



Swami Vivekananda Advanced Journal for Research and Studies

Online Copy of Document Available on: www.svajrs.com

ISSN:2584-105X

Pg. 157- 165



CRIMINAL JUSTICE IN TRANSITION: THE RISE OF FORENSIC SCIENCE IN INDIAN INVESTIGATION

Mohit Thapa

Designation/Course - LLM criminal (1yr)

Department - School of Law

Institute/University - CT University , Punjab India

Email -advmohitthapa@myyahoo.com

Accepted: 20/04/2026

Published: 21/04/2026

DOI: <http://doi.org/10.5281/zenodo.19679891>

Abstract

The transformation of criminal investigation in India from confession-centric policing to evidence-based scientific inquiry marks a defining shift in the philosophy of criminal justice administration. Forensic science has emerged as a crucial instrument in ensuring fairness, accuracy, and objectivity in criminal trials. This research paper examines the historical evolution, core principles, constitutional permissibility, statutory recognition, and judicial interpretation of forensic science in India. Through analysis of leading Supreme Court judgments, provisions of the Indian Evidence Act, the Code of Criminal Procedure, and constitutional safeguards, this paper highlights the growing indispensability of forensic evidence in modern investigation. It further analyses the infrastructural, procedural, and legal challenges that hinder effective use of forensic science and offers suggestions for strengthening forensic administration within the criminal justice system..

Keywords: *Forensic Science, Criminal Investigation, Evidence-Based Justice, Indian Criminal Justice System*

1: Introduction

Human beings are often considered the most advanced species on earth, driven by a constant desire to improve their lives through knowledge and innovation. From the era of early humans to modern society, scientific discoveries have shaped the way people live, work, and communicate. Today, science is deeply embedded in everyday life—whether it is cooking food, using mobile phones, travelling across continents, or accessing information instantly. Modern technology is now accessible to people of all ages and backgrounds, and general awareness of its use has increased significantly.¹

Yet, science has two sides. While it has brought comfort and progress, it has also been misused. As technology advances, so do the methods of committing crimes. Criminals now exploit digital platforms and fast communication to engage in cybercrime, financial fraud, cyber bullying, pornography, terrorism, human trafficking, and other offences. Telecommunication devices are often misused for extortion, stalking, spreading defamatory content, and coordinating illegal activities.

In this evolving scenario, it has become essential for investigative agencies to adopt scientific tools and modern methods of investigation. Earlier, fear of law enforcement often led suspects to confess their crimes. Today, increased awareness of legal and human rights prevents the use of coercive or forceful methods. As a result, investigators must rely on objective, evidence-based techniques to uncover the truth.

This need has led to the growing importance of forensic science in criminal investigations. If science can enable humans to achieve extraordinary feats, it can certainly help reveal the truth behind criminal acts. Forensic techniques such as fingerprint analysis, DNA testing, handwriting examination, and cyber forensics help connect suspects to crime scenes without violating human rights.

Although modern forensic science has developed significantly in recent times, its roots in India can be traced back to ancient texts and practices. Over time, especially during the British period, scientific methods of investigation became more structured with the establishment of medical institutions and forensic studies. Today, forensic

science stands as a vital tool in ensuring justice through scientific evidence rather than confession.

Definition of Forensic Science

Forensic science refers to the investigation of crime through scientific methods. It involves the application of scientific knowledge to legal issues and plays a vital role in the administration of justice. According to the *Oxford Companion to Law*, edited by David M. Walker, forensic science is —a branch of science concerned with the application of scientific knowledge to legal purposes, particularly in the discovery and interpretation of facts that are significant in legal inquiries.²

Forensic science addresses a wide range of matters, including the examination of weapons, ballistics, explosives, and altered or disputed documents. It provides scientifically based evidence that assists courts in determining the truth during criminal investigations and trials. By translating scientific findings into legally admissible evidence, forensic science bridges the gap between science and law.

As a multidisciplinary field, forensic science draws upon several branches of knowledge such as chemistry, biology, physics, geology, psychology, and the social sciences. Each discipline contributes specialized techniques for analyzing physical evidence found at crime scenes. The primary objective of forensic science is the recognition, identification, individualization, and evaluation of physical evidence through established scientific principles and methods.³

In simple terms, forensic science is the study and analysis of evidence discovered at a crime scene for the purpose of presenting reliable and objective findings in a court of law.

Research Question

To what extent has forensic science transformed criminal investigation in India from confession-based practices to constitutionally valid, evidence-based justice, and what challenges hinder its effective implementation?

Objectives of the Study

- ❖ **To examine the concept and fundamental principles of forensic science** and their relevance in criminal investigation.

¹ Gowsia Farooq Khan, Sheeba Ahad, —Role of Forensic Science in Criminal Investigation: Admissibility In Indian Legal System And Future Perspective, *International Journal of Advance Research in Science and Engineering*, Vol. 07, Issue 04, 220(March 2018)

² **David M. Walker (ed.)**, *The Oxford Companion to Law*, Oxford University Press, Oxford, definition of Forensic Science”

³ **B.R. Sharma**, *Forensic Science in Criminal Justice System*, Law Publishers (India) Pvt. Ltd., Allahabad.

- ❖ **To analyze the transformation of criminal investigation in India** from confession-based methods to scientific, evidence-based techniques.
- ❖ **To study the constitutional validity of forensic techniques** under Articles 20(3) and 21 of the Indian Constitution.
- ❖ **To evaluate the statutory recognition of forensic evidence** under the Indian Evidence Act and the Code of Criminal Procedure.
- ❖ **To assess the judicial approach** towards forensic methods such as DNA testing, fingerprint analysis, Norco-analysis, and expert opinion through leading case laws.
- ❖ **To identify the practical challenges** faced in the effective use of forensic science in India, including infrastructural and procedural issues.
- ❖ **To suggest reforms and measures** for strengthening forensic science in the Indian criminal justice system.

Hypothesis

Hypothesis focuses the information on a definite target and usually contains what the researcher wants to prove in their study. The present study made in for to analyses that Relevance of Forensic Science in Criminal Justice System. The law relating to forensic science in India is insufficient, uncertain and non-conclusive. The authenticity of such techniques is doubtful. The evidence collected through these techniques is admissible and relevant in the Indian Courts but not as a matter of course. Most of the forensic science techniques are violation of the Constitutional provisions in a strict sense. Scientific evidence is treated as a weak piece of evidence till date due to the Lack of training of Police personnel in barricading the crime scene, collecting and packaging of clues contamination free from the crime scene. There is lack of scientific knowledge and reluctance on the part of Courts.

Historical Evolution of Forensic Science

The traces of forensic knowledge can be found in ancient civilizations. Kautilya's Arthashastra contains references to medico-legal practices and methods of investigation. Ancient practices like Agni Pariksha and Jal Pariksha were primitive attempts to determine truth based on physiological reactions.

Modern forensic science, however, developed during the 19th and 20th centuries through contributions of scientists such as Edmond Locard, Hans Gross, and Sir William Herschel.

Herschel's introduction of fingerprint identification in India in 1858 laid the foundation of modern dactyloscopy. Later developments in toxicology (Marsh Test), ballistics, anthropology, and serology further strengthened scientific investigation⁴.

The discovery of DNA profiling by Sir Alec Jeffreys in 1984 revolutionized forensic science worldwide. In India, the establishment of Forensic Science Laboratories (FSLs) and the increasing role of scientific experts in courts marked the institutional growth of forensic application.⁵

Principles of Forensic Science

The application of forensic science is governed by certain foundational principles:

- (a) Law of Individuality – Every object possesses unique characteristics. Fingerprints and DNA exemplify this principle.
- (b) Principle of Exchange (Locard's Principle) – Whenever two objects come into contact, there is a mutual exchange of traces.
- (c) Law of Progressive Change – Crime scenes and physical evidence change with time, requiring prompt action.
- (d) Principle of Comparison – Only like objects can be compared for accurate analysis.
- (e) Principle of Analysis – Proper sampling and contamination-free preservation are essential.
- (f) Facts Do Not Lie – Material evidence is more reliable than oral testimony when properly handled.

These principles form the scientific basis of criminal investigation.⁶

Forensic Science and the National Legal Framework in India

Forensic science today stands at the heart of the Indian criminal justice system. As crime has grown more complex and sophisticated, the law has increasingly turned to science to uncover truth with accuracy, fairness, and objectivity. Scientific techniques such as fingerprint identification, DNA

⁴ B.R Sharma, *Forensic Science in Criminal Investigation and Trials*, 59(Universal Law Publication, New Delhi, 2014).

⁵ Joseph Peterson, Ira Sommers, Deborah Baskin, and Donald Johnson, —The Role and Impact of Forensic

Evidence in the Criminal Justice Process], Available at: <https://www.ojp.gov/pdffiles1/nij/grants/231977.pdf> (Last visited on May 3, 2022)

⁶ P.C Dixit, *Medical Jurisprudence and Toxicology*, 10(Lexis Nexis Butterworths, New Delhi, 2002).

profiling, photography, voice analysis, and expert examination now assist courts in reaching conclusions that are not merely based on oral testimony but supported by material evidence. At the same time, the Indian legal framework carefully balances the use of these techniques with the protection of individual dignity and constitutional rights guaranteed under Articles 20(3) and 21 of the Constitution.

- Article 21 assures that no person shall be deprived of life or personal liberty except by a procedure established by law that is just, fair, and reasonable. Article 20(3) embodies the fundamental principle that no accused shall be compelled to be a witness against himself, reflecting the maxim *nemo tenetur se ipsum accusare*.⁷The Supreme Court, in *State of Bombay v. Kathi Kalu Oghad*,⁸ clarified that the collection of fingerprints, handwriting samples, or bodily specimens does not amount to testimonial compulsion. This judgment laid the foundation for permitting scientific methods of identification within constitutional limits.

□ Legal Recognition of Fingerprint Evidence

Fingerprint science has long been regarded as a dependable means of personal identification. The **Identification of Prisoners Act, 1920** empowers police officers and magistrates to obtain fingerprints and other measurements of accused persons for investigative purposes. Sections 4 and 5 of the Act provide legal authority for such collection, and refusal to comply may lead to action under Section 186 of the **Indian Penal Code**.⁹ Now **221 of Bharatiya Nyaya Sanhita, 2023** herein after referred as **BNS**]

The **Indian Evidence Act, 1872**, [Bharatiya Sakshya Adhinyam, 2023 Here in after referred as **BSA**] under Section 45 [39[1] OF **BSA**] , recognizes the opinion of fingerprint experts as relevant evidence. Sections 46 [40 of **BSA**] and 51 [45 of **BSA**] further permit examination of the basis of such expert opinion. Additionally, Section 293 of the **Code of Criminal Procedure, 1973** now **329 of [Bharatiya Nagarik Suraksha Sanhita, 2023 here in after referred as **BNS**]** allows reports from fingerprint bureaus to be admitted as evidence without requiring the expert's presence in court unless specifically summoned. In *Jaspal Singh v. State of Punjab*¹⁰, the Supreme Court

acknowledged fingerprint identification as an exact and reliable science.

□ DNA Profiling and Judicial Caution

DNA evidence has revolutionized criminal investigations by enabling precise identification and resolution of issues such as paternity, sexual offences, and unidentified remains. Though India does not yet have a comprehensive DNA statute, provisions in **Sections 53, 53A, 54, and 164A of the CRPC 1973** now **51, 52, 53 and 184 of BNS** authorize medical examination of accused persons and victims, which includes the collection of biological samples for forensic analysis. The courts have upheld the constitutional validity of DNA testing where it does not infringe Article 20(3). In *Ramlal Bhogilal Shah v. D.K. Guha*,¹¹ it was held that taking blood samples does not amount to testimonial compulsion. However, in sensitive matters like paternity disputes, the Supreme Court in *Goutam Kundu v. State of West Bengal*¹² and *Kamti Devi v. Poshni Ram* urged restraint, emphasizing the presumption under Section 112 of the Evidence Act/section 116 of **BSA**. At the same time, in *Sharda v. Dharmpal*¹³, the Court recognized that medical tests, including DNA, may be necessary to achieve justice in matrimonial disputes.

□ Narco-analysis and Related Techniques

Techniques such as narco-analysis, polygraph tests, and brain mapping have raised serious human rights concerns. The Supreme Court in *Selvi v. State of Karnataka (2010)*¹⁴ held that involuntary administration of these tests violates Articles 20(3) and 21. The Court clarified that while such techniques may assist investigation if conducted with consent, their results are not admissible as evidence in court.

Section 161(2) of the **CRPC 1973** Now **section 180 [2] of BNS** further protects individuals from answering questions that may expose them to criminal liability. **Sections 45 and 27 of the Evidence Act/now section 39 and 23[2] of BSA** govern the limited admissibility of expert opinion and discoveries made from information given by the accused.

□ Photography and Voice Evidence

Photographs serve as important corroborative evidence under Section 9 of the **Evidence Act/Now section 7 of BSA** for identification and

⁷ Kailash Rai, *Constitutional Law of India*, 35(Central Law Publication, Allahabad, 2005)

⁸ . *State of Bombay v. Kathi Kalu Oghad*, AIR 1961 SC 1808.

⁹ Kailash Rai, *Constitutional Law of India*, 36(Central Law Publication, Allahabad, 2005)

¹⁰ AIR 1979 SC 1708

¹¹ [1973] 3 SCR 438

¹² AIR 1973 SC 116

¹³ *Sharda v. Dharmpal*, (2003) 4 SCC 493.

¹⁴ *Selvi v. State of Karnataka*, (2010) 7 SCC 263.

explanation of relevant facts. In **Umar Abdul Sakoor Sorathia v. Intelligence Officer**,¹⁵ courts accepted identification through photographs, provided they are supported by reliable evidence.

Voice samples and tape-recorded conversations have also been judicially recognized. In **CBI v. Abdul Karim Telgi**¹⁶, the Court ruled that taking voice samples does not violate Article 20(3). Tape recordings are admissible under Sections 7 and 8 of the **Evidence Act/ Now section 5 and 6 of BSA** and may be used to challenge the credibility of witnesses **under Section 155 now section 158 of BSA**.

□ Role and Status of Forensic Experts

Forensic experts form the bridge between science and law. Section 45 of the **Evidence Act/ SECTION 39 OF BSA** defines experts as persons specially skilled in science, art, handwriting, or fingerprint identification. Their opinions assist courts in understanding technical matters beyond common knowledge.

Sections 292 and 293 of the CRPC 1973/ Section 328 and 329 of BNSS permit reports from government forensic experts to be used as evidence without requiring personal testimony, though courts retain the discretion to summon them. The **Malimath Committee on Criminal Justice Reforms** strongly advocated for wider use of forensic science, establishment of a national DNA database, and modernization of forensic laboratories across the country.¹⁷

□ Scientific Temper and Constitutional Vision

Article 51A(h) of the Constitution enjoins citizens to develop scientific temper and a spirit of inquiry. The use of forensic science in investigations reflects this constitutional vision. Courts have repeatedly observed that scientific methods contribute to speedy and fair trials, which are integral to Article 21.

The incorporation of forensic science into the Indian legal system represents a humane and progressive effort to discover truth while preserving constitutional liberties. Scientific evidence reduces dependence on unreliable testimony, minimizes wrongful convictions, and strengthens the integrity of the justice system. At the same time, judicial safeguards ensure that investigative methods respect human dignity and the right against self-incrimination. As crime continues to evolve, forensic science and the role

of forensic experts will remain central to achieving justice, fairness, and truth in India's legal process.

Evidentiary Value of Expert Opinion

- The evidentiary value of forensic evidence in Indian law lies in its ability to provide **objective, scientific, and material proof** that assists courts in discovering the truth with greater certainty than oral testimony alone. Unlike eyewitness accounts, which may be influenced by memory, bias, fear, or manipulation, forensic evidence is derived from scientific examination of physical materials such as fingerprints, blood, DNA, documents, voice samples, photographs, and other trace evidence collected from the crime scene. Its strength lies in neutrality, accuracy, and resistance to human error.
- Under **Section 45 of the Indian Evidence Act, 1872/SECTION 39 OF BSA**, the opinion of persons specially skilled in science, art, handwriting, or fingerprint identification is considered relevant. Forensic experts fall squarely within this provision. Their reports and testimony help the court understand technical matters beyond ordinary knowledge. However, expert opinion is **corroborative in nature**; it does not replace judicial reasoning but assists it. Courts evaluate such evidence along with other facts and circumstances of the case¹⁸.
- The evidentiary weight of forensic science is strengthened by statutory recognition under the **Code of Criminal Procedure, 1973**. **Section 293 CrPC / 329 of BNSS** allows reports of government scientific experts, including forensic laboratories, fingerprint bureaus, and chemical examiners, to be admitted directly as evidence without requiring the expert's personal appearance, unless the court specifically summons them. This provision acknowledges the reliability and authenticity of forensic analysis.
- Judicial interpretation has further clarified the status of forensic evidence. In **State of Bombay v. Kathi Kalu Oghad**,¹⁹ the Supreme Court held that taking fingerprints, handwriting samples, or bodily specimens does not violate Article 20(3) of the Constitution, as these are physical evidence and not testimonial statements. This judgment constitutionally validated the evidentiary use of forensic identification techniques.

¹⁵ Umar Abdul Sakoor Sorathia v. Intelligence Officer, (1999) Cri LJ 2892 (SC).

¹⁶ CBI v. Abdul Karim Ladsab Telgi, (2005) Cri LJ 2868.

¹⁷ M. P. Sharma and Others v. Satish Chandra, District Magistrate, Delhi, And Others, AIR 1954 SC 300

¹⁸ Available at: <https://en.wikipedia.org/wiki/Polygraph>, (Last visited on July 11, 2022).

¹⁹ AIR 1961 SC 1808

- Similarly, in **Jaspal Singh v. State of Punjab**²⁰, the Court recognized fingerprint science as an exact and dependable method of identification. DNA evidence has also received judicial approval. In **Ramlal Bhogilal Shah v. D.K. Guha**,²¹ the Court held that collection of blood samples does not amount to testimonial compulsion. However, in **Goutam Kundu v. State of West Bengal**²² and **Kamti Devi v. Poshi Ram**²³, the Court cautioned that DNA tests should not be ordered routinely, especially in sensitive paternity matters, thereby showing that forensic evidence must be used with judicial prudence.
- Forensic evidence such as photographs (**Section 9, Evidence Act**),/ [**Section 7 of BSA**] voice samples and tape recordings (Sections 7 and 8 of Evidence act/ section 5 and 6 of BSA), and discoveries made pursuant to information from the accused (Section 27 of evidence act / section 23[2] Of BSA) are also admissible when properly proved and relevant to the facts in issue²⁴.
- Importantly, forensic evidence often becomes decisive in cases where eyewitnesses turn hostile or where there is no direct evidence. Ballistic reports, serology tests, fingerprint matches, and DNA profiling have led to convictions based purely on scientific linkage between the accused and the crime scene.
- In essence, the evidentiary value of forensic evidence in India is **high, persuasive, and increasingly indispensable**. While it is generally treated as corroborative expert evidence, courts frequently rely upon it as a reliable foundation for establishing guilt or innocence, provided it is collected, preserved, and analyzed according to proper scientific and legal procedures.

Challenges in the Use of Forensic Science in India

1. Inadequate Forensic Infrastructure

India faces a serious shortage of well-equipped forensic laboratories. Many states have limited FSLs with outdated equipment, resulting in overburdened facilities and long backlogs of cases awaiting examination.

2. Delay in Forensic Reports

Due to heavy pendency and limited staff, forensic reports often take months or even years. Such delays adversely affect investigation, trial, and the right to speedy justice under Article 21 of the Constitution.

3. Shortage of Trained Forensic Experts

There is a lack of qualified forensic professionals, particularly in specialized fields like DNA profiling, cyber forensics, toxicology, and ballistics. This shortage weakens the quality and reliability of forensic examination.

4. Improper Collection and Preservation of Evidence

Investigating officers often lack proper training in handling crime scenes. Evidence gets contaminated, destroyed, or improperly sealed, reducing its evidentiary value in court.

5. Lack of Awareness Among Police and Judiciary

Many police officers, prosecutors, and even judicial officers lack sufficient understanding of scientific techniques, resulting in improper appreciation or underutilization of forensic evidence.

6. Absence of Uniform Standard Operating Procedures (SOPs)

There is no uniform nationwide protocol for collection, preservation, transportation, and examination of forensic samples, leading to inconsistency in forensic practices.

7. Limited Use of Advanced Technology

Despite technological advancement globally, many Indian forensic labs still rely on outdated methods due to budgetary and administrative constraints.

8. Legal and Procedural Gaps

India lacks a comprehensive and specific legislation governing DNA profiling and other modern forensic techniques. This creates ambiguity regarding admissibility, consent, and privacy concerns.

9. Constitutional and Human Rights Concerns

Techniques like narco-analysis, polygraph, and brain mapping face constitutional challenges under Articles 20(3) and 21, limiting their use despite investigative value.

10. Chain of Custody Issues

Improper documentation and handling during the transfer of evidence from crime scene to laboratory often leads to doubts regarding authenticity and admissibility.

11. Over-Reliance on Oral Evidence

²⁰ Jaspal Singh v. State of Punjab, (1979) 3 SCC 631.

²¹ Ramlal Bhogilal Shah v. D.K. Guha, AIR 1961 SC 1752.

²² Goutam Kundu v. State of West Bengal, (1993) 3 SCC 418.

²³ Kamti Devi v. Poshi Ram, (2001) 5 SCC 311.

²⁴ Available at: <https://blog.iplleaders.in/expert-witnesses-under-the-indian-evidence-act-1872/> (Last visited on July 11, 2022).

Traditional investigation methods still prioritize confessional and eyewitness evidence over scientific evidence, reducing the effective use of forensic science.

12. Financial Constraints

Establishing and maintaining modern forensic laboratories require substantial funding, which is often inadequate in many states.

13. Lack of Forensic Education and Training Institutions

Limited academic institutions provide advanced forensic education, resulting in a narrow talent pool.

14. Poor Coordination Between Agencies

Lack of coordination between police, forensic laboratories, prosecution, and judiciary hampers timely and effective use of forensic results.

15. Judicial Reluctance in Some Cases

Courts sometimes hesitate to rely solely on forensic evidence without strong corroboration, reducing its practical impact.

16. Privacy and Data Protection Issues

Proposals like a national DNA database raise concerns regarding misuse of personal data and lack of clear data protection laws.

17. Backlog in Cyber Forensic Analysis

With rising cybercrimes, the capacity for digital forensic examination is insufficient to meet growing demands.

18. Lack of Accreditation and Quality Control

Not all forensic laboratories follow internationally accepted standards, affecting the credibility of reports.

19. Hostile Witnesses and Forensic Dependence

While forensic evidence can compensate for hostile witnesses, delays and poor quality sometimes fail to provide that support.

20. Need for Policy Reforms

Recommendations of bodies like the Malimath Committee regarding modernization of forensic science remain only partially implemented.

These challenges collectively hinder the effective utilization of forensic science in India's criminal justice system and call for urgent reforms, investment, and awareness to strengthen scientific investigation.

Suggestions to Strengthen the Use of Forensic Science in India

1. Expansion and Modernization of Forensic Laboratories

There is an urgent need to establish more fully equipped forensic science laboratories at the state and regional levels. Existing laboratories must be modernized with advanced instruments and technology to reduce backlog, improve accuracy, and ensure timely forensic reports that support speedy trials.

2. Recruitment and Continuous Training of Forensic Professionals

The shortage of qualified forensic experts, particularly in specialized areas such as DNA profiling, cyber forensics, toxicology, and ballistics, must be addressed through systematic recruitment. Regular training and skill-development programs should be conducted to keep professionals updated with scientific advancements.

3. Scientific Training for Investigating Officer

Police officers and investigating agencies must be trained in proper crime scene management, including collection, preservation, sealing, labeling, and transportation of evidence. Proper handling at the initial stage ensures that forensic evidence retains its evidentiary value in court. 4. **Capacity Building for Judges and Prosecutors**

Judicial officers and public prosecutors should be provided training and workshops to enhance their understanding of forensic techniques. This will enable them to better appreciate scientific evidence and apply it effectively during trials.

5. Uniform Standard Operating Procedures (SOPs)

A nationwide uniform protocol should be framed for handling forensic evidence. Clear SOPs will reduce inconsistencies, prevent contamination, and strengthen the credibility of forensic results across jurisdictions.

6. Enactment of Comprehensive DNA and Forensic Legislation

India requires a specific and comprehensive legal framework governing DNA profiling and other advanced forensic methods. Such legislation should address issues of consent, privacy, admissibility, and data protection to remove existing legal ambiguities.

7. Creation of Secure National Databases

Establishing national databases for DNA profiles, fingerprints, and other identification records will greatly assist in identifying repeat offenders and

solving crimes efficiently, while ensuring strict safeguards to protect personal data.

8. Strict Maintenance of Chain of Custody and Accreditation

Proper documentation and digital tracking of evidence from the crime scene to the courtroom must be ensured. All forensic laboratories should be accredited and periodically audited to maintain quality standards and reliability of reports.

9. Adequate Financial Support and Promotion of Forensic Education

The government should allocate sufficient funds for forensic development and encourage universities to introduce specialized forensic science courses. This will create a skilled workforce and strengthen the scientific foundation of criminal investigation.

10. Implementation of Reform Recommendations and Ethical Use

Recommendations of expert committees such as the Malimath Committee should be implemented. At the same time, the use of forensic techniques must always respect constitutional safeguards, human dignity, and ethical standards to ensure justice without rights violations.

Conclusion

Forensic science has become an integral and indispensable component of the criminal justice system in India. In an era where crime has grown increasingly sophisticated, reliance on scientific methods of investigation is no longer optional but essential for the effective administration of justice. Techniques such as fingerprint analysis, DNA profiling, photography, voice examination, and expert forensic opinion have significantly strengthened the ability of courts to arrive at accurate and objective conclusions based on material evidence rather than solely on oral testimony or confessional statements.

The Indian legal framework, through the Constitution, the **Indian Evidence Act**, the **Code of Criminal Procedure**, and the Identification of Prisoners Act, provides substantial recognition to forensic evidence while ensuring that its use remains within constitutional boundaries. Judicial pronouncements have consistently balanced the need for scientific investigation with the protection of fundamental rights under Articles 20(3) and 21, ensuring that the pursuit of truth does not come at the cost of personal liberty and human dignity.

However, despite its recognized value, the effective use of forensic science in India is hindered by infrastructural limitations, shortage of

trained experts, delays in forensic reporting, and lack of awareness among investigating agencies and the judiciary. Addressing these challenges through modernization, training, legal reforms, and implementation of expert recommendations is crucial.

Ultimately, forensic science represents the movement of the criminal justice system from confession-based investigation to evidence-based justice. Its proper use enhances fairness, reduces wrongful convictions, and strengthens public confidence in the legal system. With continued reforms and commitment to scientific advancement, forensic science will play an even greater role in ensuring justice, truth, and rule of law in India.

REFERENCES

1. The Constitution of India, 1950.
2. The Indian Evidence Act, 1872. / Bharatiya Sakshya Adhiniyam2023
3. The Code of Criminal Procedure,1973./Bharatiya Nagarik Suraksha Sanhita, 2023
4. The Indian Penal Code, 1860./Bharatiya Nyaya Sanhita, 2023
5. The Identification of Prisoners Act, 1920.
6. State of Bombay v. Kathi Kalu Oghad, AIR 1961 SC 1808.
7. Jaspal Singh v. State of Punjab, (1979) 3 SCC 631.
8. Ramlal Bhogilal Shah v. D.K. Guha, AIR 1961 SC 1752.
9. Goutam Kundu v. State of West Bengal, (1993) 3 SCC 418.
10. Kamti Devi v. Poshi Ram, (2001) 5 SCC 311.
11. Sharda v. Dharmपाल, (2003) 4 SCC 493.
12. Selvi v. State of Karnataka, (2010) 7 SCC 263.
13. Umar Abdul Sakoor Sorathia v. Intelligence Officer, (1999) Cri LJ 2892 (SC).
14. CBI v. Abdul Karim Ladsab Telgi, (2005) Cri LJ 2868.
15. State of Gujarat v. Bharat alias Bhupendra, AIR 1996 SC 3055.
16. Malimath Committee Report on Reforms of Criminal Justice System, 2003.
17. Modi, J.P., A Textbook of Medical Jurisprudence and Toxicology.

18. Saferstein, Richard, *Criminalistics: An Introduction to Forensic Science*.
19. Sharma, B.R., *Forensic Science in Criminal Investigation and Trials*.
20. Nanda, B.B. & Tewari, R.K., *Forensic Science in India: A Vision for the Twenty-First Century*.

Disclaimer/Publisher's Note: The views, findings, conclusions, and opinions expressed in articles published in this journal are exclusively those of the individual author(s) and contributor(s). The publisher and/or editorial team neither endorse nor necessarily share these viewpoints. The publisher and/or editors assume no responsibility or liability for any damage, harm, loss, or injury, whether personal or otherwise, that might occur from the use, interpretation, or reliance upon the information, methods, instructions, or products discussed in the journal's content.
