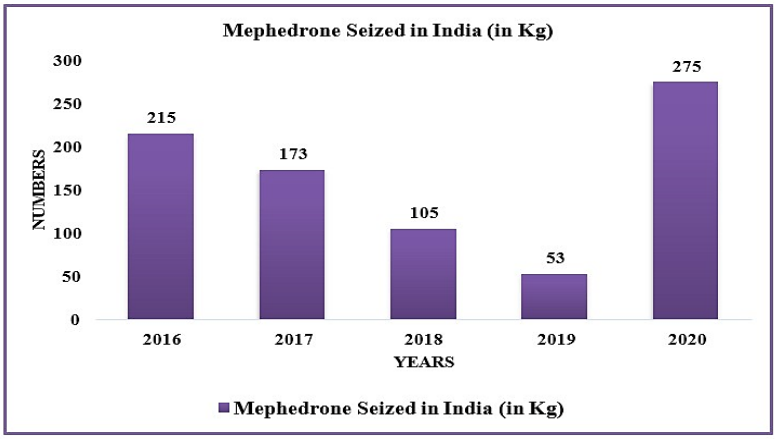
According to the data, 2016 recorded the highest number of arrests in the South West region, with 14 arrests, followed by the North region with 1 arrest and the East region with none. In 2017, the North region saw a significant surge in arrests, with 13 captures, while the South West region experienced a drop to 6 arrests, and the East region remained consistent at zero. Comparing the two years, it can be observed that the trend shifted

from the South West region to the North region. In 2018, 2019, and 2020, the state-wise data on Ketamine arrests were not reported.

The overall analysis indicates a significant increase in the amount of Ketamine seized over the years, while the number of cases and arrests remained relatively consistent throughout the given time frame.

Figure 7

Mephedrone seized in India from 2016 to 2020

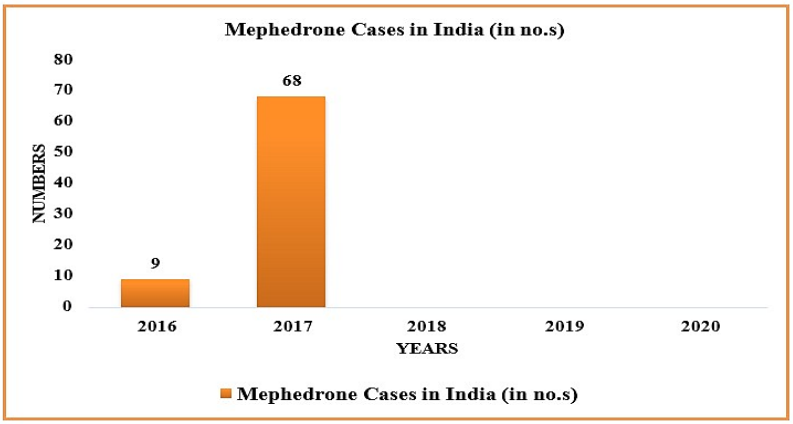


Source: NCB, MHA, GoI, Annual Reports for the years 2016 (p. 85–86), 2017 (p. 84–85), 2018 (p. 80), 2019 (p. 99), and 2020 (p. 101).

Figure 7 illustrates the quantity of Mephedrone seized over the half-decade from 2016 to 2020. The data shows that 2016 exceeded the 200 kg mark, but as the years progressed, the amount seized dropped significantly, with only 53 kg seized in 2019, the lowest recorded during the period. In contrast, 2020 saw a dramatic surge, with seizures rising to 275 kg, the highest amount within the given timeframe. A pattern can be observed, as the first four years (2016-2019) experienced a steady, though significant, decline, while 2020 marked a sharp upsurge. Thus, 2016-2019 showed a relatively consistent trend with minimal fluctuations.

Figure 8

Mephedrone cases in India from 2016 to 2020



Source: NCB, MHA, GoI, Annual Reports for the years 2016 (p. 85–86), 2017 (p. 84–85), 2018 (p. 80), 2019 (p. 99), and 2020 (p. 101).

Figure 8 illustrates the number of reported Mephedrone cases from 2016 to 2020. The number of reported cases started slowly in 2016 with 9 cases, followed by a sharp surge in 2017, which saw 68 reported cases. However, there is no data available for the years 2018 to 2020 regarding recorded cases across India. Therefore, it can be concluded that the cases exhibited significant fluctuations, with a sharp increase in 2017 and no subsequent data for the last three years, resulting in a lack of consistent patterns during the period.

Table 4

Mephedrone Seizures, Cases, and Arrests Region-wise in India from 2016 to 2020

Regions	Details	2016	2017	2018	2019	2020
North Region	Quantity	14.25	135.85	2.02 + 8.50 (L)	10.03	270.42
	Cases	1	2	•	•	•
	Arrests	8	7	•	•	•
East Region	Quantity	0	0	0	0	0.82
	Cases	0	0	•	•	•
	Arrests	0	0	•	•	•
South West Region	Quantity	200.47	37.13	102.60	43.25	3.70
	Cases	8	66	•	•	•
	Arrests	9	89	•	•	•
Totals	**Quantity**	**214.72**	**172.98**	**104.62 + 8.50 (L)**	**53.28**	**274.94**
	Cases	**9**	**68**	•	•	•
	Arrests	**17**	**96**	•	•	•

Note: (• = Not Reported).

Source: NCB, MHA, GoI, Annual Reports for the years 2015 (p. 66–68), 2016 (p. 85–86), 2017 (p. 84–85), 2018 (p. 80), 2019 (p. 98–99), and 2020 (p. 100–102).

Table 4 presents the data on Mephedrone seizures over five years (2016–2020) and the number of cases reported and arrests made during 2016–2017, based on regions. In 2016, the South West region reported the highest amount seized, with 200.47 kg, followed by the North region, while the East region recorded no seizures. In 2017, the North region reported 135.85 kg, a significant increase, while the South West region saw a drastic decrease to 37.13 kg, and the East region maintained its consistent record of zero seizures. The South West region regained the top position in 2018 with 102.60 kg, while the North region reported a drop to 2.02 kg and 8.50 liters of liquid, with the East region remaining at zero. In 2019, the South West and North regions experienced declines, recording 43.25 kg and 10.03 kg, respectively. However, 2020 saw a substantial surge in the North region to 270.42 kg, while the South West region witnessed a significant drop, and the East region reported 0.82 kg seizures. Over the five years, the East region consistently recorded zero seizures, while the trend alternated between the South West and North regions, with the North region reporting the highest amount seized in 2020.

Regarding the number of cases in 2016, the South West region reported 8 cases, followed by the North region with 1 case, while the East region recorded zero cases. In 2017, the East region consistently reported zero cases, while the South West region saw a drastic increase to 66 cases, ranking it the highest within the given time frame. In contrast, the North region showed a marginal change, reporting 2 cases. The comparative data indicate that while the North and East regions remained consistent, the South West region experienced a significant increase in the number of cases. In 2018, 2019, and 2020, the state-wise data on Mephedrone cases were not reported.

In 2016, the South West region reported 9 arrests, followed closely by the North region with 8 arrests, while the East region recorded no arrests in both 2016 and 2017. However, the South West region showed a significant increase in arrests in 2017, rising to 89, whereas the North region experienced a slight decrease, reporting 7 arrests compared to 8 in 2016. In 2018, 2019, and 2020, the state-wise data on Mephedrone arrests were not reported.

The overall analysis indicates that, while the amount seized followed a relatively consistent pattern, the number of cases and arrests saw a substantial increase over the years, largely driven by the South West region.

Findings:

Figure 9

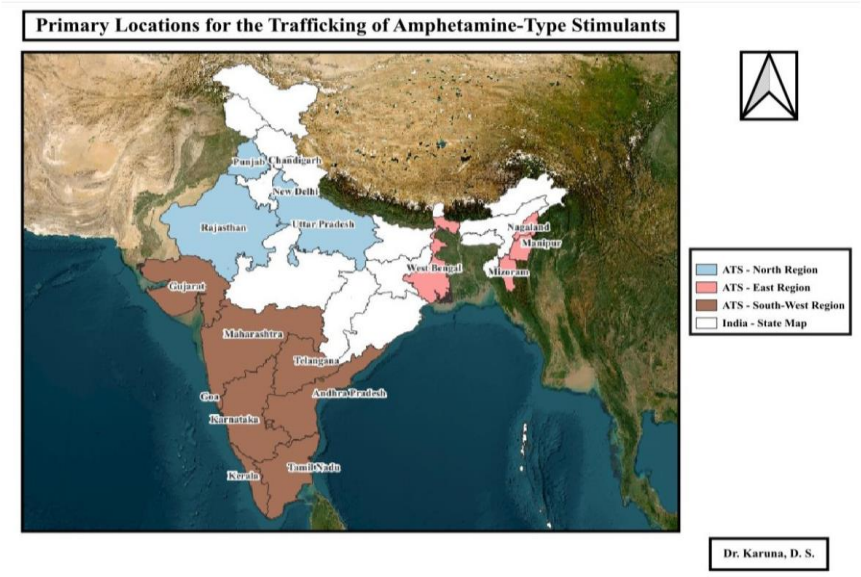


Figure 9 illustrates the primary locations for the trafficking of Amphetamine Type Stimulants (Amphetamine, Methamphetamine, and Methaqualone). The North ("Chandigarh, New Delhi, Punjab, Rajasthan, and Uttar Pradesh") and East ("Manipur, Mizoram, Nagaland, and West Bengal") regions are identified as the main hubs, followed by the South-West regions ("Andhra Pradesh, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Tamil Nadu, and Telangana").

Figure 10

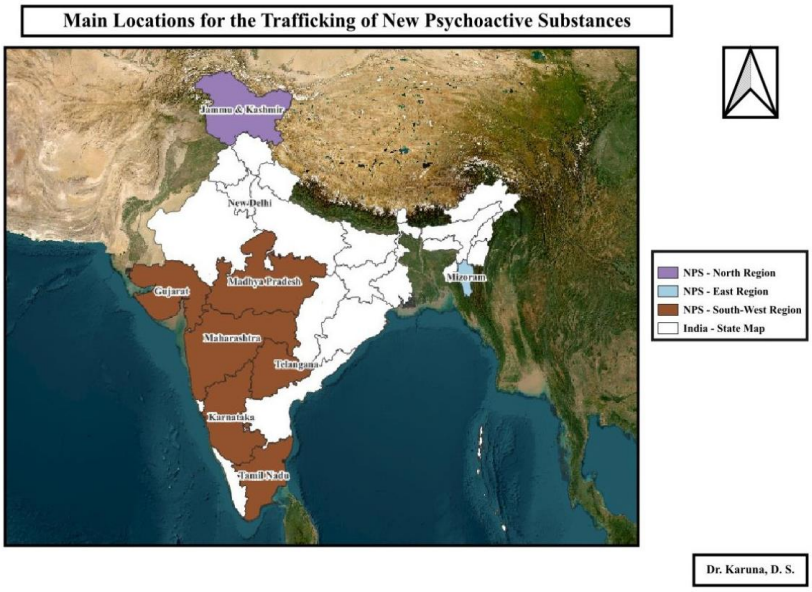


Figure 10 illustrates the primary locations for the trafficking of New Psychoactive Substances (Ketamine and Mephedrone). The main regions involved are the North ("Jammu and Kashmir and New Delhi"), the East ("Mizoram"), and the South-West ("Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Tamil Nadu, and Telangana").

Discussion:

Amphetamine Type Stimulants are sent from India to Myanmar, while finished stimulants are shipped in the opposite direction. In India, the majority of Amphetamine and Methamphetamine tablet seizures occur in the northeastern border states, with one of the primary trafficking methods being through courier packages. A significant number of seizures involving Amphetamine Type Stimulants have taken place at the airports in Mumbai and New Delhi. Methamphetamine seizures continue to rise, both in tablet and crystalline forms. Increased law enforcement activities in the region may partly explain the rise in Methamphetamine seizures in 2018 across multiple countries, indicating a steady supply of the drug

(GSP-UNODC, 2019). The main destinations for trafficking Amphetamine Type Stimulants from India are Malaysia, Australia, and Thailand (AR-NCB, 2020).

Methaqualone (Mandrax) trafficking from India to Malaysia, Australia, the USA, South Africa (AR-NCB, 2020), Addis Ababa, and Kuwait (AR-NCB, 2017) has been reported. Seizures of Methaqualone are primarily made at the airports in New Delhi, Kolkata, and Mumbai (AR-NCB, 2020). One of the key methods of trafficking Methaqualone is through courier packages (AR-NCB, 2017).

Ketamine was added to the list of psychotropic substances under the Narcotic Drugs and Psychotropic Substances Act, 1985, by a notification dated February 10, 2011 (AR-NCB, 2016). Ketamine is commonly trafficked to East and South-East Asian countries using similar trends, patterns, and routes from India, where its use is widespread. The main destinations for Ketamine trafficking from India are South-East Asia and Australia. Ketamine trafficking involves citizens from India, Malaysia, and Nigeria (AR-NCB, 2017). Ketamine is found in courier parcels, domestic transportation, marine cargo, and airport interdictions. Additionally, there have been instances of Ketamine trafficking to South Africa and the UK via courier packages (AR-NCB, 2016).

By the Narcotic Drugs and Psychotropic Substances Act of 1985, Mephedrone was added to the list of psychotropic substances on February 5, 2015. In February 2016, 0.170 kg of illegal Mephedrone was seized in Pune, marking the first known seizure of the drug. Two individuals were also taken into custody (AR-NCB, 2016). In 2015, no arrests, seizures, or cases were recorded.

Conclusion:

Despite strict laws and control of the sale, distribution, purchase, and storage of some drugs, there is evidence that Psychotropic Substances are being diverted. Drug law enforcement officers must keep abreast of current drug trafficking trends, patterns, and the transition from legal to illegal psychiatric drugs. The researcher highlights a recent pattern indicating a rise in arrests, seizures, and cases based on the data. The rapid synthesis of

precursor chemicals and synthetic medications has severely hindered our understanding of synthetic pharmaceuticals. The illicit production of synthetic drugs, such as covert labs manufacturing Benzodiazepines, New Psychoactive Substances, and Amphetamine Type Stimulants, has emerged as a new trend. Consequently, monitoring, drug detection, legislation, and drug control now face additional challenges. Law enforcement and international control efforts are significantly hindered by the complexity and diversity of psychoactive drugs. Therefore, to effectively combat the overuse and abuse of psychotropic medications in India, coordinated and focused actions are essential.

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Annexure – I

The list of Eighteen New Psychoactive Substances in India

S.No	Year	Name of the Manufactured Drugs and Psychotropic Substances
1	2011	Ketamine
2	2015	Mephedrone
3	2016	AH-7921
4	2016	25B-NBOMe
5	2016	25C-NBOMe
6	2016	25l-NBOMe
7	2016	N-Benzylpiperazine
8	2016	JWH-018
9	2016	AM-2201
10	2016	MDPV (3,4-Methylenedioxypyrovalerome)
11	2016	Methylone
12	2017	Acetylfentanyl
13	2017	MT-45
14	2017	Para-methoxymethylamphetamine (PMMA)
15	2017	Pyrrolidinovalerophenone (PVP)
16	2017	Para methyl -4-methylaminorex 4,4' DMAR
17	2017	Methoxetamine
18	2017	Phenazepam

Source: NCB, MHA, GoI, Annual Report 2017 (p. 33–34).

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