



# "From Investigation to Conviction: Assessing the Procedural Integrity of DNA Evidence in the Criminal Justice System of Madhya Pradesh"

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## Abstract

DNA evidence has emerged as one of the most reliable scientific tools for criminal investigation in India, offering unprecedented accuracy in identifying offenders and exonerating the innocent. This study critically evaluates the procedural integrity, admissibility, and judicial reliance on DNA evidence in the criminal justice system of Madhya Pradesh, spanning the chain of custody, forensic laboratory protocols, investigative procedures under the Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023, and evidentiary standards under the Bharatiya Sakshya Adhiniyam (BSA) 2023. Using a mixed-method approach—combining analysis of 60 district court judgments and 30 High Court decisions (2015–2024), interviews with police officers, medical examiners, and forensic experts, and field observations in state forensic laboratories—the study reveals critical insights into the strengths and systemic gaps in DNA-based investigations.

Results show that DNA evidence significantly increases conviction rates when procedural safeguards are strictly followed. In 78% of analyzed cases, DNA profiles were consistent, complete, and admitted without dispute. However, 22% cases showed procedural lapses, such as improper sample storage, delays exceeding 30–45 days in laboratory processing, incomplete documentation of chain of custody, and lack of trained personnel at police station level. Courts in Madhya Pradesh accepted DNA reports as primary evidence in 64% of cases but rejected or questioned them in 12% due to contamination risks or inadequate laboratory certification. The study concludes that despite being a powerful evidentiary tool, the reliability of DNA evidence depends heavily on stringent adherence to scientific protocols, improved forensic infrastructure, specialized training for investigators, and legal reforms to ensure uniformity in collection, handling, analysis, and presentation of DNA samples. This research underscores the

need for a more systematic and technologically robust forensic ecosystem to strengthen justice delivery in Madhya Pradesh.

**Keywords:** DNA Evidence, Criminal Justice System, Procedural Integrity, Forensic Science, Madhya Pradesh Judiciary, etc.

## I. Introduction

The emergence of DNA profiling has transformed criminal investigation across the world, marking a paradigm shift from traditional, perception-based policing to scientifically grounded forensic practices. In India, and particularly in states such as Madhya Pradesh, DNA evidence has become indispensable in cases involving homicide, sexual assault, paternity disputes, and unidentified bodies. Its scientific accuracy, ability to individualize biological samples, and capacity to reconstruct crime events make DNA analysis one of the strongest forms of modern forensic evidence (Kaur & Raina, 2020). As the Indian criminal justice system increasingly embraces forensic science, questions regarding the procedural integrity, chain of custody, admissibility standards, and judicial reliability of DNA evidence have gained significant scholarly and legal attention (Sharma, 2019; Singh, 2022).

Madhya Pradesh is among the states with a high number of violent crimes, making the role of forensic science particularly critical (National Crime Records Bureau, 2023). Recent legislative reforms—most notably the Bharatiya Nagarik Suraksha Sanhita (BNSS) 2023 and the Bharatiya Sakshya Adhiniyam (BSA) 2023—have further emphasized scientific investigation, mandating streamlined procedures for sample collection, forensic documentation, and digital evidence management (Government of India, 2023a; 2023b). These reforms align Indian criminal procedure with global forensic standards, yet practical challenges remain in laboratories, police stations, and investigative agencies at the state level (Mehta & Kulkarni, 2021). Ensuring procedural integrity from evidence collection to courtroom presentation—is essential for maintaining public trust, protecting constitutional rights, and delivering justice.

### [a] DNA Evidence: A Transformative Forensic Tool

DNA evidence stands at the intersection of biology, law, and technology. Its application ranges from individual identification to biological relationship testing, and from determining the origin of trace materials to reconstructing crime circumstances (Jeffreys, 2004). Unlike eyewitness testimony, which is susceptible to memory distortion and bias, DNA analysis provides objective, quantifiable results with extremely low probabilities of error (Budowle et al., 2011). Studies across jurisdictions indicate that proper DNA profiling significantly increases both detection and conviction rates while preventing wrongful convictions (Garrett, 2015; Saks & Koehler, 2005).

In India, the use of DNA evidence has expanded rapidly since the early 2000s, supported by the establishment of state forensic laboratories, standard operating procedures, and judicial precedents affirming its admissibility (Rathod, 2018). However, challenges such as backlog, contamination, deficient chain-of-custody documentation, and inconsistent training impede the full realization of DNA's evidentiary power (Chakraborty & Chatterjee, 2021).

These issues are particularly pronounced in resource-constrained states, including Madhya Pradesh, where laboratory infrastructure and investigative training vary significantly across districts (Tiwari, 2020).

#### [b] Legal Framework Governing DNA Evidence in India

The admissibility and legal status of DNA evidence are shaped by multiple statutory and judicial mechanisms. Historically, Indian courts admitted forensic reports under Section 45 of the Indian Evidence Act, 1872, which recognized expert testimony in scientific matters (Ramasamy, 2017). With the introduction of the Bharatiya Sakshya Adhiniyam (BSA) 2023, expert evidence continues to hold essential evidentiary value but now operates under updated procedural norms designed to match contemporary technological realities (Government of India, 2023b).

The BNSS 2023 places greater emphasis on scientific investigation, requiring police to collect biological samples in compliance with ethical, procedural, and scientific standards (Government of India, 2023a). For instance, provisions regarding forensic evidence collection, documentation, and videography aim to reduce discretionary errors and strengthen the chain of custody (Menon, 2024). Additionally, the DNA Technology (Use and Application) Regulation Bill, 2019—though pending—provides a comprehensive framework for DNA data banks, privacy safeguards, and accreditation of laboratories (Mukherjee, 2019).

Judicial precedents have further shaped the landscape. In cases such as *Krishan Kumar Malik v. State of Haryana* (2011), the Supreme Court emphasized the necessity of DNA evidence in sexual assault investigations, while *Navjot Sandhu v. State (Parliament Attack Case)* (2005) reaffirmed its validity when properly collected and analyzed. Courts in Madhya Pradesh have similarly relied on DNA findings in multiple convictions, though inconsistencies remain where procedural lapses occur (Pandey, 2022).

#### [c] Chain of Custody and Procedural Integrity

The reliability of DNA evidence rests fundamentally on its procedural integrity. The chain of custody—documenting the collection, sealing, transportation, analysis, and storage of forensic samples—is essential to prevent contamination, substitution, or tampering (Houck & Siegel, 2015). Any break in the chain can lead to exclusion of evidence or reduced evidentiary weight. International best practices, including those recommended by the FBI and Interpol, require strict documentation and accreditation mechanisms for forensic laboratories (Interpol, 2021). In Madhya Pradesh, although State Forensic Science Laboratories (SFSs) follow standard protocols, field-level inconsistencies have been observed due to understaffing, inadequate training, and logistical challenges (Verma, 2020).

#### [d] Investigative Challenges in Madhya Pradesh

Despite advancements, multiple structural and procedural challenges hinder the effective use of DNA evidence in the state. These include:

- (i) Delayed submission of samples, often exceeding the ideal window for biological preservation (Gupta & Rawat, 2019).
- (ii) Lack of refrigerated transport for biological specimens.
- (iii) Inadequate training of first responders and police personnel in evidence handling.
- (iv) Backlog in forensic laboratories, leading to delays in trials (Singh & Thakur, 2021).
- (v) Absence of widespread accreditation, limiting compliance with international standards (Lal & Joshi, 2022).
- (vi) Limited awareness among judicial officers regarding the nuances of DNA interpretation (Prasad, 2020).

These challenges collectively affect the credibility and admissibility of DNA reports in courtrooms. In several Madhya Pradesh cases, otherwise strong DNA evidence was undermined due to improper sealing, missing documentation, or laboratory delays, leading to acquittals despite incriminating scientific findings (Rajput, 2021).

#### [e] The Need for Empirical Assessment

While DNA evidence is widely recognized as powerful, its effectiveness in Madhya Pradesh requires systematic assessment. Previous studies have examined forensic efficiency at national or institutional levels, but few have focused on state-specific procedural integrity, especially from investigation to conviction (Chatterjee, 2018). Given Madhya Pradesh's high crime rate, reliance on forensic evidence, and ongoing legal reforms, a detailed analysis of how DNA evidence travels through the criminal justice process is urgent and necessary.

#### [f] This study bridges this gap by examining:

- (i) Collection procedures at the crime-scene level.
- (ii) Chain of custody documentation across multiple stakeholders.
- (iii) Forensic laboratory processing and reporting timelines.
- (iv) Judicial evaluation of DNA reports in trial and appellate courts.
- (v) Rates of acceptance, rejection, or dilution of DNA evidence.

The investigation spans 60 district court judgments and 30 High Court decisions in Madhya Pradesh (2015–2024), supplemented by interviews with forensic scientists, prosecutors, medical officers, and investigating officers.

#### [g] Significance of the Study

Ensuring procedural integrity of DNA evidence is central not only to convictions but also to safeguarding human rights. DNA's scientific power must be balanced with stringent ethical standards to prevent misuse, privacy

violations, or wrongful incrimination. For regions like Madhya Pradesh, strengthening forensic governance has broader implications:

- (i) Enhancing conviction rates in heinous crimes.
- (ii) Reducing pendency through faster investigation.
- (iii) Improving victim trust.
- (iv) Ensuring fair trial rights.
- (v) Aligning state forensic practices with national reforms.

This research contributes to criminology, forensic science, and legal scholarship by offering evidence-based recommendations for improving forensic infrastructure, training, and procedural implementation in Madhya Pradesh.

## II. Research Methodology

This study adopts a mixed-method research design combining doctrinal, empirical, and case-study approaches to assess the procedural integrity of DNA evidence in the criminal justice system of Madhya Pradesh. The methodology involves three key components.

First, a judicial analysis of 60 District Court judgments and 30 Madhya Pradesh High Court decisions (2015–2024) was conducted to evaluate how courts interpret, admit, or reject DNA evidence. Each judgment was coded for variables such as chain of custody, laboratory certification, sample integrity, and evidentiary weight assigned by the judiciary.

Second, an empirical component involved semi-structured interviews with police investigators (N=25), forensic scientists (N=15), medical officers (N=10), and public prosecutors/judicial officers (N=20). These interviews explored ground-level challenges in evidence collection, sample storage, transportation, and laboratory analysis.

Third, a forensic procedural assessment was carried out through field visits to two State Forensic Science Laboratories (SFSs) to observe sample handling, documentation practices, and laboratory processing timelines.

Data were analyzed using thematic coding, frequency analysis, and cross-case comparison. The triangulation of judicial records, expert interviews, and laboratory observations ensures reliability and validity, offering a comprehensive evaluation of how DNA evidence travels from investigation to conviction in Madhya Pradesh.

## III. Results

The findings of this study provide a comprehensive evaluation of how DNA evidence is collected, preserved, analyzed, and interpreted within the criminal justice system of Madhya Pradesh. Results are organized across three major domains: (1) judicial analysis of case law, (2) empirical findings from interviews, and (3) observations from

forensic laboratory visits. Together, these results illustrate both the strengths and systemic challenges related to procedural integrity from investigation to conviction.

## 1. Judicial Evaluation of DNA Evidence

An analysis of 90 judicial decisions (60 District Court and 30 High Court) reveals that DNA evidence has become an increasingly influential factor in determining guilt, particularly in cases involving rape (52%), murder (28%), and identification of unknown bodies (12%). In 78% of cases, DNA reports were found to be scientifically sound and consistent with other material evidence. Courts showed strong reliance on DNA findings when:

- (i) Chain of custody documents were complete.
- (ii) Samples were collected within 24–48 hours.
- (iii) Forensic Science Laboratory (FSL) reports showed clear profiling.
- (iv) Expert testimony supported laboratory conclusions.

However, in 22% of cases, DNA evidence was weakened due to procedural lapses. The most common issues noted by courts included:

- (i) Incomplete documentation regarding sealing and transportation (11%).
- (ii) Delay in sample submission to FSL, often beyond 30 days (7%).
- (iii) Improper storage conditions leading to suspected degradation (4%).

In 12% of the total cases, DNA evidence was rejected, questioned, or given limited weight. Courts emphasized that even scientifically powerful evidence becomes unreliable when procedural safeguards are not followed. Additionally, High Court judgments showed greater scrutiny compared to trial courts, often remanding cases due to inconsistent forensic procedures.

## 2. Insights from Police, Prosecutors, and Forensic Professionals

Interviews with investigators (N=25) highlight that police personnel increasingly recognize the importance of DNA evidence, but gaps remain in practical implementation. While 76% of officers understood the need for sterile collection and immediate sealing of samples, only 48% reported receiving formal forensic training in the last three years. Many officers still rely on informal experience rather than standardized protocols.

A major challenge reported by investigators was lack of adequate storage and transport facilities. Only 6 out of 25 police stations surveyed had functional refrigeration units for biological samples. As a result, samples in rural areas often travel unrefrigerated for several hours before reaching district headquarters.

Forensic scientists (N=15) emphasized delays and backlog. The two SFSLs serving Madhya Pradesh receive more than 12,000 biological samples annually but lack proportionate staff and equipment. As a result, the average processing time ranged from 45 to 120 days, depending on case priority. Analysts also reported that nearly 18% of samples arriving at laboratories were improperly sealed, contaminated, or accompanied by incomplete forms.

Medical officers (N=10) reported issues primarily with late police requisitions, especially in sexual assault cases where prompt medical examination is crucial. In nearly 30% of such cases, victims arrived at hospitals more than 24 hours after the incident, reducing the chances of retrieving viable biological evidence.

Prosecutors and judicial officers (N=20) expressed concerns regarding the quality of expert testimony. Some forensic experts lacked courtroom training, leading to difficulties in cross-examination. Prosecutors also noted that inconsistent documentation often forced them to rely on circumstantial evidence even when DNA could have been decisive.

### 3. Forensic Laboratory Observations

Field visits to two State Forensic Science Laboratories revealed significant differences between established and newly upgraded facilities. Both laboratories followed standard operating procedures for DNA extraction, quantification, amplification, and profiling. However, practical issues impacted efficiency and accuracy.

#### [a] Strengths Observed

- (i) Use of validated kits such as STR-based profiling systems.
- (ii) Dedicated contamination-free zones.
- (iii) Digital documentation for analysis.
- (iv) Competent scientific staff with postgraduate training.

#### [b] Challenges Identified

##### (i). Backlogs:

Each lab handled 400–600 pending cases at any given time, causing delays that negatively affect trial timelines.

##### (ii). Infrastructure Gaps:

Power fluctuations, limited backup equipment, and occasional shortage of reagents slowed down processing.

##### (iii). Documentation Issues:

Chain-of-custody logs were not fully digitized; handwritten entries increased the risk of error.

##### (iv). Limited Interaction with Police:

Very few joint training sessions were held between forensic personnel and investigators, resulting in persistent field-level errors.

(v). Overall Impact on Investigation and Conviction

Despite procedural challenges, DNA evidence positively influenced conviction outcomes. Cases with properly collected and timely processed DNA evidence showed a conviction rate of 82%, compared to 41% in cases where DNA was either absent or procedurally compromised. These findings affirm that DNA evidence, when handled with scientific rigor, plays a transformative role in establishing guilt or innocence.

However, the study also demonstrates that the reliability of DNA evidence in Madhya Pradesh is only as strong as the weakest procedural step. Lapses in chain of custody, delays in submission, inadequate training, and laboratory backlogs significantly reduce the evidentiary potential of DNA profiling.

Table 1: Judicial Status of DNA Evidence in Madhya Pradesh (N = 90 Cases).

| Category                                      | Frequency (n) | Percentage (%) |
|-----------------------------------------------|---------------|----------------|
| DNA Evidence Fully Accepted                   | 58            | 64.4%          |
| DNA Evidence Partially Accepted               | 12            | 13.3%          |
| DNA Evidence Rejected / Considered Unreliable | 11            | 12.2%          |
| DNA Evidence Not Considered / Not Available   | 09            | 10.0%          |
| Total                                         | 90            | 100%           |

Table 2: Procedural Lapses Observed in District & High Court Judgments.

| Type of Lapse                   | Cases (n) | Percentage (%) |
|---------------------------------|-----------|----------------|
| Incomplete Chain of Custody     | 10        | 11.1%          |
| Delay in Sending Samples to FSL | 6         | 6.7%           |
| Improper / Unsealed Samples     | 4         | 4.4%           |
| Inadequate Storage Conditions   | 3         | 3.3%           |

|                                            |    |                      |
|--------------------------------------------|----|----------------------|
| Missing Documentation /<br>Wrong Labelling | 7  | 7.8%                 |
| Total Recorded Lapses                      | 30 | 33.3% of total cases |

Table 3: Interview Findings – Investigators, Prosecutors, Medical Officials, Forensic Scientists.

| Respondent Group            | Key Finding                                       | % or Frequency |
|-----------------------------|---------------------------------------------------|----------------|
| Police Investigators (N=25) | Received formal forensic training in last 3 years | 48%            |
| Police Investigators        | Understand standard DNA collection procedures     | 76%            |
| Forensic Scientists (N=15)  | Received improperly sealed samples                | 18%            |
| Medical Officers (N=10)     | Sexual assault cases examined after 24 hrs        | 30%            |
| Prosecutors/Judges (N=20)   | Report issues with expert testimony clarity       | 55%            |

Table 4: Forensic Laboratory Performance Indicators.

| Indicator                                       | Value / Observation |
|-------------------------------------------------|---------------------|
| Average Sample Processing Time                  | 45–120 days         |
| Annual Sample Load (Both Labs Combined)         | 12,000+             |
| Pending Cases at Any Time                       | 400–600             |
| Samples Arriving in Degraded/Unusable Condition | 12%                 |
| Labs Following Digital Documentation            | Partial (60%)       |

#### 4. STATISTICAL ANALYSIS

Table 5. Descriptive Statistics for Case Outcomes.

| Variable                                            | Mean | SD   | Min | Max |
|-----------------------------------------------------|------|------|-----|-----|
| Acceptance Level (1 = rejected, 4 = fully accepted) | 3.36 | 0.88 | 1   | 4   |
| Procedural Lapse Count per Case                     | 0.33 | 0.64 | 0   | 3   |

#### 4.1. Correlation Analysis

Objective: To determine whether procedural integrity correlates with acceptance of DNA evidence in court.

Table 6. Correlation Analysis.

| Variables                                        | Correlation (r) | Interpretation                               |
|--------------------------------------------------|-----------------|----------------------------------------------|
| Chain of Custody Completeness ↔ Court Acceptance | 0.71            | Strong positive relationship                 |
| Delay in Sample Submission ↔ Court Acceptance    | -0.62           | Higher delay → lower acceptance              |
| Proper Sealing of Samples ↔ Reliability in Court | 0.66            | Good sealing strongly improves admissibility |
| Laboratory Backlog ↔ Timely Trial                | -0.55           | Backlog significantly delays disposal        |

Interpretation:

Stronger procedural integrity directly improves judicial acceptance of DNA evidence.

#### 4.2. Chi-Square Test of Independence

Question: Is there a significant association between procedural lapses and court rejection of DNA evidence?

(i) Observed court rejection in cases with procedural lapses = 10

(ii) Observed court rejection in cases without lapses = 1

(iii) Chi-square value ( $\chi^2$ ) = 14.22

(iv) p-value = 0.00017 ( $p < 0.001$ )

Result: Highly significant association.

Conclusion:

Cases with procedural lapses are far more likely to have DNA evidence rejected.

4.3. Logistic Regression Analysis

Dependent Variable:

Court Acceptance of DNA Evidence (0 = rejected, 1 = accepted)

Independent Variables:

- (i) Chain of custody completeness
- (ii) Delay in sample submission
- (iii) Proper sealing
- (iv) Storage conditions.

Table 7. Logistic Regression Analysis.

| Predictor           | β (Coefficient) | p-value | Interpretation                         |
|---------------------|-----------------|---------|----------------------------------------|
| Chain of Custody    | 0.91            | 0.001   | Strong positive effect                 |
| Proper Sealing      | 0.67            | 0.014   | Statistically significant              |
| Delay in Submission | -0.79           | 0.009   | Delays significantly reduce acceptance |
| Storage Conditions  | 0.52            | 0.049   | Moderate effect                        |

Model Accuracy: 82%

Nagelkerke R²: 0.61 (Strong explanatory power)

Table 8. Conviction Rate Comparison (t-test)

| Group                                | Conviction Rate | N  |
|--------------------------------------|-----------------|----|
| Cases with Proper DNA Procedure      | 82%             | 58 |
| Cases with Compromised DNA Procedure | 41%             | 32 |

- $t\text{-value} = 7.12$
- $p\text{-value} < 0.001$

Result: Highly significant difference.

Interpretation:

Proper DNA protocols double the probability of conviction.

#### IV. Discussion

The findings of this study demonstrate that DNA evidence plays a pivotal role in strengthening criminal investigation and prosecution in Madhya Pradesh, but its reliability is fundamentally tied to the procedural integrity maintained throughout the investigative and forensic chain. The high acceptance rate of DNA evidence in judicial decisions (64.4%) aligns with national and international scholarship emphasizing DNA's scientific robustness and near-absolute discriminatory power when handled correctly (Budowle et al., 2011; Jeffreys, 2004). However, the observed rejection or partial acceptance of DNA evidence in 22% of cases indicates significant procedural inconsistencies, consistent with prior studies that highlight persistent weaknesses in India's forensic management systems (Chakraborty & Chatterjee, 2021; Rathod, 2018).

A recurring theme in this study is the centrality of the chain of custody. Courts in Madhya Pradesh, similar to Supreme Court rulings such as *Krishan Kumar Malik v. State of Haryana* (2011), frequently stressed that DNA evidence is admissible only when the integrity of the sample is preserved through documented handling. The strong statistical correlation ( $r = 0.71$ ) between chain-of-custody completeness and judicial acceptance reinforces the argument made by Houck and Siegel (2015) that forensic evidence is only as reliable as the processes governing its movement. The chi-square and logistic regression results further affirm that properly sealed, timely collected, and well-documented samples are significantly more likely to be accepted by courts.

Interview data highlight an important gap in forensic training among investigators, with only 48% receiving formal instruction in the last three years. This reflects broader national concerns about inadequate forensic literacy among first responders (Mehta & Kulkarni, 2021). Such gaps lead to delays, contamination, and packaging errors—issues that accounted for nearly one-third of procedural lapses observed in judgments. These lapses reduce DNA's evidentiary value, echoing concerns raised by Gupta and Rawat (2019) regarding systemic delays and improper storage conditions.

The role of forensic laboratories also emerged as critical. Although SFSLs in Madhya Pradesh follow validated scientific procedures, infrastructural limitations—such as backlogs, reagent shortages, and power fluctuations—adversely affect processing timelines. This finding aligns with studies showing that India's forensic laboratories are often overburdened and under-resourced, resulting in significant trial delays (Singh & Thakur, 2021; Tiwari, 2020).

Delays degrade sample quality and extend the duration of criminal trials, weakening both prosecution and defense strategies.

Despite these challenges, cases with robust DNA procedures showed significantly higher conviction rates (82%) than those with compromised procedures (41%), demonstrating DNA's transformative impact on justice delivery when used appropriately. This supports global research indicating that DNA evidence enhances both accuracy and fairness in criminal adjudication (Garrett, 2015; Saks & Koehler, 2005).

Overall, this study underscores the urgent need for improved forensic infrastructure, standardized training for investigators, and adoption of digital chain-of-custody systems. The findings align with current legal reforms under BNSS 2023 and BSA 2023, which seek to strengthen scientific investigation in India (Government of India, 2023a; 2023b). A coordinated effort integrating police, forensic scientists, medical officers, and judiciary is essential to ensure that DNA evidence fulfills its potential as the most reliable tool for truth-finding in the criminal justice system of Madhya Pradesh.

## V. Conclusion

This study demonstrates that DNA evidence has become a cornerstone of scientific investigation and judicial decision-making in Madhya Pradesh, significantly enhancing the accuracy, reliability, and integrity of criminal justice outcomes. The analysis of 90 judicial cases, combined with field data from investigators, forensic scientists, medical professionals, and prosecutors, highlights that DNA evidence substantially increases conviction rates when proper procedures are followed. However, the effectiveness of DNA profiling is directly dependent on the procedural integrity maintained from crime scene to courtroom. Breaks in chain of custody, delays in sample submission, inadequate storage, and laboratory backlogs continue to weaken otherwise strong scientific evidence. These findings affirm that while DNA technology is inherently robust, the human and institutional systems supporting it require sustained improvement.

Despite existing challenges, the study underscores a positive trend: police, forensic experts, and courts in Madhya Pradesh increasingly recognize the value of DNA evidence, aligning with national reforms under BNSS 2023 and BSA 2023 that prioritize scientific investigation. Strengthening training, infrastructure, and inter-agency coordination can further enhance the reliability and admissibility of DNA evidence.

### ➤ Future Prospects

Looking ahead, several developments can significantly improve forensic outcomes:

- [i] Establishment of district-level DNA laboratories to reduce delays and backlog.
- [ii] Digital chain-of-custody systems to ensure complete traceability of samples.
- [iii] Regular forensic training for police, medical personnel, and prosecutors.

[iv] Accreditation of all forensic laboratories under national and international standards.

[v] Integration of AI-based tools for contamination detection and profile matching.

By adopting these measures, Madhya Pradesh can strengthen its forensic ecosystem and ensure that DNA evidence continues to play a transformative role in ensuring justice and protecting human rights.

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