JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue

JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)

An International Scholarly Open Access, Peer-reviewed, Refereed Journal

FORENSIC EVIDENCE AND DNA PROFILING IN CRIMINAL TRIALS UNDER THE BSA, 2023

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Abstract: The Bharatiya Sakshya Adhiniyam, 2023 (BSA 2023) is a landmark upgradation of India's evidentiary system, legally incorporating scientific and electronic evidence in criminal trials. Of these, DNA profiling is a very effective forensic technique that can accurately identify people and add weight to prosecution and defence. This paper critically discusses the legal and procedural frame of forensic evidence in India after BSA 2023, examining statutory provisions, judicial patterns, and significant case law, such as landmark decisions in Smt. Sharda v. Dharmpal (2003) and Kattavellai @ Devakar v. Tamil Nadu (2025). Issues discussed include laboratory capacity, chain-of-custody, risk of contamination, and privacy issues under Articles 20(3) and 21 of the Constitution. Comparative insights from the U.S., U.K., and EU underscore requirements for admissibility, laboratory accreditation, and protection of genetic data. Recommendations for legislative reform, procedural protection, and capacity-building for the sake of ensuring scientifically sound DNA evidence, constitutionally acceptable, and contributing effectively to fair and accurate justice in India conclude the paper.

IndexTerms - Bharatiya Sakshya Adhiniyam 2023, DNA profiling, forensic evidence, expert opinion, admissibility, chain-of-custody, privacy, Article 21, Daubert standard, comparative forensic law, criminal justice, genetic data protection

I. INTRODUCTION

The Bharatiya Sakshya Adhiniyam, 2023 (BSA 2023) is a seminal reform of India's law of evidence, superseding the Indian Evidence Act, 1872. This new law conspicuously embraces contemporary modes of proof, particularly scientific and electronic evidence. DNA profiling, being one of the most effective forensic weapons, can potentially revolutionize both prosecution and defense in criminal trials. Yet, its validity and acceptance raise intricate legal, technical, and ethical problems. While DNA evidence can yield "unique markers" that "make exact identification possible from minuscule samples", referred to as a "genetic eyewitness" or "new gold standard" in forensic science, at the same time, issues like contamination, degradation, inadequate chain-of-custody, or privacy issues can compromise its probative worth and fairness. This paper critically analyzes the extent and importance of forensic evidence and DNA profiling in India's criminal justice system after BSA 2023. It discusses the statutory provisions under BSA 2023 (and ancillary legislation), contrasts the same with the previous Evidence Act, traverses major judicial pronouncements prior to and after the new Act, and underscores challenges like laboratory capacity, procedural safeguards, and rights of the individual. We also situate India's practice in a comparative frame of reference, mentioning international best practices (e.g. the Daubert standard in America and stringent privacy regimes in Europe). Last, we recommend changes to ensure that DNA technology is brought into trials in such a way that it is scientifically solid, constitutionally proper, and hospitable to justice.

II. STATEMENT OF PROBLEM

The passing of the Bharatiya Sakshya Adhiniyam, 2023 represents a paradigm shift in India's law of evidence, focusing more on digital and scientific evidence. Of these pieces of evidence, DNA profiling is ranked as one of the most effective tools in forensic analysis in criminal investigation and adjudication. Nonetheless, its validity and admissibility present intricate legal, technical, and ethical issues. Problems like absence of infrastructure in forensic labs, inadequate chain of custody, possibility of contamination, lack of uniform standards, privacy concerns, and abuse of genetic information pose challenges in using DNA profiling successfully. Additionally, judicial interpretation in the context of the new paradigm of BSA, 2023 is evolving, and hence a critical analysis of its extent and implications in criminal proceedings is called for

III. RESEARCH QUESTIONS

1. What is the scope and significance of forensic evidence, particularly DNA profiling, under the Bharatiya Sakshya Adhiniyam, 2023?

2. How does the BSA, 2023 differ from the Indian Evidence Act, 1872 in terms of admissibility of forensic and scientific evidence?

3. What role does DNA profiling play in strengthening prosecution or defense in criminal trials?

4. What are the challenges faced by courts, forensic laboratories, and investigating agencies in ensuring the reliability of DNA evidence?

5. How do Indian judicial interpretations align with international standards on DNA evidence?

6. What reforms or safeguards are necessary to balance scientific accuracy, privacy rights, and fair trial guarantees?

IV. SIGNIFICANCE OF RESEARCH

This study is of immense importance as it critically explores the pivotal role of forensic evidence, specifically DNA profiling, in the criminal justice system of the Bharatiya Sakshya Adhiniyam (BSA), 2023. Through a study of statutory provisions, judicial decisions, and forensic laws, this research attempts to clarify whether the prevailing legal framework satisfactorily strikes a balance between scientific evidence and postulates of fairness, privacy, and the right to a fair trial.

It takes into account critical contemporary issues, particularly concerning the reliability, admissibility, and ethical considerations of DNA profiling such as privacy rights, chain of custody, and technical mistakes, which can substantially impact criminal adjudication. Additionally, the paper traces the historical development of forensic evidence in India, displaying contextual appreciation of its current usage and potential incongruities in upholding justice.

The findings of this research aspire to inform scholarly debate, shape policy creation, andimpact legal and procedural reform initiatives, providing recommendations to enhance standards in forensic practice, strengthen judicial oversight of DNA evidence, and protect individual rights while ensuring the integrity of the criminal justice system. In summary, the research contributes to ensuring that forensic evidence, particularly DNA profiling, is a dependable and morally sound means during criminal trials under the BSA, 2023.

V. SCOPE AND LIMITATION OF RESEARCH

The research is largely confined to the Indian legal framework, addressing forensic evidence and DNA profiling under the Bharatiya Sakshya Adhiniyam, 2023, and its interface with current criminal procedure and evidence law. The study delves into statutory provisions under the BSA, 2023, Indian Evidence Act, 1872, and sections of the Code of Criminal Procedure, 1973. Landmark judgments and case laws interpreting DNA evidence admissibility and credibility, for instance, State of Haryana v. Rajesh, Selvi v. State of Karnataka, and other prominent rulings, are discussed to assess judicial interpretation and application. The research also considers issues of contemporary relevance, including forensic validity, ethical protection, privacy, and technical constraints in DNA profiling, and provides limited comparative comments from overseas jurisdictions (e.g., UK, US) to evaluate conformity with international best practice. Ethical safeguards. The study is doctrinal and analytical, rooted primarily in case law, statutes, and scholarly comment. It lacks empirical field research, interviews with forensic scientists, and statistical analysis of forensic labs. While the study refers to procedural and technical problems in DNA sampling and analysis, legal and evidentiary concerns in criminal trials remain the focus. Comparative evaluation is limited to illustrative examples and is not an exhaustive cross- jurisdictional analysis.

VI. RESEARCH OBJECTIVES

1. To examine the legal framework governing forensic evidence and DNA profiling under the Bharatiya Sakshya Adhiniyam, 2023.
2. To analyse the admissibility, reliability, and evidentiary value of DNA profiling in criminal trials.
3. To assess judicial trends and case laws interpreting DNA evidence before and after the enactment of the BSA, 2023.
4. To identify challenges in implementation, such as privacy concerns, chain of custody, and technical limitations of forensic procedures.
5. To explore comparative perspectives by looking at international standards and best practices regarding DNA evidence in criminal justice.
6. To provide suggestions for effective integration of forensic science with criminal adjudication to ensure fair trial and justice.

VII. RESEARCH METHODOLOGY

The research approach in this study is doctrinal legal research. The primary sources are the Bharatiya Sakshya Adhiniyam, 2023, the Indian Evidence Act, 1872, relevant provisions of the Code of Criminal Procedure, 1973, and judicial pronouncements of the Supreme Court and High Courts on forensic evidence and DNA profiling. The secondary sources are journal articles, books, research papers, reports of forensic committees, and documents of international forensic standards and human rights bodies. Comparative analysis resorts to foreign legislation and jurisprudence (e.g., UK, US, EU) on DNA evidence. We conduct close reading of statutes, forensic regulations, and judgments, synthesis of principles of law, and interpretation of scholarly commentary. We structure our analysis around themes to address statutory provisions, evidentiary norms, historical evolution of DNA profiling, judicial applications, technical and ethical challenges, and reform proposals. Whenever possible, we buttress our arguments with authoritative sources in the form of court reports, official government publications, and well-respected forensic literature.

VIII. CHANGING LEGAL FRAMEWORK FOR FORENSIC PROOF

From the Evidence Act, 1872 to BSA 2023

Scientific evidence was admitted as expert opinion under Section 45 of the Indian Evidence Act, 1872 (IEA) and could be used by courts in respect of matters of science, art, handwriting or foreign law. The BSA 2023 preserves this scheme in Section 39(1) almost word for word, providing that where the court is required to express an opinion on a matter of science or other technical subject, an opinion of an individual "specially skilled" in it is a relevant fact. Essentially, DNA examiners (and other forensic scientists) still provide "opinion evidence" under the new Act. Significantly, Section 39(2) of BSA 2023 extends a step further in clearly including electronic evidence: it makes opinion of an Examiner of Electronic Evidence (as defined under the IT Act) relevant to opinions regarding any data stored or transmitted electronically. This enshrines contemporary cyber-forensics into the evidentiary paradigm, a concept missing under the 1872 Act.

BSA 2023 further brings electronic records per se into the modern age. For example, Section 63 states that "computer output" (data from electronic records reproduced on paper or held in digital form) is a document if certain conditions are fulfilled.39 Bharati and Nagarale note that the BSA "makes electronic and digital records the main evidence, thus making the submission of evidence a simpler process." In day-to-day terms, this entails proof such as CCTV records, emails, and text messages, much of which can form the basis for forensic investigations, having the same evidential value as conventional paper-based documents. Authentication procedures (for example, certificates under Section 65B of the IEA) are also elevated under BSA, with the requirement that digital records in dispute must be accompanied by legal certificates verifying their provenance. In summary, the new Act demonstrates a general movement towards accepting scientific and electronic media as acceptable evidence with formal legal acceptance.

IX. ADMISSIBILITY OF FORENSIC EVIDENCE UNDER BSA

Both the old and new legislations have the admissibility of DNA profiling resting on the "opinions of experts" framework. Section 39(1) BSA (similar to Section 45 IEA) makes expert reports admissible, but does not determine their weight. Therefore, DNA evidence is not considered absolute proof but as expert opinion to assist fact-finding. The Supreme Court has always stressed that expert evidence is advisory and not conclusive. In Pattu Rajan v. State of Tamil Nadu (2019), to give a specific illustration, the Court observed that "DNA evidence is also in the nature of opinion evidence", and like any other opinion evidence, its probative value "varies from case to case… given that… it may be said to be infallible". The Court warned that no adverse inference follows merely from a lack of DNA match. In short, a conviction cannot be based on a DNA report alone, except in cases where it is supported by other proof.

The BSA does not change these basic principles. By deeming DNA analysis an "expert opinion," Section 39 essentially brings DNA results under the same standards as other scientific evidence. This implies the report should be well-written by a competent professional, based on established scientific practice, and the court should be convinced that the expert complied with proper procedure in gathering and analysing. Indeed, drawing on U.S. jurisprudence, one commentator notes that under Section 39 BSA, DNA evidence is admissible only through such qualified expert testimony analogous to the Daubert standard in America, which screens scientific evidence for relevance and reliability before trial. The Frye standard of "general acceptance" and Daubert criteria of peer review, error rates, and standards, etc. are readily adopted elsewhere and Indian courts similarly take note of these thresholds even if not statutorily enacted.

Compared to other nations, Indian law has no independent statutory basis for DNA evidence as in a few nations. For example, the United States is based on judicially created rules (Daubert) as well as codified legislation (such as legislation permitting DNA databasing), whereas the United Kingdom and much of Europe is supported by dedicated statutes regulating forensic DNA databanks as well as privacy protections. India's BSA generally looks at DNA evidence through the general framework of expert opinions, without new substantive limits. Yet, other newer legislation does touch on compulsion and collection: the Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023 permits DNA sampling of suspects during investigation, adopting the assumption (implied in Puttaswamy v. Union of India) that bodily samples for forensic analysis are not "testimonial" and do not attract Article 20(3) protections. Meanwhile, the Courts have emphasized that privacy and individual liberty under Article 21 place constraints on when DNA may be extracted coercively. In XYZ v. ABC (2021), the Supreme Court held that compelling a DNA test in a civil litigation would infringe upon the individual's privacy and liberty, emphasizing the proportionality test derived from Puttaswamy. These

rulings emphasize that, although admissibility is generally available, coerced DNA extraction in criminal proceedings needs to adhere to constitutional protections (e.g., court authorization, necessity, and least intrusive means).

X. JUDICIAL TRENDS

Pre-BSA Case Law on DNA Evidence

Indian courts had already struggled with the evidentiary worth of DNA profiling prior to BSA 2023. The seminal High Court ruling Smt. Sharda v. Dharmpal (2003) was the first significant acknowledgment of DNA tests in India. In the said matrimonial case, the Supreme Court established that DNA tests are acceptable scientific evidence and do not contravene Articles 20(3) or 21. The Court reiterated that a decree can be passed based on indisputable scientific tests of paternity. According to one analysis, Sharda "upheld technology in civil/matrimonial disputes, ruling it does not violate Article 21 or 20(3)." This maxim opened the door to general forensic application. In criminal proceedings, the Courts have insisted that DNA evidence is very probative though not determinative in itself. In State (NCT of Delhi) v. Navjot Sandhu (2005) (the Nirbhaya case), DNA testing was referred to as "virtually infallible evidence" of identity, essential to the conviction. The Delhi High Court in the Priyadarshini Mattoo case (2006) also gave the same treatment to DNA reports as clinching evidence if they were properly collected, reversing the trial court's earlier rejection of DNA on grounds of procedural flaws. However, if custody is tainted, courts have been dubious. In Rahul v. State of Delhi (2022), the Delhi High Court declined DNA evidence since the sample of the accused had been in police custody for two months and thus the report was unreliable. These conflicting decisions show that Indian courts require strict protection measures; DNA analysis must be conducted by certified labs, with an unbroken chain-of-custody, in order for the report to be admissible.

The Supreme Court's recent curiosity regarding DNA found its climax in the case of Kattavellai @ Devakar v. State of Tamil Nadu (2025). In this case, the Court delivered elaborate guidelines regarding the handling of DNA evidence in criminal trials. The Court in Devakar specifically classified DNA results as opinion evidence under Section 39 BSA, and cautioned that it is as powerful as adheres strictly to forensic practices. The Court mandated that each DNA sample had to be taken with scrupulous documentation (FIR number, official signatures, witnessing) and sealed straight away; sent to the lab within 48 hours; followed in a formal custody register; and opened (if at all) only by court order. These judicial developments reflect an expanding paradigm: DNA evidence is appreciated as significant corroboration, yet only if gathered, stored, and examined pursuant to scientific and legal parameters.

Post-BSA Developments and Guidelines

Since BSA 2023 became law (effective July 2024), courts have started interpreting its provisions. In Devakar, the Supreme Court itself used the term "opinion evidence" with respect to DNA under Section 39(1) BSA. It reiterated that, as with any expert opinion, DNA evidence needs context-based assessment and corroboration. The Court's DNA-handling

guidelines effectively operationalize BSA's principles by strengthening chain-of-custody and lab standards in trial practice. Other superior courts have referred to BSA as well to evaluate DNA. For instance, in N. Sesharatnam v. State of Haryana (Madras HC, 2025), the court observed that BSA Section 39 displaces earlier Evidence Act provisions and that new technological specialists (such as "Examiners of Electronic Evidence") are now legally established. Nevertheless, due to the novelty of BSA, exhaustive appellate decisions remain rare. Most of the existing guidance has taken place in these pioneer cases and rule-making authorities (e.g., DNA Profiling Board was established under the 2019 Bill's regime) which will be impacted by BSA soon.

XI. CHALLENGES IN DNA EVIDENCE AND FORENSIC PROCEDURES

Technical and Procedural Barriers

Successful utilization of DNA profiling in the courtroom relies heavily on laboratory facilities and procedures. India has a long-standing lack of accredited forensic laboratories, resulting in heavy backlogs and delays.58 Numerous state labs are not equipped with modern facilities or accredited procedures, and training and quality management vary extensively. Consequently, cases bog down while evidence waits to be analyzed. There is no standard assurance of laboratory quality due to the absence of a strong accreditation system in India. Outside observers have highlighted that DNA evidence requires "strict quality control procedures along with blind testing and independent verification", yet in reality Indian laboratories occasionally function under pressure and austerity. Chain-of-custody is another nagging issue. DNA evidence is delicate and susceptible to contamination by even a minute procedural failure. Each step from sample collection on the crime scene to ultimate analysis has to be documented and sealed. Regrettably, police forces have not always adhered to best practices. In a few cases reviewed, samples were retained in police custody or even lost, prompting courts to challenge the validity of findings. The Supreme Court's Devakar guidelines highlight this issue: it mandates a written chain-of-custody register accompanying each DNA sample, an unthinkable step under the previous regime of evidence. In their absence, even very discriminating DNA tests become doubtful. Contamination and degradation are intrinsic scientific issues. DNA evidence "can still present certain problems" like contamination at or during transportation. DNA traces are degraded by extreme heat, moisture, or light. Additionally, "secondary transfer" of DNA (in which a person's cells become deposited on an object through an intermediary) can produce false matches.62 Courts have acknowledged these risks. The probabilistic nature of DNA mixed samples must be interpreted with care; a "match" means potential presence at a location but does not establish guilt beyond reasonable doubt unless combined with other evidence.

These scientific qualifications are reflected in the form of legal difficulties. Judges need to comprehend the skepticism of DNA matching based on statistics and skepticism about probability. Excessive dependency upon a molecular "match" without additional context is liable to result in miscarriages of justice. For instance, DNA evidence alone cannot prove who perpetrated the crime—only who deposited DNA at the crime scene. Therefore, Indian courts consistently caution that DNA should be balanced against motive, eyewitness testimony, and circumstantial evidence. There is a consensus that DNA evidence should minimize doubt, not produce a false certainty.

Privacy and Ethical Issues

DNA profiling gives rise to substantial privacy and human-rights concerns. In contrast to fingerprints or other identification, genetic information can disclose intimate details about a person's health, ethnic background, and relatives. Misuse of DNA has dystopian possibilities for monitoring or discrimination. In India, no overarching law regulates genetic data, although a "DNA Technology Regulation Bill" was introduced in 2019 (now expired). Courts have been mindful of privacy. Drawing on K.S. Puttaswamy v. Union of India (2017), the Supreme Court in 2021 ruled that coercively making a person undergo a DNA test (e.g., by a litigant in a civil suit) infringes fundamental rights of privacy and liberty. The Court directed that any coercion has to undergo a rigorous proportionality test—it may be ordered only if crucial to justice and with due safeguards. While Puttaswamy did not engage criminal defendants, the doctrine that genetic sampling is a serious invasion applies to criminal cases as well.

Simultaneously, Article 20(3) (protection against self-incrimination) is not held to exclude DNA tests. Experts point out that DNA sampling is not testimonial, similar to fingerprinting, and therefore outside Article 20(3) protection. BNSS 2023 clearly authorizes DNA collection from accused persons in investigation. But Article 21 (right to privacy and dignity) still demands that any search of one's body or biological samples have to be reasonable. DNA collection has to be sanctioned by law (e.g., the BNSS provisions or CrPC identification acts) and in a minimally invasive form. Procedural protections (judicial oversight, chain-of- custody practices, sealing, etc.) partly provide privacy protection by ensuring personal genetic material is not abused or put on public display. Lastly, the lack of a specific DNA law results in no legislative arrangement for a national database of DNA or data retention constraints. Civil society and experts have cautioned that the deficiency may cause abuse. International conventions (Council of Europe's Convention on Human Rights and Biomedicine) emphasize that processing genetic data must have explicit legal safeguard and limitation of purpose. As analysts recommend, India may want to enact the DNA profiling law in order to establish clear cut-offs since most nations (UK, US, EU members) already have.

XII. INTERNATIONAL STANDARDS AND COMPARATIVE PERSPECTIVES

DNA profiling is regulated globally under strict standards. In the US, the admissibility of scientific evidence is dominated by the Daubert standard (Daubert v. Merrell Dow Pharmaceuticals, 1993), which mandates techniques to be scientifically sound and applied reliably. DNA profiling readily satisfies Daubert's requirements (peer review, established error rates, acceptance in the scientific community), and that's the reason that U.S. courts reliably accept it as evidence of extremely high reliability. Prior to Daubert, the Frye test (1923) established the requirement of "general acceptance" of the method. In India, no Daubert-like rule exists, but courts have applied these principles and effectively secure reliability by cross-examining experts and testing them. The Egyptian Journal of Forensic Sciences observes that around the world there are "different standards or protocols, e.g., Frye test, Daubert test, prejudicial effect test, [and] usefulness standard" to evaluate scientific evidence. Without having a formal system in place, Indian courts do—and can—refer to such standards in order to determine forensic validity.

In the United Kingdom, both scientific validation and judicial gatekeeping are highlighted in the consideration of DNA evidence. The UK Forensic Science Regulator publishes guidelines to make all forensic tests (including DNA) ISO-accredited. The UK National DNA Database (NDNAD) accumulates profiles under rigid legal controls; only serious crimes are covered, and there are specified rules regarding destruction of samples. Adjudicators in criminal court proceedings utilize the "admissibility" test under the Police and Criminal Evidence Act 1984 (and the codes of practice)—the DNA evidence is required to be lawfully obtained and treated well, or it will be excluded. Conveners and expert panels are also employed in the UK to make complex DNA issues understandable to juries. Indian courts have yet to establish such formal regimes, but the Devakar guidelines echo many British practices (timely transfer to labs, sealed envelopes, custody logs).

The U.S. and EU have similarly robust schemes. For example, the FBI's Combined DNA Index System (CODIS) uses standardized STR (short tandem repeat) loci across all states. STR analysis becomes widely used since its high discrimination power ensures that two people not connected in any way cannot share identical DNA profiles, and the FBI has implemented STR for CODIS. That is to say, DNA profiles added into CODIS are directly comparable jurisdiction-wise. Indian investigators have no parallel national DNA database (the 2019 Bill would have established one), so cross-matching profile opportunities are limited.

Eithically, most countries have also legislated genetic privacy. The EU's GDPR categorizes genetic information as "sensitive personal data" under special protections. Under the Genetic Information Nondiscrimination Act (GINA) in the U.S., people are shielded against health insurance or employment discrimination by DNA. India lacks such protections despite the increasing use of DNA, highlighting the urgency for legislative protection. The comparative lesson is clear: robust standards and oversight, combined with respect for individual rights, are essential if DNA evidence is to be trusted.

XIII. CHALLENGES AND THE NEED FOR REFORM

The effective integration of DNA profiling into Indian trials faces several hurdles. First, infrastructure and capacity are inadequate. India's Federal and State forensic labs are overburdened and under-resourced. Backlogs mean that evidence can remain unanalysed for years or months, discrediting timely justice. The quality of expertise is uneven and some labs are not NABL-certified or equipped with contemporary equipment. This is compared to nations such as the UK or Australia where forensic labs have to adhere to high accreditation and quality-control standards. To build confidence in DNA evidence, India must upgrade its laboratories, increase funding, and institutionalize training.

Second, procedural protocols need tightening. As discussed, maintaining an unbroken chain- of-custody is vital. This requires standard forms and registers at every police station and FSL. Investigators and doctors who collect biological samples must be trained to seal them properly, store them at suitable temperatures, and document transfers. The Supreme Court in Devakar specifically required such protocols. More broadly, judges and police officers should be taught the rigorous standards for forensic evidence. Forensic law courses in police and law schools can fill knowledge gaps.

Third, there are interpretative and scientific problems. Combined or low-template DNA profiles (from a minor or mixed sample) can be uncertain. Courts have acknowledged that expert statistical interpretation is required, and that reports need to contain match probability statistics. If these are misinterpreted, jurors can receive a misleading sense of certainty. Reformers recommend that forensic analysts be present in court to provide context on limitations. In addition, ongoing auditing of forensic procedures (blind retests, proficiency tests) would lower rates of error. India can implement models such as the U.S. Organization of Scientific Area Committees (OSAC) standards or the activities of the National Commission on Forensic Science (NCFS) for the purpose of ensuring laboratories revise methods.

Privacy and protection of genetic data are open issues. In the absence of a DNA profiling law, India is behind international standards. Parliament must reprise and enact the DNA Technology (Use and Application) Bill. Such legislation would specify which offenses justify DNA collection, set rules on retention periods, and create a control board (like the UK's Ethics Group). It should also ensure erasure of innocent individuals' data and ban profiling for non-law-enforcement uses. Simultaneous data protection laws (or revision of the Personal Data Protection Bill) would need to include genetic data. The Devakar guidelines and expert comment all urge this legislative intervention. Lastly, the justice system itself must evolve culturally. Judges and attorneys must not treat DNA evidence as unquestionable truth or as useless gimmick. The Judiciary might create model jury instructions on DNA. Fact-finders must be reminded of the limits of the evidence: a match doesn't tell how or when DNA was left behind. A lack of DNA match, on the other hand, doesn't necessarily exonerate if there is other evidence. Clear instructions can avoid blind faith and excessive suspicion.

XIV. FINDINGS

Our analysis discovers that the Bharatiya Sakshya Adhiniyam, 2023 (BSA 2023) has significantly modernized the Indian law of evidence, explicitly incorporating scientific and electronic evidence into criminal trials. DNA profiling, as recognized under Section 39, is treated as expert opinion rather than conclusive proof. Indian courts consistently stress that DNA evidence cannot alone determine guilt; it must be corroborated by other evidence such as eyewitness accounts, circumstantial facts, or motive. For instance, in Pattu Rajan v. State of Tamil Nadu (2019), the Supreme Court emphasized that DNA evidence, while highly probative, remains advisory and its weight depends on the context of collection and analysis.

In practice, judicial interpretation has strengthened procedural safeguards. Landmark cases such as Kattavellai @ Devakar v. State of Tamil Nadu (2025) provide detailed guidelines for sample collection, sealing, chain-of-custody, and court-monitored transfer to laboratories. These measures operationalize BSA 2023 and aim to prevent contamination, degradation, and procedural lapses that have historically undermined reliability, as seen in Rahul v. State of Delhi (2022). Despite these improvements, challenges remain, including inadequate laboratory infrastructure, uneven accreditation standards, and technical difficulties in analyzing mixed or low-template DNA samples. Comparatively, India lags behind international standards. In the U.S., the Daubert standard ensures DNA techniques meet rigorous reliability, peer review, and error rate thresholds. In the UK and EU, accredited labs, strict chain-of-custody protocols, and robust privacy protections are mandatory. India, while adopting procedural oversight and expert-led evaluation, has no statutory DNA databank, uniform lab accreditation, or comprehensive privacy law for genetic data. The absence of these mechanisms increases risks of misuse and ethical concerns, particularly relating to Article 21 protections of privacy and dignity.

Experts and scholars highlight that the lack of dedicated DNA legislation and genetic data safeguards may hinder public trust and lead to potential abuse. Yet, procedural reforms under BSA 2023, supported by judicial guidelines, do provide a framework for fair and reliable use of DNA evidence. While courts have begun enforcing strict documentation and procedural compliance, excessive reliance on molecular "matches" without context remains a potential risk.

That being stated, our analysis recognizes the legitimate aim of DNA evidence: it significantly strengthens investigative and judicial processes, contributing to precise and scientifically supported fact-finding. The BSA 2023 demonstrates a legislative effort to integrate modern forensic science with criminal justice. However, operational challenges— such as lab capacity, procedural training, statistical interpretation, and privacy safeguards— indicate that the full potential of DNA profiling is yet to be realized. In brief, while BSA 2023 lays the foundation for scientifically sound and constitutionally acceptable forensic practice, the courts, legislature,

and investigative agencies must collectively implement reforms to ensure DNA evidence reliably advances the cause of fair and accurate justice in India.

XV. CONCLUSION

The BSA 2023 unambiguously recognizes that scientific and forensic contributions are integral to contemporary trials. By making electronic records and opinion evidence real under the Evidence Act, Parliament has entered into an undertaking of technology-facilitated justice. DNA typing, in its unique capacity to oblige, represents such change. It has put more toward the goal of "beyond reasonable doubt" in connecting suspects with crimes, as one Supreme Court case after another has demonstrated. Technology is no magic bullet, though. Its advantages are accompanied by obligations: for investigators to carefully store samples; for experts to be methodical in analysis; and for the judicial system to impose high standards. The Devakar guidelines and international best practices supply a template for these obligations.

India is at crossroads today. Abuse or misuse of DNA evidence can result in miscarriage of justice and erode public confidence. But with all the proper checks in place—more transparent laws, improved labs, capable personnel, and alert judges—DNA profiling can become the "new gold standard" in India's criminal trials. The Bharatiya Sakshya Adhiniyam provides the contemporary framework; it now remains for the courts and the legislature to construct the edifice of rules and norms that will make forensic science perform its role in thecause of fair and accurate justice.