FORENSIC EVIDENCE IN INDIAN CRIMINAL TRIALS: EVOLVING STANDARDS OF RELIABILITY, ADMISSIBILITY, AND JUDICIAL EVALUATION

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ABSTARCT

The use of forensic evidence has proven to be one of the most effective pieces of evidence to be used in modern criminal proceedings in India. In the growing appeal to scientific methods like DNA profiling, fingerprint analysis, ballistic testing, toxicology and digital forensics, courts are now increasingly being faced by evidence that purports objectiveness, accuracy and impartiality. Nevertheless, even the scientific nature of forensic evidence does not necessarily make it reliable and admissible in court. The Indian criminal jurisprudence indicates a complicated interplay between scientific and procedural protection and judicial discretion, as in most cases the forensic evidence can swing between being considered as decisive evidence and being viewed as corroborative evidence.

This paper is a critical review of the developmental standards in regards to the reliability, admissibility and judicial assessment of forensic evidence in Indian criminal trials. It claims that irrespective of the increasing broad engagement of forensic science, Indian courts remain conservative and principle-based by insisting on observing the statutory requirements, procedural integrity, and standards of proof. The paper examines the assessment of forensic evidence based on the Indian Evidence Act, 1872,(now BSA,2023) and the Code of Criminal Procedure, 1973,(now BNSS,2023) and also relies on previous jurisprudence.

It has also been noted in the paper that there exist systemic issues that include poorly equipped forensic laboratories, delays in forensic reporting, lack of consistency, risk of contamination and over reliance on expert opinion and without sufficient judicial oversight. The research validates the idea that judicial verdicts have always ruled that forensic evidence especially expertise testimony cannot substitute substantive evidence but that it should be considered alongside other circumstances incriminating evidence. The last section of the paper discusses the reforms that would help to fortify the forensic infrastructure, standardisation of admissibility standards, judicial literacy as regards to forensic science as well as the fact that scientific evidence should serve the cause of justice and not compromise the right to a fair trial.

Keywords: Criminal Trials; Reliability of Evidence; Judicial Evaluation; Forensic Evidence; DNA Profiling; Fair Trial.

1. INTRODUCTION

Historically, the criminal justice administration has been based on human testimony, circumstantial evidence and confessions to prove the presence or absence of guilt. However, in recent decades, the forensic science has become a key factor in the criminal investigations and trials in India. Scientific techniques DNA profiling, fingerprint comparison, handwriting analysis, ballistic analysis, and cyber- forensics are increasingly being sold as being objective and infallible and able to find the truth with mathematical accuracy. This increased dependency on forensic evidence has seen a dramatic change in the evidentiary scenario of the Indian criminal trials.[1] The desirability of forensic evidence is based on the fact that forensic evidence promises neutrality and scientific certainty. Forensic methods are not supposed to be biased, have memory lapses, or have emotional distortion like a human witness. By extension, the investigation agencies are likely to adopt the forensic results as conclusive and prosecutions are inclined to accord great significance to the expert opinions made based on scientific analysis. Even courts have recognized the relevance of forensic science in enhancing the evidentiary base of criminal cases in a number of situations. However, such an understanding of scientific infallibility is very problematic. The forensic evidence does not lack human error, institutional bias, methodological, and procedural lapses.[2]

The Indian criminal jurisprudence is a conservative approach towards forensic evidence. Courts have reiterated on numerous occasions that expert opinion is merely a matter of advice and not binding to the court.[3] The law has always held that forensic evidence must meet the set standards of admissibility and reliability before it can be taken action. The foundation of this judicial scepticism lies in the understanding that forensic science is conducted within social and institutional contexts that can undermine accuracy such as the fact that some forensic

[1] Ratanlal & Dhirajlal, *The Law of Evidence* (27th ed., LexisNexis 2023).
[2] Brandon L. Garrett, *Convicting the Innocent: Where Criminal Prosecutions Go Wrong* (Harvard Univ. Press 2011).
[3] *State of H.P. v. Jai Lal*, (1999) 7 SCC 280.

laboratories are underfunded and some staff lack expertise or forensic work can be delayed, samples contaminated, and poorly standardised.

The implementation of the Bharatiya Sakshya Adhiniyam, 2023 and BNSS, 2023 is an important step in the development of the evidentiary law in India. Although the new law does not change the basic principles of expert evidence, it also shows a greater sensitivity to scientific and electronic evidence, which is that the lawful collection, maintenance and presentation of forensic evidence is vital.[4] Such developments require the criminal justice system to review their approach to forensic evidence in a new way. One of the most important issues is the inclination to apply excessive use of forensic evidence as an alternative to a thorough investigation. Cases Multiple instances have been presented of circumstances where weak or the incomplete forensic evidence has been employed as the filler to the gaps in the prosecution narrative at the cost of a guarantee of fair trial.[5] The possibility of undeserved convictions due to the imperfection of the forensic practices is not a fiction any more it is a fact and is documented.

The other major problem is associated with judicial appraisal of forensic evidence. The judges are supposed to evaluate complicated scientific content even though he or she may not have the required technical skills. This imposes a lot of burden on the judiciary to find the balance between deferring to expert opinion and judicial reasoning. Indian courts have countered this by formulating principles that necessitate the corroboration, scrutiny of methodology, and assessment of credibility of forensic experts.[6] But the lack of standardized standards and forensic literacy still remains a challenge.

The paper will attempt to examine the forensic evidence not only as a scientific instrument, but also as a legal instrument and a legal instrument which should operate within constitutional assurances, procedural fairness and evidentiary discipline. It looks at the manner in which the Indian courts are navigating issues of reliability, admissibility and probative value and whether the current legal systems can handle the increasing role of forensic science. The paper proposes that science should not dominate justice but only help it by placing forensic evidence into the framework of the criminal procedure and judicial accountability.

[4] Bharatiya Sakshya Adhiniyam, 2023, ss. 39–42 & BNSS, 2023 Section 176(3).
[5] *Magan Bihari Lal v. State of Punjab*, (1977) 2 SCC 210.
[6] *Selvi v. State of Karnataka*, (2010) 7 SCC 263.

2. LITERATURE REVIEW

The study of forensic evidence in a criminal trial falls under the domain of several different fields of study such as criminal law, forensic science, criminology, and judicial administration. The Indian literature, however, is still disjointed it is usually technical or descriptive or case-specific and does not show any long-term doctrinal concern with the conditions of reliability, admissibility and judicial appraisal. This is a critical review of literature available on thematic heads done to identify the prevailing tendencies, methodological shortcomings and gaps that the current study aims to fill. Forensic science and criminal investigation involves studying the science of crime investigations and the role of forensic scientists in the judicial system.

2.1 Forensic Science and Criminal Investigation:

This is the study of the science behind investigating crimes and the place of forensic scientists in the criminal justice system.

In early Indian literature on forensic evidence, forensic science is widely regarded as a technology used to support criminal investigation. Criminal procedure and policing texts are often focused on the contribution of forensic methods to detection of crime, identification of its perpetrators, and recreation of the location of the crime.[7] Such works introduce forensic science as an objective and unbiased process that reinforces the probative worth of the criminal investigations.

Most such studies focus on:

- the technical operation of forensic tools,
- the system of forensic disciplines (DNA, ballistics, toxicology, fingerprints),
- the usefulness of science in enhancing conviction rates.

Nonetheless, this literature seldom questions the legal consideration of forensic reliance. The idea of forensic science usually seems to be reliable on its own, and there is not much emphasis on human intervention, institutional bias, and fallibility of its methods. Consequently, these studies do not cover the issue of how forensic evidence should be questioned in the context of criminal adjudication.

2.2 Expert Evidence according to the BNSS.

[7] K.N. Chandrasekharan Pillai, *Criminal Law* (Eastern Book Co. 2022).

The other important literature investigates the forensic evidence on the basis of expert intervention under the Bharatiya Nagarik Suraksha Sanhita, 2023. According to the scholars, despite reinforcing the procedural role of forensic experts, especially via the obligatory forensic investigation in serious-offences as provided by section 176 BNSS, the decisions made by experts are not binding on the courts.[8] Although in some jurisdictions, forensic reports may be accepted as documentary evidence under section 329 BNSS,[9] it is at the judicial discretion to accept such evidence or not. Analyses based on doctrine stress that expert evidence is not an independent evidence, the competence and procedural integrity of experts must be questioned by the court, and that forensic conclusions should be backed by substantive evidence. Nonetheless, there is a void in the current commentary as it is still quite abstract and does not apply well to contemporary forensic techniques like probabilistic analysis of DNA and digital forensic algorithms, indicating that the BNSS compliance with the procedure is not reflected in a relevant judicial appraisal.

2.3 Dependability and Inadequacy of Forensic Evidence.

Another negative literature casts doubt on the forensic infallibility assumption. Comparative scholarship, especially in the United Kingdom and United States, has shown that defective forensic practices have led to wrongful conviction.[10] This has been demonstrated by scholars like Garrett who hold that the reliability of scientific evidence in the court is being compromised through exaggerated forensic certainty, examiner bias and absence of validation research.

There is a paucity of Indian academic work done on forensic fallibility. Certain criminological researches recognize such problems as:

- lack of good forensic infrastructure,
- you know, backlog in the laboratories,
- absence of accreditation and standard operating procedures.[11]

Nevertheless, such deliberations tend to be either empirical or administrative in character and cannot be transformed into legal admissibility and assessment criteria of systemic flaws. The

[8] Bharatiya Nagarik Suraksha Sanhita, 2023, s. 176.
[9] Bharatiya Nagarik Suraksha Sanhita, 2023, s. 329.
[10] Ibid (2)
[11] Bureau of Police Research and Development, *Status of Forensic Science Laboratories in India* (Govt. of India, 2021).

connection between the unreliable forensic practices and constitutional rights, especially the right of fair trial is an area of study that has not been fully explored in Indian literature.

2.4 Judicial Disposition to forensic evidence.

Another valuable literature on forensic evidence is judicial decisions. It has been repeatedly warned by courts to avoid the blind use of expert testimony and the importance of judicial questioning has been highlighted. There are more cases like *Magan Bihari Lal v. State of Punjab* and *State of H.P. v. Jai Lal* point out that a forensic evidence cannot replace substantive evidence, and should be considered along with other evidences.[12]

It has been argued elsewhere by scholars that judicial attitudes frequently:

- summarises case law trends,
- emphasizes the preference of corroboration by courts,
- observes judicial scepticism against exclusive recourse to forensic reports.

However, a lot of this literature is descriptive in nature. It fails to adequately discuss the way the judges review forensic methodology, or whether courts have the institutional ability to comprehensively review the scientific validity. It is a fact that judges and lawyers lack forensic literacy but seldom does this issue get dealt with in normative terms.

2.5 Procedural Safeguards and Chain of Custody.

The other significant field of study is procedural protection in forensic evidence treatment. Criminal procedure studies emphasize the significance of legal collection, sealing, preservation and transmission of samples.[13] The chain of custody has been cited as an essential element of forensic material integrity.

Even though procedural compliance is a recurring topic, the literature tends to view violations as technical flaws and not as important threats to reliability. There is not much literature regarding the issue of how procedural failures during forensic treatment are supposed to affect admissibility or the importance of such evidence. This is especially noticeable when forensic outcomes are the foundation of the action taken by the prosecution.

2.6 Forensic Evidence, Human Rights and Fair Trial.

[12] Ibid (5)
[13] K.I. Vibhute & P. Vibhute, *Criminal Justice* (Oxford Univ. Press 2020).

A lesser yet important amount of literature investigates forensic evidence through the lenses of rights. These papers have suggested that overreliance on forensic science can erode the presumption of innocence and put the burden of proof on the accused.[14] Issues relating to forced forensic procedures, bodily integrity, and privacy have been done away with, particularly in instances of narco-analysis, polygraph tests, and DNA samples.

Nevertheless, the rights literature also tends to dwell upon the investigative excesses, as opposed to the evaluative consideration at the trial stage. The interface between forensic reliability and the constitutional safeguards of Articles 20 and 21 of the Constitution is not developed yet.

2.7 Comparative Perspectives

International scholarship provides more advanced systems of evaluating forensic evidence. Standards like the *Daubert v. Merrell Dow Pharmaceuticals* to be tested on scientific validity prior to admissibility.[15] European solutions of this problem are based on proportionality, accreditation of forensic laboratories and judicial control.

Indian literature cites such comparative models but hardly modifies them to local circumstances. It has little interaction with the question of whether such standards are possible or even desirable under the conditions of the adversarial system of India and its resources.

2.8 Literature Gaps

Based on the analysed literature, some gaps can be identified:

- Absence of a unified legal system used in determining forensic reliability in India.
- Lack of definite judicial criteria of assessment of scientific methodology.
- Excessive attention to forensic efficiency and a lack of attention to the rights to a fair trial.
- The analysis of the doctrines is short under the Bharatiya Sakshya Adhiniyam, 2023& BNSS, 2023.
- Low involvement with role of forensic evidence in wrongful convictions.

The paper will attempt to fill these gaps by considering forensic evidence as the legal institution, but not as the scientific instrument. It combines doctrinal analysis, judicial

[14] Ibid (6)
[15] *Daubert v. Merrell Dow Pharmaceuticals*, 509 U.S. 579 (1993).

reasoning and constitutional principles to suggest a principled framework of the admissibility and admissibility of forensic evidence in Indian criminal trials.

3. RESEARCH QUESTIONS & OBJECTIVES

Primary Research Question

What are the measures that the Indian criminal courts should take with respect to assessing the forensic evidence so as to guarantee dependability, legal admissibility, and adherence to the constitutional provisions on fair trial?

Secondary Research Questions

i. What are the criteria when it comes to the dependability of the forensic evidence in the criminal trials in India?

ii. How does the Bharatiya Sakshya Adhiniyam, 2023, deal with forensic evidence, especially expert evidence and what is the difference to BNSS, 2023?

iii. On what principles is the admissibility of forensic reports and expert opinion in criminal proceedings based?

iv. What is the judicial approach of Indian courts to the forensic evidence, particularly when it has been used as the major source of conviction?

v. How far can forensic evidence be regarded as incontrovertible evidence, and in what instances should it be regarded as corroborative only?

vi. Which are the organizational and procedural issues that have impacted on the reliability of forensic evidence in India?

vii. What can be done to enhance Indian evidentiary standards to ensure that miscarriages of justice occur due to defective or exaggerated forensic science?

OBJECTIVES OF THE STUDY

The following objectives will be pursued in the present study:

i. To investigate the conceptual and legal underpinnings of Indian criminal jurisprudence forensic evidence.

ii. To examine the standard of reliability ensured in Indian court to forensic evidence.

iii. To critically evaluate the admissibility rule of the forensic and expert evidence under the current Indian law.

iv. In order to assess judicial strategies in handling expert testimony and forensic reports, using leading Supreme Court and High Court cases.

v. To discover systematic gaps in forensic investigation such as infrastructural, procedural, and institutional constraints.

vi. To discuss the connection between forensic evidence and constitutional protective procedures, namely the right to a fair trial and the presumption of innocence.

vii. To present legal and policy changes that will help enhance the judicial review and regulatory system of forensic evidence in India.

4. RESEARCH METHODOLOGY

The methodology used in the research is qualitative, doctrinal and analytical and is complemented by comparative and policy-based methodology. With the legality of the investigation, the research is based more on secondary descriptions and legal documents than on the empirical investigation.

4.1 Doctrinal Legal Research

The main part of the work is doctrinal in character. It involves:

- Critical analysis of statutory requirement concerned with the forensic and expert evidence under the Bharatiya Sakshya Adhiniyam, 2023, and procedure requirements involved in the same under the Bharatiya Nagarik Suraksha Sanhita, 2023.
- Principles Analysis of principles of expert opinion, admissibility, relevance and probative value of scientific evidence.

- Law Research Study of various classical and modern commentaries on evidence law and criminal procedure.[16]

The investigation of the doctrines is employed to trace the position of the forensic evidence in the formal system of law and the interpretation of the legislative intent in the courts.

4.2 Judicial Analysis

One of the key sources of analysis of the study is judicial decisions. The methodology includes:

- Review of Supreme and High Court cases that concerned forensic evidence, DNA profiling, handwriting analysis, ballistic reports and medical jurisprudence.
- Determination of the judicial tendencies with regard to the corroboration, the expert credibility, and the standards of proof.
- Opposing evaluation of examples of the cases that were upheld or reversed in their verdict based on the use of forensic evidence.[17]

The approach assists in knowing the way abstract legal precepts are used in real-life criminal trials.

4.3 Analytical and Critical Approach.

In addition to the descriptive analysis, the research uses a critical evaluative approach. This includes:

- Doubting assumptions of objectivity and infallibility of forensic science.
- Examination of judicial reasoning in order to establish whether courts substantively review forensic methodology or just leave that to the experts.
- Considering the compatibility of forensic reliance and constitutional requirements of fairness, reasonableness and due process.[18]

This method enables the research to get out of the teaching of dogma and evaluate normative sufficiency

4.4 Comparative Method

[16] Supra (1)
[17] Ibid (3)
[18] *Maneka Gandhi v. Union of India*, AIR 1978 SC 597.

It takes a narrow comparative approach in order to put Indian practices in perspective. This involves:

- Citation of international jurisdictional provisions on forensic evidence, especially the tests by a court of science.
- Comparative analysis of the security measures including accreditation of the forensic laboratories and the reliability of experts.[19]

The comparative analysis is not applied to transplantation but to determine the optimal practices that can be adapted to the Indian legal system.

4.5 Review of Policy and Institutional.

The paper also analyses forensic evidence in the institutional perspective by:

- Examination of government reports about forensic infrastructure, laboratory capacity and delay in forensic analysis.
- The policy documents to be analysed will concern criminal justice reform and forensic modernisation.
- The evaluation of the mismatch between policy goals and on-the-ground delivery.[20]

Through this approach, structural problems that impact forensic reliability are emphasized outside the courtroom judgment.

4.6 Scope and Limitations

The study has limited itself to criminal cases in India and has not been applied in the case of civil and administrative cases. It concentrates on the doctrinal and judicial study and not the empirical test of forensics accuracy. Although comparative references are also provided the main focus is made to Indian law and jurisprudence.

5. RELIABILITY OF FORENSIC EVIDENCE

5.1 Conceptual Understanding of Reliability in Forensic Evidence.

In the field of forensic evidence, reliability is the extent to which a scientific method or professional judgment is able to produce consistent and repeatable valid results when using the

[19] Ibid (14)
[20] Ibid (10)

same situation. The issue of reliability in the context of criminal trials is not only a scientific issue but also a legal necessity because the results of a study of guilt or innocence directly depend on the results of forensic evidence. Compared to normal documentary or oral evidence, forensic evidence is accompanied with an aura of scientific objectivity, and this can easily affect the reasoning of the judges unless it is keenly scrutinised.

Indian courts have time and again recognized the fact that scientific evidences are not beyond fault. Reliability should therefore not be evaluated using only the basis of scientific qualifications but using legal standards whereby the practice used, the mode of gathering, the qualification of the expert conducting the examination and the uniformity of the findings made are evaluated.

5.2 Forensic Science: Myth of Fallibility.

One of the constant suppositions in the field of criminal adjudication is the assumption that forensic science is both inherently true and neutral. Legal scholars and courts have both challenged this assumption more and more. Forensic evidence can be susceptible to numerous error sources, such as human bias, contamination, procedural failure and outdated methodology.[21]

The limitations that might affect the Indian forensic labs include inadequate staffing, workloads, and uncertified labs, in addition to inconsistent standards of procedures. All these systemic flaws have a direct effect on the validity of the forensic results. Regardless of these facts, forensic reports are often accepted as a definitive pointer of guilt especially where there is no first-hand eye-witness testimony.

The threat of excessive reliance on forensic evidence is that the juristical rationale will be replaced with scientific opinion. Courts have warned that although scientific evidence is persuasive, it cannot outweigh the basic tenets of criminal jurisprudence like a proof beyond reasonable doubt.

5.3 Reliability of Expert Opinion in the Evidence Law.

In the Indian evidence law, forensic evidence is mostly presented in the form of expert testimony. The admissibility of expert opinion is due to the specialised knowledge that the

[21] Supra (2)

expert has; that is, the reliability of expert opinion is based on the judicial determination and not the expert determination.

It has always been the case with courts that:

- expert evidence is counsel as such;
- it does not bind the court;
- it should be adjudged as any other evidence.[22]

There is a threat on reliability when the courts accept the conclusions of experts without scrutinizing the methodology. The lack of cross-examination of scientific processes, margin of error and alternative interpretations further undermine the reliability test.

Indian jurisprudence emphasises on corroboration because they understand that expert opinion is a feeble type of evidence on its own unless it is corroborated by other material.

5.4 Methodological Reliability of Forensic Techniques.

Forensic evidence has a great difference in reliability, which depends on the discipline.

5.4.1 DNA Evidence

The forensic evidence of DNA profiling is commonly considered the most valid one as it has the scientific foundation and accuracy in terms of statistics. The high probative value has been recognized by Indian courts which have at the same time warned of lapses in proceedings.[23]

DNA evidence is reliable depending on:

- appropriate collection and maintenance of samples;
- an unbroken chain of custody;
- avoidance of contamination;
- open laboratory practice.

Without these defences, the evidentiary power of DNA evidence is destroyed, despite the level of scientific expertise.

5.4.2 Fingerprint and Handwrite Analysis.

[22] Supra (3)
[23] *Mukesh v. State (NCT of Delhi)*, (2017) 6 SCC 1.

Fingerprint analysis is accepted by the courts as it has been used over a long period, but the use of handwriting analysis has been met with a lot of scepticism. It has been observed by courts that handwriting identification is a subjective exercise and is also susceptible to error.[24]

The validity of this evidence will depend on:

- the existence of adequate comparison material;
- the skills and objectivity of the examiner;
- substantiation by collateral evidence.

5.4.3 Ballistics and Medical Evidence.

Medical jurisprudence and ballistic evidence are essential in determining the cause of death, weapons that were involved as well as the patterns of injuries. Although medical evidence is deemed to be objective, courts have explained that any medical and ocular evidence discrepancies need to be addressed cautiously, so that one does not favour one over the other, which does not amount to a mechanical preference.[25]

5.5 Chain of Custody and Procedural Integrity

The procedural compliance cannot be separated with reliability of forensic evidence. A chain of custody is appropriate to make sure that evidence has not been interfered with since it was collected to the time it is presented in court. Any breach in this chain that cannot be explained with reasons casts serious questions of reliability.

Indian courts have held that:

- improper sealing,
- late forwarding of samples,
- absence of documentation,

are capable of making forensic evidence unreliable and unfit to be used in conviction.[26]

5.6 Reliability vs. Admissibility: A Groundbreaking Difference.

[24] Supra (5)
[25] *Solanki Chimanbhai Ukabhai v. State of Gujarat*, (1983) 2 SCC 174.
[26] *Vijayee Singh v. State of U.P.*, (1990) 3 SCC 190.

Admissibility and reliability are to be separated. Although forensic evidence might be admissible under the law, its dependability will dictate how much weight it should have. The Indian courts have made it clear that the admissibility did not imply acceptance.[27]

This fact is important in avoiding miscarriages of justice since inadmissible forensic evidence, in spite of being admissible, can still not meet the required standard of proof during criminal proceedings.

5.7 Capacity of Judicial to determine Reliability.

One of the greatest difficulties in considering forensic reliability is a lack of scientific training of judges. The evaluation of the courts is usually based on the credentials of the experts and not the methodological appraisal. This poses a danger of judicial confidence to the scientific authority.

The scholars believe that the courts will be required to develop:

- forensic literacy,
- systematic reliability tests,
- logical thinking of professional approaches,

to make forensic evidence reinforce and not deter fair criminal trials.[28]

5.8 Standard of Proof and Reliability.

The criminal justice system dictates that there must be beyond reasonable doubt. This standard cannot even be diluted with the best evidence in the courtroom. It has been reiterated by the courts that legal certainty cannot be substituted by scientific certainty.

Where forensic evidence:

- is inconsistent,
- lacks corroboration,
- or is infirm in procedure,

it cannot be the one constituent of conviction. The reliability should be determined together with totality of evidence on record.

[27] *Ramesh Chandra Agrawal v. Regency Hospital Ltd.*, (2009) 9 SCC 709.
[28] Ibid (2)

5.9 New Concerns and Future Directions.

As the digital forensics and algorithmic analysis along with the use of tools based on artificial intelligence are increasingly utilized, the problem of reliability has become more complicated. Automated forensic processes are not very transparent, which casts doubt on transparency and reproducibility.

These challenges have not been fully met by the Indian legal scholarship, and thus, there has been the need to develop dynamically judicial standards that can adapt to the changes in technology without undermining fairness.

6. ADMISSIBILITY OF FORENSIC EVIDENCE UNDER BHARATIYA SAKSHYA ADHINIYAM, 2023 AND THE BHARATIYA NAGARIK SURAKSHA SANHITA, 2023

Two separate legal regimes that the forensic evidence can use in criminal trials in India include the Bharatiya Sakshya Adhiniyam, 2023 (BSA) and the Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS)[29]. Whereas the BSA governs the substantive regulations of evidence, such as relevance, expert opinion and probative value, the BNSS contains the procedural protections of the forensic material collection, preservation, transmission and presentation. The admissibility of forensic evidence, therefore, depends on whether there is adherence to the evidentiary legality and procedural due process.

6.1 Admissibility: Fraudulent Legal Framework and Legal Foundations.

Indian Evidence Act, 1872 (IEA) has a long history of providing control over admissibility of forensic evidence in India. The law on evidence, scientific and expert evidence included, has now been significantly re-focused towards a more structured and more policy-oriented model with the enactment of Bharatiya Sakshya Adhiniyam, 2023 (BSA). The BSA, in contrast to the version that preceded it, specifically recognizes contemporary types of evidences, such as forensic and digital evidence, and spells out more specific admissibility requirements.[30]

The forensic evidence usually gets to the court in form of an expert testimony or certified report of a forensic laboratory. The BSA acknowledges that scientific evidence is a specialised

[29] Bharatiya Nagarik Suraksha Sanhita, 2023, s. 176.
[30] Bharatiya Sakshya Adhiniyam, 2023, ss. 5–10.

evidence that needs to be given consideration by the courts in the spirit not only of its special characteristics but also of the traditional criteria of relevancy, probative value, and fairness.

6.2 Principles of Admissibility in BSA in general.

In the BSA, any evidence, such as forensic evidence, must meet three elements, in order to be admissible:

i. Relevance: The evidence should have an inclination to demonstrate or refute a fact in issue, logically.[31]

ii. Reliability: The evidence should be of scientific and procedural soundness.[32]

iii. Legality: The evidence provided should be legally acquired, with respect to the procedural protections and constitutional protections.[33]

These principles have been interoperable with the broader constitutional orders, including the right to a just trial, due process and equality before the law.

6.3 Procedure admissibility under BNSS, 2023.

Although BSA controls the admissibility of the forensic evidence, the BNSS controls the entry of the evidence into the courtroom. The requirement of admissibility as per the BNSS is procedural compliance. The forensic material obtained contrary to the statutory procedure is likely to be discarded due to unfairness and prejudice to the accused.

Another significant procedural change brought by the BNSS is that of requiring forensic investigation in a serious offence. This shows a legislative move to institutionalise the scientific research and minimise the reliance on confession or poor circumstantial evidence. Even though, there is no dilution of admissibility standards by mandatory collection. Courts are still examining a question on whether or not the statutory procedure was strictly adhered to.[34]

6.4 Legal Requirements of Admissibility of Scientific Evidence.

The BSA defines particular considerations that the court should undertake in establishing the admissibility of scientific or forensic evidence:

[31] BSA, 2023 ss. 7(1)–(2).
[32] BSA, 2023 s. 7(3).
[33] Constitution of India, art. 21; banned evidence makes trial unfair.
[34] Bharatiya Nagarik Suraksha Sanhita, 2023, s. 329.

6.4.1 Methodological Validity

The experts should prove that the methods employed are:

- is generally, in the scientific community in question, accepted,
- subject to peer review, and
- able to give reproducible results.[35]

This requirement is consistent with the international standards of admissibility, including the Daubert paradigm, but tailors them to Indian jurisprudence without necessarily making it adapt foreign tests.

6.4.2 Documentation and Transparency.

The researcher must document the study and the results and share them freely.

Forensic analysts should be able to give:

- full record documentation of procedures,
- description of instruments to be used, and
- reasonings of the quality control techniques and error proportions.[36]

Incomplete records, unreasonable atypical behaviour of standard procedures, or discrepancy of error rates can result in the evidence being excluded.

6.4.3 Chain of Custody and Integrity of Evidence.

The BSA stresses the fact that the chain of custody of all physical evidence should not be broken. Forensic reports would be admissible based on a provable protection of samples between the time of collection to the time of presentation. Any interruption in the chain of evidence without justifiable cause may make the evidence inadmissible.[37]

6.5 Difference between Admissibility and weight.

One of the most important doctrinal principles, which are acknowledged by the BSA is a division between admissibility and weight. Admissibility is the issue of presenting any evidence in the court; weight is the impact or relevance that the evidence must have on adjudication. The BSA teaches that admissible forensic evidence should still be considered on

[35] BSA, 2023 s. 39(3)(a).
[36] BSA, 2023 s. 39(3)(b).
[37] BSA, 2023 s. 39(4).

its merits in determining the weight to be given to it, be it by way of conclusiveness, corroboration or of mere assistance.

To illustrate such case, DNA evidence can be admissible when collected and analysed appropriately, however, its weight can differ based on the precautionary measures and supporting evidence of the story prosecution tells.

6.6 Discretion and Protections in Judiciary

Although the BSA provides statutory guidelines regarding admissibility, it does not interfere with judicial discretion, having the ability to bar evidence which, though technically admissible, should not be so because it would prejudice the trial process. This is in line with constitutional rights like the right to a fair hearing and presumption of innocence.

Courts may exclude a forensic evidence where:

- the collection procedure infringed the basic rights;
- the analysis was not transparent;
- or presenting evidence would create an unfair prejudice.[38]

It is in line with the fact that procedural fairness should not be compromise at the shrine of scientific ingenuity.

6.7 Forensic Reports: Certification and Authentication

The BSA presents the updated method of certification of the documentary and forensic reports. Prerequisites To become certified, one needs:

- testimony of qualified persons,
- establishing their authenticity,
- information of testing laboratories,
- dates of analysis, and
- experienced management of processes.[39]

Such conditions are supposed to minimize any disagreement regarding authenticity and facilitate the admission of forensic evidence in court.

[38] BSA, 2023 s. 41.
[39] BSA, 2023 s. 40.

6.8 Digital and Electronic Forensic Evidence.

The BSA too has recognized the digital age and therefore offers a space to digital forensic evidence such as electronic records, metadata, and extracts of devices. In order to be admissible, the Act stipulates that such evidence should be:

i. authorized using the standard protocols;

ii. obtained by means of sound forensic processing;

iii. not compromised through the elements of tampering, malware, or unauthorised access.[40]

This is a progressive provision, given the emergence of electronic communication and cybercrime; however, its practical ability is going to rely on judicial capability and technological skill.

6.9 Comparative Attitudes to Admissibility Standards.

Despite the fact that it was based on Indian legislative reform, the admissibility criteria in the BSA echo with the world trend. For instance:

- The American Daubert standard emphasizes methodology validity and reliability in science.[41]
- The European strategy focuses on the proportionality and dignity of human rights.[42]

Carbon copies of these models are not the admissibility criteria of the BSA, but an Indian standard that is contextualised and incorporates both scientific rigour and procedural fairness.

6.10 Challenges in Application

Although the new admissibility framework is promised to be structured, there are several challenges:

- The lack of judicial familiarity with complicated scientific procedures can give way to in-depth questioning.
- The absence of universal accreditation and quality assurance of forensic laboratories can cause disagreements regarding the validity of the methods.

[40] BSA, 2023 s. 45.
[41] Ibid (14)
[42] Council of Europe, *European Convention on Human Rights*, art. 6 (fair trial).

- Any delay and backlog in the forensic reporting process can affect prompt assessment of evidence.

Such practical concerns tend to bleach the aspirational definition of statutory language, requiring judicial and administrative changes.

7. JUDICIAL EVALUATION: STANDARDS AND CASE LAW

The principle of scientific evidence used in Indian criminal trials that, even though persuasive, it is powerless to occupy the place of court judgment is used by judicial evaluation of forensic evidence. The ruling courts in India have always held the view that the forensic evidence has to be tested by the judiciary and not be unquestioningly accepted on the singular basis of science.

7.1 Standards of Governance of Judicial Bodies.

The Indian courts use some of the well established standards when assessing forensic evidence:

To begin with, forensic evidence is not substantive evidence but is an opinion evidence. The competence of the expert, the scientific method used, and the rationale between the data to the conclusion must be questioned in courts.[43]

Second, forensic evidence is generally subject to corroboration particularly in cases where it is the only foundation of the prosecution case. Only expert opinion as a basis of conviction is looked at with suspicion.

Third, the courts also discuss the procedural integrity, such as chain of custody, methods of collection, sealing of samples, and preservation of samples. Lapses in procedures have a direct relationship with the weight of forensic material that is available as evidence.

Fourth, forensic evidence is evaluated along with the general prosecution narrative and the discrepancies in forensic evidence and ocular or circumstantial evidence should be addressed by logical arguments.

7.2 Supreme Court Jurisprudence.

[43] Ratanlal & Dhirajlal, *The Law of Evidence* (27th ed., LexisNexis 2023).

In *Magan Bihari Lal v. State of Punjab*, the Supreme Court in this found that opinion evidence of handwriting experts is a poor piece of evidence and could not be utilised without strong corroboration. This case was a solid foundation of judicial scepticism about subjective forensic disciplines.[44]

In *State of H.P. v. Jai Lal*, the Court confirmed that expert evidence is advisory and the court needs to make its independent assessment concerning its reliability and not to relinquish its opinion to the decision of the expert.[45]

The Court in *Mukesh v. State (NCT of Delhi)* acknowledged that DNA evidence has high probative value but at the same time emphasised that any high-level forensic method cannot be applied with impunity to the sample provided that there is no procedural infirmity.[46]

In *Selvi v. State of Karnataka*, the Supreme Court in this case explored the forensic methods through the prism of constitutional factors and determined that the use of forced methods to administer some forensic tests infringes on the rights to personal liberty and the right against self-incrimination.[47]

7.3 High Court Trends

Where chain of custody was lost or expert evidence was not methodologically clear, High Courts have often overturned forensic evidence. Courts have highlighted that inexplicable delays in submitting samples, lack of sealing of records or inconsistent laboratory reports undermine credibility in the forensic side and cannot represent conviction.

7.4 Emerging Judicial Approach

The current jurisprudence indicates a slow transition to methodology-based questioning especially of the DNA and digital forensic evidence. The courts become more demanding in the quality of laboratories and professional thinking, instead of taking the conclusions on the face of it. Nonetheless, the lack of a standard judicial test of scientific reliability still leads to inconsistency.

[44] *Magan Bihari Lal v. State of Punjab*, (1977) 2 SCC 210.
[45] *State of H.P. v. Jai Lal*, (1999) 7 SCC 280.
[46] *Mukesh v. State (NCT of Delhi)*, (2017) 6 SCC 1.
[47] *Selvi v. State of Karnataka*, (2010) 7 SCC 263

8. CHALLENGES AND REFORMS

Even though the use of forensic evidence in criminal trials in India has been gaining prominence, a number of structural, procedural and doctrinal obstacles have persisted to undermine its efficiency and dependability. It is important to address such challenges in order to make sure that forensic science reinforces but does not undermine the administration of criminal justice.

8.1 Key Challenges

8.1.1 Structural and institutional inadequacies

The insufficient forensic infrastructure in India is also one of the greatest threats. Forensic Science laboratories (FSLs) are plagued with constant understaffing, inadequate and outdated equipment, and high case loads. Such limitations lead to poor and delayed reporting, haste analysis, and quality of forensic examination. Late reporting of forensics usually undermines the delivery of justice and interferes with the right of the accused to have a quick trial.[48]

8.1.2 Lack of Coherent Standards and Accreditation.

India does not have a detailed statutory provision that requires a consistent set of accreditation and quality assurance among the forensic laboratories. Laboratory practice, testing procedure and reporting variance create discrepancy in the results of forensic process. In the absence of standardisation, courts will have a hard time determining the reliability and comparability of forensic evidence.[49]

8.1.3 The excessive dependence on expert opinion may be considered as an abuse of discretion.

Forensic reports are occasionally given undue weight in court without due scrutiny on the scientific methodology behind the report. Such judicial comity may contribute to the fact that expert opinion is converted into de facto decisive evidence, which is opposed to established rules in the law of evidence. This excessive dependence is especially dangerous in the case of an entirely forensic conviction.

8.1.4 Limited Forensic Literacy

[48] Bureau of Police Research and Development, *Status of Forensic Science Laboratories in India* (Govt. of India 2021).
[49] Law Commission of India, *245th Report on Forensic Science in Criminal Justice* (2014).

In many cases, judges, prosecutors and defence counsel do not receive enough training to consider the complex forensic methods especially in the case of DNA and digital forensics. Such lack of knowledge decreases the efficacy of cross-examination and judicial review, where unreliable or exaggerated claims on science go unquestioned.[50]

8.1.5 Rights-Based Concerns

Some of the forensic practices are associated with constitutional issues that have to do with autonomy of the body, privacy and the privilege against self-incrimination. Something the wrong collection of biological samples or forceful forensic method may invalidate the validity of the forensic evidence and infringe upon inherent rights in Article 21 of the Constitution.[51]

8.2 Proposed Reforms

8.2.1 Forensic Infrastructure Strengthening.

The State will have to invest in the growth of the number of forensic laboratories and their modernisation, the rise in the number of skilled staff, and the decrease in the number of cases waiting in queues. Improper forensic reporting will not result in fair adjudication and effective criminal justice provision.

8.2.2 Standardisation and obliges Mandatory Accreditation.

They should establish a national structure that makes forensic labs accredited and experts of forensic work certified. Standardized system of collection, testing and reporting would increase uniformity and confidence of the judiciary in the forensic evidence.

8.2.3 Training and Capacity Building of the judicial.

Judges, prosecutors and defence lawyers should receive regular training programmes on forensic science. By promoting forensic literacy, the courts would then be in a position to critically examine scientific evidence and not blindly accept the authority of the experts.

8.2.4 Good Judicial Guidelines on Evaluation.

[50] Brandon L. Garrett, *Convicting the Innocent* (Harvard Univ. Press 2011).
[51] Ibid (45)

The courts ought to develop systematic principles in the assessment of forensic evidence with emphasis on methodological validity, error rates and procedural integrity. These guidelines would enhance uniformity and less arbiter in judicial rulings.

8.2.5 Rights-Oriented Safeguards

The forensic practices should correspond to the constitutional perspectives. Protecting the rights of individuals, as well as protecting the authenticity of forensic evidence, requires the protection of individual rights, transparency, and proportionality in forensic testing.

9. CONCLUSION

Forensic evidence has become a main ingredient in the present-day criminal adjudication in India that offers objectivity, accuracy and scientific certainty in either verifying or refuting guilt or innocence. But, as this paper has shown, even greater dependence on forensic science reveals its structural weaknesses and the vagueness of its dogma in the criminal justice system. The importance of forensic evidence has not been in its scientific nature but rather in the strength of the legal frameworks that guide the reliability of forensic evidence, its admissibility and judicial discretion. As it is analysed, the idea of forensic infallibility was continuously denied by the Indian courts. The judicial precedents underline that forensic evidence, as any other expert opinion, will be in an advisory nature, and must be thoroughly questioned. Scientific methods do not necessarily possess reliability but must rely on methodological soundness, procedural integrity and clear reasoning. The requirement of corroboration and standard of proof beyond reasonable doubt is evidence in the consciousness of the judiciary of the hazard of blind belief in the conclusions of the forensic process.

The Bharatiya Sakshya Adhiniyam, 2023 is a big legal initiative to reform the available set of evidence to become more modern. The statute will also attempt to balance the evolution of evidentiary law with technological progress by placing a specific emphasis on the acknowledgment of scientific and digital evidence and the statement of admissibility criteria. However, the statutory admissibility is not equal to the evidentiary conclusiveness. The further difference between admissibility and weight has remained the focus of preserving the right to fair trial and avoiding miscarriages of justice. The forensic evidence in India has been judged with hesitation, contextualization and procedural conformity. Criminal cases show that courts are ready to suppress forensic evidence in cases where chain of custody is not preserved, expert

reasoning is not transparent, or when constitutional rights are not violated. Nevertheless, the lack of institutional criteria by which the scientific methodology can be judged has led to ad hoc results and sometimes excessive use of expert power. This highlights why there is a need to have more forensic literacy in the judiciary and the legal profession.

The problems that have been diagnosed in this paper such as infrastructural shortcomings, the absence of consistent standards, and rights-related issues show that forensic reliability is more of an institutional matter than a legal one. To make sure that forensic science has become an instrument of justice and not a cause of error, reforms should be made to strengthen forensic infrastructure, require accreditation, and increase judicial capacity. The forensic evidence should be enlightened at the end as an aide to the judicial reasoning rather than a replacement of the reasoning. The validity of forensics evidence in criminal trials is pegged on a balanced strategy that incorporates scientific development and legal caution, constitutional protection, and judiciary independence. It is only within this system of integration that forensic evidence can play any useful role in the process of seeking the truth and at the same time not compromising the very principles of criminal justice in India.

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