



Forensic DNA Profiling and Criminal Justice in India: Assessing Infrastructure, Legal Implementation and Case- Outcomes

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Abstract

Forensic DNA profiling has become a vital component of India's criminal justice system, influencing investigations ranging from sexual offences and homicide to disaster victim identification and paternity disputes. However, its expanding use raises critical concerns about infrastructural adequacy, legal protections, and its real impact on case outcomes. This paper evaluates India's forensic DNA capacity, the evolving legal framework governing DNA collection and use, and judicial approaches to DNA evidence. Drawing on forensic science research, doctrinal analysis, policy documents, and case examples, the study argues that India's rapid expansion of DNA infrastructure has not been matched by parallel development of rights-protective legal norms or institutional safeguards.

While initiatives such as the National Forensic Sciences University, the National Forensic Infrastructure Enhancement Scheme, and increased support for State Forensic Science Laboratories have expanded capacity, persistent challenges backlogs, uneven quality assurance, and limited technical manpower remain. Legally, constitutional protections, new criminal codes, and the Criminal Procedure (Identification) Act 2022 coexist with the absence of a dedicated DNA statute. Recent Supreme Court rulings emphasize chain of custody, quality control, and statistical rigor. The paper concludes that DNA profiling can enhance both truth-finding and fair-trial rights only within a robust governance framework that ensures accreditation, safeguards, and defence access to expertise.

Keywords: forensic DNA profiling, criminal justice, India, Criminal Procedure Act, DNA Technology Bill, forensic infrastructure, privacy, fair trial

1. Introduction

Over three decades, forensic DNA profiling has transformed criminal investigation worldwide, often described as a “genetic eyewitness” capable of linking biological traces at a crime scene to specific individuals with very high probative value (Srivastava, 2022). In India, DNA evidence has played a prominent role in high-profile cases such as the Naina Sahni “tandoor” murder, the Priyadarshini Mattoo and Nirbhaya cases, and the identification of victims in the assassinations of Rajiv Gandhi and Beant Singh (Srivastava, 2022). More recently, DNA profiling has been crucial in routine prosecutions under the Protection of Children from Sexual Offences (POCSO) Act and in complex homicide and sexual assault prosecutions, where traditional eyewitness testimony may be unreliable or unavailable.

At the same time, DNA profiling is deeply intrusive: it involves extracting genetic material from the body, generating unique identifiers that can persist for decades, and, when stored in databases, potentially enabling mass surveillance and familial searching. Indian constitutional jurisprudence recognises both the right against self-incrimination under Article 20(3) and the right to privacy and dignity under Article 21, most prominently in *Justice K.S. Puttaswamy v. Union of India* (2017). The challenge is to reconcile the truth-enhancing potential of DNA with these rights, through a principled framework of necessity, proportionality, and procedural safeguards (Podder, 2025).

This tension is sharpened by recent legislative moves. Parliament replaced colonial-era core criminal statutes with the Bharatiya Nyaya Sanhita (BNS), Bharatiya Nagarik Suraksha Sanhita (BNSS), and Bharatiya Sakshya Adhiniyam (BSA) in 2023, explicitly acknowledging “modern scientific

techniques” such as DNA profiling for investigation and evidence. The Criminal Procedure (Identification) Act 2022 (CPIA) authorises the collection and long-term retention of “measurements,” including biological samples and their analysis, from a wide category of persons, empowering the National Crime Records Bureau (NCRB) to store this data for up to 75 years. At the same time, the government withdrew the long-pending DNA Technology (Use and Application) Regulation Bill, 2019, even though it had been designed to provide a dedicated regulatory regime for DNA profiling, data banks, and accreditation of laboratories (PRS Legislative Research, 2019; Indian Express, 2023).

Against this backdrop, the Supreme Court in 2025 issued detailed guidelines on DNA evidence in *Kattavellai @ Devakar v. State of Tamil Nadu* and *Putai v. State of Uttar Pradesh*, emphasising standardisation of collection and preservation, chain of custody, laboratory accreditation, and proper presentation of match statistics. These decisions mark a significant judicial intervention into an area where statutory regulation remains incomplete.

This paper addresses three interrelated questions:

1. **Infrastructure:** Is India’s forensic DNA infrastructure laboratories, equipment, personnel, and governance arrangements adequate to meet the growing demand for DNA analysis?
2. **Legal implementation:** How does the current legal framework structure the collection, use, and retention of DNA, and does it adequately protect constitutional rights?
3. **Case-outcomes:** How are Indian courts actually using DNA evidence, and what

patterns emerge regarding convictions, acquittals, and evidentiary weight?

The discussion is based on a review of forensic science scholarship (e.g., Srivastava, 2022; Madhava Menon ICREP, 2023), doctrinal and policy analyses (Podder, 2025; Mundhra, 2023), government documents, and recent case reports.

2. Scientific and Institutional Context of Forensic DNA Profiling in India

2.1 Scientific basics

Forensic DNA profiling involves isolating and analysing polymorphic regions of the genome typically non-coding short tandem repeats (STRs) from biological samples such as blood, semen, saliva, hair, or tissue. The resulting profile can be compared with reference samples to infer identity or biological relationships (Podder, 2025). Contemporary methods require only trace quantities of material, allow analysis of degraded samples, and can generate highly discriminating profiles suitable for use in court.

Indian forensic practice, as reflected in training manuals like *DNA Profiling in Justice Delivery System* issued by the Central Forensic Science Laboratory (CFSL), emphasises STR-based profiling, statistical interpretation of matches (likelihood ratios, random match probabilities), and quality control measures to minimise contamination and artefacts.

2.2 Institutional architecture

India's forensic DNA capacity is distributed across multiple institutional layers:

- **Central Forensic Science Laboratories (CFSLs):** As of 2025, there are seven CFSLs (Chandigarh, Delhi, Kamrup, Kolkata, Bhopal, Pune and Hyderabad), with

in-principle approval for seven additional CFSLs in Rajasthan, Tamil Nadu, Bihar, Uttar Pradesh, Odisha, Chhattisgarh and Kerala.

- **State Forensic Science Laboratories (SFSLs) and regional labs:** Each state and many Union Territories maintain SFSLs with biology/serology and DNA units; the Ministry of Home Affairs has approved 30 projects under a Nirbhaya-funded scheme to strengthen DNA analysis and cyber forensics in state laboratories, with over ₹185 crore released by late 2024.
- **National Forensic Sciences University (NFSU):** Established under the NFSU Act 2020, this national university headquartered in Gandhinagar now operates multiple campuses across India and abroad, offering advanced training and research in forensic disciplines, including DNA profiling.
- **Specialised centres:** Institutions like the Centre for DNA Fingerprinting and Diagnostics (CDFD) in Hyderabad and the Centre for Cellular and Molecular Biology (CCMB) have long provided DNA analysis in high-profile cases and continue to serve as reference laboratories (Srivastava, 2022).
- **Private laboratories:** A limited number of NABL-accredited private DNA laboratories undertake court-referred or defence-commissioned testing, although their use in criminal trials remains relatively constrained compared to government labs.

Recent policy initiatives underscore a strong state push to expand capacity. The **National Forensic Infrastructure Enhancement Scheme (NFIES)** (2024-2029) has a financial outlay of approximately ₹2,254

crore to establish off-campus NFSU laboratories in all states and Union Territories and to expand central forensic facilities. The Ministry of Home Affairs has also launched an **e-Forensics IT platform** connecting 117 laboratories nationwide to streamline case assignment, tracking, and reporting.

Despite these investments, multiple studies and official responses acknowledge systemic constraints: the Directorate of Forensic Science Services has itself noted that existing state and central infrastructure is insufficient for timely disposal of DNA examinations, and empirical work points to chronic staff shortages and significant backlogs in many FSLs. India Justice Report data from 2025 indicates hundreds of FSLs nationwide but persistent vacancies and rising pendency, especially in biology and serology divisions.

In short, India's forensic DNA infrastructure is expanding, but unevenly. Capacity growth has outpaced the development of uniform quality-assurance frameworks and independent accreditation, creating potential disparities in the reliability of DNA evidence produced across jurisdictions.

3. Legal and Regulatory Framework

3.1 Constitutional foundations

The constitutional framework for forensic DNA profiling rests primarily on three provisions:

1. **Article 20(3)** - the privilege against self-incrimination, “No person accused of an offence shall be compelled to be a witness against himself.”
2. **Article 21** - the right to life and personal liberty, interpreted to include bodily integrity, privacy, and dignity.

3. **Article 14** - equality before the law and non-arbitrariness.

In *State of Bombay v. Kathi Kalu Oghad* (1961), the Supreme Court distinguished between “testimonial” and “physical” evidence, holding that compelling an accused to provide fingerprints, handwriting, or signatures does not violate Article 20(3). This reasoning has since been extended to certain forms of biological evidence (Srivastava, 2022; Madhava Menon ICREP, 2023).

In *Selvi v. State of Karnataka* (2010), however, the Court held that invasive techniques like narco-analysis, polygraph examination, and brain mapping cannot be administered without consent, emphasising mental privacy and bodily integrity. DNA profiling was not directly at issue but is often discussed in light of this judgment.

Crucially, *Justice K.S. Puttaswamy v. Union of India* (2017) recognised privacy as a fundamental right, articulating a four-part proportionality test for state intrusions: legality, legitimate aim, rational connection, and necessity plus balancing. Any DNA database or compulsory collection regime must now be justified under this framework, a point underscored in legal scholarship critiquing the CPIA and DNA databank proposals (Mundhra, 2023; Podder, 2025).

3.2 Statutory provisions in the new criminal codes

Historically, DNA collection in criminal cases relied on the Code of Criminal Procedure (CrPC) provisions on medical examination of accused and victims (Sections 53, 53A, 54, 164A), and the Indian Evidence Act (Sections 45, 45A) on expert opinion. Srivastava (2022) documents how these provisions were gradually interpreted to authorise DNA tests, especially in rape and paternity cases, even in the absence of a DNA-specific statute.

The replacement criminal codes the Bharatiya Nagarik Suraksha Sanhita (BNSS) and Bharatiya Sakshya Adhiniyam (BSA) largely preserve this structure while updating terminology. According to Podder (2025), BNSS Section 349 corresponds broadly to former CrPC Section 53, empowering registered medical practitioners to examine accused persons and collect samples (including blood, semen, swabs) “using modern and scientific techniques,” explicitly encompassing DNA profiling; Section 350 provides for medical examination of victims with consent. The BSA retains the principle that expert scientific evidence is relevant and admissible, while leaving detailed standards largely to judicial development.

3.3 Criminal Procedure (Identification) Act 2022

The **Criminal Procedure (Identification) Act 2022 (CPIA)** replaced the colonial Identification of Prisoners Act 1920. It authorises police and prison authorities to collect “measurements” including fingerprints, iris and retina scans, and “biological samples and their analysis” from convicts, arrested persons (subject to certain exceptions), and detainees, for storage by the NCRB for 75 years.

Critics argue that CPIA effectively incorporates significant portions of the DNA Technology Bill “through the backdoor,” but without specialised safeguards such as an independent DNA Regulatory Board or detailed consent and destruction regimes (Indian Express, 2023; Mundhra, 2023). Project 39A and other commentators warn that blanket retention of biological measurements for decades, coupled with broad categories of persons from whom samples may be taken, fails to satisfy *Puttaswamy*’s proportionality standard.

3.4 The DNA Technology (Use and Application) Regulation Bill

The **DNA Technology (Use and Application) Regulation Bill**, first introduced in 2003 and re-introduced in 2018 and 2019, sought to regulate DNA profiling in India. Key features included:

- Establishment of a **DNA Regulatory Board** to accredit laboratories, frame standards, and oversee DNA Data Banks;
- Creation of a **National DNA Data Bank** and **Regional DNA Data Banks**, with indices for crime-scene samples, suspects, offenders, missing persons, and unknown deceased;
- Detailed procedures for collection, use, retention, and expungement of DNA profiles;
- Penal provisions for misuse or unauthorised disclosure of DNA information.

However, concerns about privacy, potential abuse, and vague safeguards particularly around consent, familial searching, and the inclusion of “volunteers” led to sustained opposition. The Parliamentary Standing Committee recommended significant changes in 2021; ultimately, the government withdrew the Bill in July 2023, reasoning that many of its operational provisions were already covered by the CPIA and earlier CrPC amendments.

Analysts note that this withdrawal has left India without a dedicated DNA law governing laboratory accreditation, databank governance, or independent oversight, even as collection powers have expanded (Srivastava, 2022; Podder, 2025).

3.5 Soft-law standards and expert guidelines

In the absence of a specific statute, practice has been shaped by soft-law instruments such as:

- **Directorate of Forensic Science Services (DFSS)** manuals on DNA collection, preservation, and analysis;
- **Standard Lists of Equipment and SOPs** for forensic laboratories issued by the MHA;
- Judicial training materials such as *DNA Profiling in Justice Delivery System* (CFSL/West Bengal Judicial Academy);
- Medical-legal and police guidelines on handling sexual assault evidence under the Criminal Law (Amendment) Act 2013.

Most significantly, the Supreme Court's 2025 guidelines in *Devakar* and *Putai* require strict adherence to chain-of-custody documentation, timely transportation and preservation of samples, use of accredited laboratories, and careful explanation of match statistics. Courts are directed to treat DNA as powerful but not infallible evidence, whose probative value depends on rigorous process.

4. Infrastructure, Backlogs, and Implementation Challenges

While statutory and soft-law frameworks authorise extensive use of DNA profiling, their practical implementation is constrained by infrastructural realities.

4.1 Capacity and expansion

Government data indicate a rapid expansion of forensic infrastructure. The MHA has reported that projects of 30 States/UTs to strengthen DNA analysis capacities in State FSLs have been approved; the NFIES scheme aims to further expand laboratories and address shortages of forensic professionals; and an e-Forensics IT platform now digitally connects 117 forensic laboratories. NFSU's growing network of campuses is expected to augment trained manpower, including DNA analysts.

Yet a series of studies and commentaries highlight persistent deficits:

- **Backlogs and delays.** Research on FSLs in Punjab and Haryana, and broader analyses of forensic science in India, note prolonged turnaround times due to staff shortages, rising case loads, and uneven funding, with downstream effects on undertrial detention and trial delays (Srivastava, 2022; Badiye et al., 2023; Patralok, 2025).
- **Uneven distribution.** Central and well-resourced states may have advanced DNA facilities, whereas others rely on a single over-burdened lab. Parliamentary answers and India Justice Report data suggest significant variation in lab and staff availability across states.
- **Quality assurance and accreditation.** While some labs are NABL-accredited, many operate without consistent external quality assessment. DFSS brochures explicitly acknowledge that existing infrastructure is inadequate to meet demand for timely DNA analysis, indicating pressure to expand without parallel investments in QA systems.

4.2 Collection practices and chain of custody

Empirical work and case law reveal recurring problems in collection and handling of biological evidence. Studies of sexual assault prosecutions highlight incomplete or improper sample collection, delays in sending exhibits to laboratories, and poor documentation, all of which can degrade or contaminate DNA samples (Srivastava, 2022; Talukdar, 2025).

Recent appellate decisions illustrate the consequences. In 2024, the Punjab and Haryana High Court acquitted two men previously sentenced

to death for gang-rape and murder, citing serious procedural lapses and gaps in the collection and handling of DNA evidence that broke the chain of custody and undermined reliability. Similarly, Supreme Court decisions discussed in 2025 commentary rejected DNA reports where samples were delayed, negligently handled, or poorly documented, stressing that such abuse compromises the scientific foundation of the evidence.

These problems intersect with training deficits among investigating officers and medical personnel. MHA has announced capacity-building programmes for police, prosecutors and medical officers on collection and storage of DNA evidence, but evaluations suggest that uniform implementation across India remains a work in progress.

4.3 Defence access and inequality of arms

Infrastructure constraints and institutional location of DNA labs within police-controlled or state-run agencies also affect defence rights. While courts occasionally permit re-testing in independent or central labs, this is not systematised, and indigent accused may lack resources to challenge flawed forensic reports. Academic commentators warn that expanding DNA capacity without strengthening defence access to expertise risks amplifying structural inequalities, particularly when under-resourced defendants confront technically sophisticated prosecution evidence (Madhava Menon ICREP, 2023; Podder, 2025).

5. DNA Evidence and Case-Outcomes

5.1 Convictions supported by DNA evidence

DNA profiling has decisively contributed to convictions in a range of violent offences. Srivastava's (2022) doctrinal review notes several landmark rape and murder cases where DNA evidence linked accused persons to crime scenes or

victims, including the Naina Sahni “tandoor” case, the Priyadarshini Mattoo case, and the Nirbhaya gang rape, often corroborating other circumstantial evidence and supporting death or life-imprisonment sentences.

Recent trial-court decisions reflect similar patterns. In 2025, a POCSO court in Nagpur sentenced a youth to 20 years' rigorous imprisonment for rape of a minor, with DNA evidence conclusively linking him to the pregnancy and playing a central role in the conviction. Likewise, a Bengaluru court imposed life imprisonment on two accused in a 2013 murder case, relying heavily on DNA analysis of bloodstains and skeletal remains to identify the victim and connect the accused to the crime.

These outcomes illustrate DNA profiling's capacity to strengthen prosecutions, particularly in cases of sexual violence and homicide where corroborative evidence is sparse. Srivastava (2022) observes that Indian courts increasingly describe DNA as the “gold standard” in forensic science, capable of providing scientific evidence “beyond reasonable doubt” when properly collected and analysed.

5.2 Acquittals and limitations

However, DNA evidence is not invariably decisive. Courts frequently acquit where DNA results are inconclusive, inconsistent with other evidence, or compromised by procedural lapses. The Punjab and Haryana High Court's 2024 acquittal in a high-profile gang-rape and murder case is illustrative: despite initial reliance on forensic reports, the Court held that poor documentation and mishandling of samples prevented any safe inference of guilt.

In another case, the Karnataka High Court upheld the acquittal of a former diplomat accused of sexually abusing his minor daughter, noting

inconsistencies in testimony and medical evidence and the absence of conclusive DNA or forensic findings linking the accused to the alleged abuse.

Supreme Court commentary in *Devakar* and *Putai* reinforces the principle that DNA, while powerful, is opinion evidence requiring robust foundational reliability; courts must examine collection methods, time-lags, chain of custody, laboratory accreditation, and interpretive methodology before ascribing weight to DNA reports.

5.3 Judicial approaches to evidentiary weight

Indian courts have gradually moved from treating DNA as merely corroborative to sometimes regarding it as sufficient for conviction when other circumstances are consistent. Nonetheless, jurisprudence emphasises caution:

- The Supreme Court has stressed that DNA cannot substitute for a complete chain of circumstantial evidence; where gaps exist in motive, opportunity, or other links, DNA alone may not suffice.
- Courts have recognised that match statistics must be properly explained; a mere assertion of “match” without random match probability or laboratory methodology may be insufficient.
- In paternity and legitimacy disputes, courts have oscillated between respecting the conclusive presumption under former Evidence Act Section 112 and giving primacy to DNA results; recent trends, as catalogued by Srivastava (2022), show increasing reliance on DNA while balancing the child’s interests and privacy.

Overall, case law reveals a nuanced stance: DNA is treated as highly persuasive when supported by

rigorous procedures and consistent circumstances, but courts remain willing to disregard compromised DNA evidence and acquit, thereby preventing blind scientism.

6. Privacy, Databases, and the Problem of Overreach

The expansion of forensic DNA profiling has renewed debates on surveillance and privacy.

6.1 DNA databases and CPIA

The withdrawn DNA Technology Bill envisaged a detailed architecture of national and regional DNA Data Banks with specified indices. CPIA, by contrast, is silent on database design but authorises the NCRB to store biological measurements for 75 years and to share them with law-enforcement and potentially other agencies.

Mundhra (2023) argues that such blanket retention without differentiation between violent and non-violent offences, suspects and convicts, or categories of samples risks violating *Puttaswamy*’s proportionality test. He highlights the absence of clear expungement mechanisms where charges are dropped, acquittals occur, or convictions are overturned, and warns about familial privacy implications when genetic data is stored.

Comparative experience with CODIS (USA) and the UK National DNA Database underscores risks of mission creep, function creep, racialised over-representation, and familial searching, necessitating robust statutory safeguards, independent oversight, and tightly defined retention rules.

6.2 Right to fair trial and informational self-determination

Podder (2025) frames DNA profiling as a “double-edged sword”: it enhances the right to a fair trial by improving evidentiary accuracy but

simultaneously threatens autonomy and privacy by enabling deep biological surveillance. He stresses that the new codes (BNS, BNSS, BSA) and CPIA must be interpreted in light of Articles 20(3) and 21, ensuring that any compulsory collection of DNA is strictly necessary, minimally intrusive, and accompanied by procedural guarantees such as judicial oversight, disclosure obligations, and rights to contest.

Srivastava (2022) similarly notes that, in the absence of DNA-specific legislation, courts have had to craft ad hoc safeguards for consent and privacy in paternity cases and sexual-offence investigations, leading to inconsistent standards. Without clear statutory limits on secondary use, cross-linking with other databases, or sharing for non-criminal purposes, there is a risk that DNA information collected in one context (e.g., as a victim, witness, or volunteer) could be used in unrelated investigations.

7. Assessment and Reform Agenda

7.1 Assessing the current landscape

This analysis suggests a mixed picture:

- **Infrastructure:** India has made substantial investments in forensic laboratories, training, and digital connectivity. Yet capacity remains uneven, backlogs are significant, and quality-assurance systems are not uniformly implemented. Accreditation and external audits are inconsistent, and defence access to independent testing is limited.
- **Legal implementation:** The new criminal codes and CPIA provide broad authorisation for DNA collection and use but do not comprehensively address privacy, data-protection, or database governance. The withdrawal of the DNA Technology Bill has

left a gap in regulatory oversight of laboratories and databanks.

- **Case-outcomes:** DNA profiling has improved the capacity to secure convictions in serious crimes, especially sexual offences, but also exposes systemic weaknesses in collection and chain of custody. Courts increasingly recognise DNA's potential and limits, but jurisprudence remains patchy, and trial-level practices vary.

In effect, India is “running ahead on collection and capacity, and lagging on regulation and safeguards.” The risk is not only of privacy violations, but also of wrongful convictions or acquittals driven by poor forensic practices, thereby undermining public confidence in science and justice alike.

7.2 Toward a rights-centred DNA governance framework

A robust governance framework would require reform along at least four axes:

(a) Dedicated DNA legislation anchored in constitutional principles

Re-introducing a DNA law, redesigned in light of *Puttaswamy* and CPIA critiques, could establish:

- A **DNA Authority** or Regulatory Board with statutory independence, responsible for accrediting labs, setting quality standards, and overseeing databases;
- Clear **scope and limits** on databases, including categories of profiles (convicts, suspects, missing persons, unknown deceased, volunteers), strict conditions for inclusion, and rules for expungement;
- Explicit provisions on **consent**, especially for victims, volunteers, and civil uses;

- Prohibitions or strict restrictions on **familial searching**, secondary uses, and sharing with private entities.

Such a law should codify proportionality standards for compulsory DNA collection, requiring judicial oversight in specified categories and mandating destruction of samples and profiles once their legitimate purpose is exhausted.

(b) Strengthening forensic infrastructure with quality assurance

Infrastructure expansion must be accompanied by:

- Mandatory **NABL or equivalent accreditation** for all DNA labs used in criminal cases;
- Participation in **external proficiency testing** and inter-laboratory comparisons;
- Transparent **SOPs** for collection, storage, analysis, and reporting, publicly available where security permits;
- Institutionalised **training programmes** for police, medical staff, prosecutors, and judges on DNA basics, chain of custody, and interpretation of statistics.

NFIES and NFSU offer an opportunity to institutionalise such standards rather than merely adding capacity.

(c) Evidentiary standards and defence rights

Judicial guidelines should be translated into detailed **evidentiary standards**, including:

- Requiring **complete disclosure** of laboratory validation studies, SOPs, and statistical methods to both prosecution and defence;
- Presuming **admissibility** only where accredited labs and documented chain-of-custody protocols are followed;

- Guaranteeing defence access to **independent experts** and re-testing, with legal-aid funding where necessary;
- Instructing courts to avoid over-stating the conclusiveness of DNA, especially in mixed or low-template samples and in cases of possible secondary transfer.

These measures would help realise DNA's potential as a tool for both conviction and exoneration, supporting the right to a fair trial.

(d) Privacy and data-protection safeguards

Finally, CPIA implementation must be aligned with privacy requirements:

- Limiting retention periods based on offence seriousness and outcome (acquittal, conviction, discharge);
- Providing a clear **right to expungement** where charges are dropped or acquittals recorded;
- Ensuring independent oversight of NCRB's management of biological measurements;
- Integrating DNA records within a broader **data-protection regime**, with audit trails and accountability for misuse.

These reforms would not only reduce risks of misuse and function creep but also bolster the legitimacy of forensic science in the public eye.

8. Conclusion

Forensic DNA profiling in India sits at a critical juncture. Scientifically, it has matured into a powerful investigative tool that has already shaped some of the country's most important criminal cases. Institutionally, the state is investing heavily in laboratories, training, and digital infrastructure, signalling an intent to mainstream DNA analysis in routine policing and prosecution.

Legally, however, governance remains incomplete. The coexistence of expansive collection powers under CPIA, broad investigative authorisations under BNSS, and the withdrawal of a dedicated DNA regulation bill has produced a landscape where DNA is widely used but only partially regulated. Constitutional principles of privacy, dignity, and fair trial as articulated in *Puttaswamy* and related jurisprudence have not yet been fully operationalised in DNA law and practice.

Case-outcomes reveal both the promise and peril of this situation. When properly collected, preserved and interpreted, DNA evidence has helped secure convictions in serious cases of sexual violence and homicide and has the potential to exonerate the innocent. When mishandled, delayed, or presented without adequate documentation, it has led courts to acquit or to disregard forensic reports entirely, prompting the Supreme Court to issue urgent guidelines stressing chain of custody, lab quality and cautious evaluation.

In assessing forensic DNA profiling's role in India's criminal justice system, one must therefore resist both techno-optimism and techno-scepticism. DNA is neither a silver bullet nor a mere ancillary technique; it is a high-stakes tool whose value depends on the integrity of institutions, the clarity of laws, and the vigilance of courts.

A reform agenda centred on dedicated regulation, quality-assured infrastructure, robust evidentiary standards, defence rights, and privacy-respecting database governance offers a path forward. If pursued seriously, it could make India a model for how a large, diverse democracy harnesses forensic genetics to advance both truth and justice convicting the guilty, protecting the innocent, and respecting the autonomy and dignity of all those whose genetic material enters the criminal process.

References

- Ajmal IAS Academy. (2025, September 16). *Forensics & DNA in criminal cases: What the Supreme Court just made crystal clear.*
- Badiye, A., Sulke, P., Bhandarkar, M., & Kapoor, N. (2023). Forensic science laboratories in India. In *Textbook of forensic science* (pp. 9530-9545).
- Central Forensic Science Laboratory & West Bengal Judicial Academy. (n.d.). *DNA profiling in justice delivery system.*
- Drishti IAS. (2025, September 16). *SC issues DNA evidence guidelines in criminal cases.*
- Indian Express. (2023, July 24). *DNA technology Bill: Features, debate, and why it was withdrawn.*
- India Justice Report. (2025). *Forensic science indicators - IJR 2025.*
- Madhava Menon ICREP. (2023). Forensic DNA profiling: A legal and ethical perspective in the Indian criminal justice system. *ICREP Journal of Interdisciplinary Studies*, 2(4).
- Mundhra, J. (2023, August 21). DNA databases and the right to privacy: Analysing the Criminal Procedure (Identification) Act 2022 and CODIS. *Journal of Indian Law and Society Blog.*
- Patralok. (2025, July 24). *Why India needs forensic overhaul: Justice delayed by science?*
- Podder, H. S. (2025). DNA profiling in criminal investigation in India: Right to fair trial vis-à-vis right to privacy. *International Journal of Research - Granthaalayah*, 13(9), 195-205.

- Press Information Bureau. (2019). *Lok Sabha passes “The DNA Technology (Use and Application) Regulation Bill, 2019”*.
- Press Information Bureau. (2024, July 30). *Upgradation of forensic labs and related infrastructure*.
- Press Information Bureau. (2024, December 18). *Time taken by forensic laboratories to deliver DNA and viscera reports*.
- PRS Legislative Research. (2019). *The DNA Technology (Use and Application) Regulation Bill, 2019 - Bill summary*.
- Prime Legal. (2025). *SC issues guidelines on DNA evidence; highlights urgency of addressing wrongful incarceration*.
- Srivastava, A. (2022). Impact of DNA evidence in criminal justice system: Indian legislative perspectives. *Egyptian Journal of Forensic Sciences*, 12, Article 40.
- Talukdar, U. (2025). Conclusiveness of DNA reports in Indian rape cases: The law’s blind spots. *Indian Journal of Medical Ethics*, 7(3), 1-7.
- Times of India. (2025, October). Youth gets 20-year RI for rape in POCSO case based on DNA evidence.
- Times of India. (2025, October). DNA evidence secures life term for duo in 2013 Bengaluru murder case.
- Times of India. (2024, June). HC acquits two sentenced to death due to lacunae & procedural lapses in collection of DNA evidence.
- Times of India. (2024, June). Karnataka HC upholds acquittal of ex-French diplomat of raping minor daughter.
- West Bengal Judicial Academy. (n.d.). *DNA profiling in justice delivery system: Manual for judicial officers*.