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DNA Evidence in Paternity Disputes: Reconciling Scientific Proof with Constitutional Rights

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ABSTRACT

The advent of DNA testing has revolutionized family law, particularly in paternity disputes, by providing an objective scientific method to establish biological parentage. While courts increasingly rely on DNA evidence due to its high accuracy, its use raises complex legal, ethical, and constitutional questions. In India, the judiciary has navigated the delicate balance between the child's right to know biological parentage and the father's fundamental rights, including privacy, bodily autonomy, and protection against self-incrimination. Landmark cases from 1993 to 2014 illustrate an evolution in judicial reasoning—from cautious discretionary use of DNA testing to its acceptance as conclusive proof, tempered by procedural safeguards. This paper analyzes statutory frameworks, constitutional principles, and judicial precedents governing DNA evidence in paternity cases, while also comparing Indian practices with international standards in the United States, United Kingdom, and European Court of Human Rights. The study finds that while DNA testing provides unparalleled accuracy, courts must carefully weigh it against constitutional protections. Policy recommendations include codified guidelines for consent, ethical safeguards, and secure data management to reconcile scientific proof with fundamental rights.

Keywords

DNA Evidence, Paternity Disputes, Constitutional Rights, Privacy and Bodily Autonomy, Child Welfare, Judicial Discretion.

Introduction

Paternity establishment has long been a foundation of family law, affecting significant matters such as child custody, support, inheritance, and succession rights. Courts traditionally used circumstantial evidence, sworn statements, blood testing, or judicial presumptions to conclude contests over biological parenthood. Although these approaches offered some insights, they tended to be unreliable, erroneous, and based on societal prejudices, with courts left to the dilemma of reconciling conflicting interests. The invention of DNA testing has transformed paternity determination by offering a very accurate, objective, and scientifically sound instrument [1]. DNA profiling examines certain genetic markers to determine biological connection with accuracy over 99.99%, thus presenting the courts with an unprecedented ability to discern truth in family matters. This scientific accuracy has made possible a move away from dependence on indirect evidence to objective confirmation, altering both the pace and reliability with which claims of paternity may be disposed of. In spite of its accuracy, however, the application of DNA evidence in paternity cases involves intricate constitutional, ethical, and legal issues. At the core of this debate is the balance to be struck between the child's right to know their biological parentage, and the alleged father's basic rights, such as the right to privacy, bodily integrity, and protection from self-incrimination. Article 21 of the Constitution, which grants the right to life and personal liberty, has been construed to include privacy and bodily autonomy, while Articles 14 and 20(3) safeguard against arbitrary treatment and self-incrimination, respectively [2].

Courts have therefore been challenged to balance ensuring DNA testing is used judiciously, proportionately, and with intelligent consent, without undermining constitutional protection. The

Indian judiciary's response to DNA evidence shows a shift in thinking over the years. Early 1990s cases like Goutam Kundu v. State of West Bengal [3] cautioned against the mechanical application of scientific tests, stressing the need for judicial discretion and safeguarding individual rights over the mechanical application of scientific tests. Conversely, recent judgments, such as Nandlal Wasudeo Badwaik v. Lata Nandlal Badwaik [4] 12 SCC 1), acknowledge DNA as very reliable and authoritative, able to override traditional legal presumptions of paternity. However, courts still emphasize procedural safeguards like valid consent, certified laboratory standards, and safe handling of genetic data, showing a consistent concern to address scientific certainty with ethical and constitutional issues. This paper attempts to analyze the legal, constitutional, and ethical aspects of DNA evidence in Indian paternity disputes. It examines the statutory context, milestone judicial rulings, and comparative jurisprudence, but underscores the ways that courts balance scientific precision and the rights of all concerned parties, especially children and putative fathers [5]. Through an examination of this nexus of science, law, and ethics, the research seeks to offer a thorough explanation of how DNA evidence has transformed paternity determination, and on that basis, offer policy suggestions for improving procedural consistency, ethical protections, and constitutional integrity.

Objectives of this study

- To review the statutory and constitutional law dealing with DNA evidence in paternity litigations in India.
- To discuss landmark judgments and the development of judicial principles from 1993 to 2014.
- To offer a comparative overview by discussing international jurisprudence in the United States, United Kingdom, and European Court of Human Rights.
- To offer pragmatic guidelines and policy suggestions balancing scientific verity with constitutional guarantees.

Literature Review

The application of DNA evidence to paternity cases has received significant attention in legal and scientific literature. Previous research centered mainly on blood group and serology tests, which were inaccurate and prone to criticism for producing inconclusive results in courts. With the advent of DNA profiling, researchers started focusing on the scientific certainty and probative strength of genetic testing, pointing to its ability to revolutionize family law by offering objective, near-absolute proof of biological ties. Legal scholarship has explored the intersection of DNA evidence and constitutional rights, especially privacy, autonomy over one's body, and immunity from self-incrimination. Puttaswamy v. Union of India [6] highlighted the significance of consent and privacy in the use and collection of genetic information, which has shaped subsequent judicial rulings in paternity cases [7]. Researchers contend that the courts have to walk on a thin line between the right of a child to be informed of their parentage and the father's constitutional rights, with proportionality and protection measures to avoid coercion or abuse of personal information. Comparative reviews add depth to the debate by examining global practices. In America, the Daubert Standard regulates the admissibility of scientific evidence, with reliability and relevance emphasized. Within the United Kingdom, the Family Law Act 1986 and Human Fertilisation & Embryology Act 1990 prioritize the welfare of children when codifying consent thresholds and procedural protections for DNA testing [8].

European Court of Human Rights case law, such as Labassee v. France, emphasizes the principle of proportionality, where privacy rights must be weighed against the state's interest in determining biological truth [9]. Although literature consistently establishes the scientific strength of DNA evidence, it also emphasizes procedural and ethical issues, such as laboratory contamination, chain-of-custody mishaps, confidentiality of data, and social stigma. Scholars propose standardised guidelines, judicial education, and legislative frameworks so that DNA analysis in paternity cases continues to be scientifically sound, ethically responsible, and constitutionally valid. This review attests that academic debate has followed judicial practice and serves to illustrate that the incorporation of DNA evidence into family law must address both scientific precision and basic rights as the starting point for current investigation and policy advice.

Legal and Constitutional Framework in India

Understanding the framework that governs the use of DNA evidence in paternity disputes—which consists of a combination of statutory requirements, constitutional principles, and judicial guidelines—is essential to understanding how courts strike a balance between scientific proof and fundamental rights.

Statutory Provisions

Indian Evidence Act, 1872

The Indian Evidence Act plays a central role in determining the admissibility of DNA evidence in paternity cases. Key provisions include:

- Section 45 – Opinions of Experts: This section allows expert opinion on scientific subjects to be considered by courts. Courts can use forensic evidence as expert testimony since DNA test reports are covered by this clause [10].
- Section 112 – Presumption as to Legitimacy of Child: A legal presumption concerning the paternity of a child born during the duration of a marriage is established by Section 112, Presumption as to Legitimacy of Child. Even while DNA evidence is scientific, it interacts with this statutory presumption and frequently overrides it in cases when biological truth is proven [10].
- Section 65B – Electronic Records: This section emphasizes the validity and dependability of technological evidence, which is similar to the standards for DNA sample integrity and chain of custody, even though it is largely for electronic evidence [10].

Family Law Statutes and Criminal Procedure

- Hindu Adoption and Maintenance Act, 1956 / Hindu Marriage Act, 1955: Courts use DNA evidence to adjudicate claims for maintenance or inheritance.
- Code of Criminal Procedure, 1973: Provides procedural

mechanisms for collection and presentation of evidence, including biological samples in disputed cases.

These legal rules serve as the foundation for the assessment and admissibility of DNA evidence, guaranteeing the integration of scientific evidence into the legal system while upholding procedural safeguards.

Constitutional Principles

DNA testing in paternity disputes raises significant constitutional questions, particularly concerning personal liberty, privacy, equality, and protection against self-incrimination**.**

Article 21 – Right to Life and Personal Liberty

- The Supreme Court in Justice K.S. Puttaswamy v. Union of India (Justice K.S. Puttaswamy v. Union of India, recognized privacy as a fundamental right under Article 21 [6] 10 SCC 1.).
- DNA testing implicates privacy in two dimensions: bodily autonomy (compulsory sample collection) and informational privacy (genetic data handling). Courts must ensure that ordering DNA tests does not violate these protected rights.

Article 14 – Right to Equality

- Ensures that all parties in paternity disputes have equal access to justice and safeguards against arbitrary or discriminatory judicial orders.
- Courts apply Article 14 to prevent unreasonable compulsion of DNA testing for one party while exempting another.

Article 20(3) – Protection Against Self-Incrimination

- The constitutional prohibition against self-incrimination restricts courts from requiring an accused father to provide biological samples.
- In practice, courts reconcile this right with the child's interest, often treating DNA testing as permissible only with judicial oversight and informed consent.

Judicial Guidelines and Discretion

In order to balance scientific accuracy with constitutional safeguards, Indian courts have developed a body of jurisprudence that emphasizes judicial discretion and proportionality when ordering DNA tests. The following key principles are reflected in this approach:

1. Consent is Critical: Courts typically require voluntary participation, unless there are exceptional circumstances in which refusal would significantly harm the child's interests;
2. Child Welfare as Paramount – Decisions prioritize the child's rights and welfare, acknowledging that biological truth can impact maintenance, custody, and inheritance;
3. Proportionality and Necessity – DNA testing should only be ordered when other evidence is insufficient, ensuring minimal intrusion into personal rights;
4. Procedural Safeguards – Chain of custody, certified laboratories, and expert testimony are necessary to ensure the reliability and integrity of DNA evidence.

Intersection of Statutes and Constitutional Rights

The interplay of statutory and constitutional provisions creates a nuanced legal framework:

- Constitutional rights serve as a check on excessive judicial power, guaranteeing that scientific evidence does not supersede fundamental liberties.
- Statutes establish the process for gathering and presenting DNA evidence, as well as paternity presumptions.
- Courts have continuously worked to bring these ideas into harmony, acknowledging that while DNA evidence can be used to uncover the truth, it cannot be considered separate from ethics and rights.

Challenges in Implementation

Despite this robust framework, several challenges remain:

1. Absence of Uniform Guidelines: Courts can give contradictory rulings about mandatory testing and consent.
2. Data Privacy Issues: The potential of misuse is increased when there are no thorough legal protections for genetic data.
3. Judicial Awareness: The results of cases may be impacted by the fact that some courts lack the technical know-how to evaluate DNA evidence critically.
4. Cultural and Social Factors: Court rulings and consent may be impacted by the stigma attached to paternity disputes.

Role and Reliability of DNA Evidence

DNA evidence has become one of the most scientifically sound instruments in the determination of biological ties, especially in paternity cases. Its importance is in offering an objective evidence-based base for courts that diminishes over-reliance on the common circumstantial or testimonial evidences [11]. While DNA evidence is extremely precise, it also comes with legal, ethical, and procedural issues that need to be handled very carefully in judicial processes.

Scientific Basis

DNA, or deoxyribonucleic acid, is the hereditary material found in nearly all human cells, which distinguishes individuals from one another, with the exception of identical twins.

Current DNA profiling methods examine certain areas of the genome, referred to as Short Tandem Repeats (STRs), which are different in each individual [12]. These areas are compared among the child, mother, and supposed father to determine a Paternity Index (PI), which measures the probability of biological fatherhood. DNA tests applied in paternity testing have a reported sensitivity of over 99.99%, rendering them considerably more accurate than earlier blood group or serological tests. The advancements in forensic genetics also enable low-sample and non-invasive testing, like buccal swabs, to reduce pain and procedural risk. In legal proceedings, these scientific techniques are considered expert evidence under Section 45 of the Indian Evidence Act, forming an authoritative grounds for adjudication by courts [13].

Advantages of DNA Evidence

One of the main advantages of DNA evidence is its objectivity and

high level of scientific reliability. Whereas circumstantial evidence, witness evidence, or assumptions of regularity are susceptible to imprecise subjective judgments, DNA gives a numerical probability of biological parentage. This objectivity minimizes the possibility of misinterpretation or prejudice in judicial decisions. Also, DNA evidence can settle disputes efficiently and definitively, especially when other evidence is contradictory or inconclusive [14]. It is a strong tool for corroboration in family law, so maintenance, custody, and inheritance claims are decided on the basis of provable biological fact and not assumptions or societal norms. Courts increasingly acknowledge that DNA evidence can maximize the accuracy and efficiency of the judicial process, ensuring fairness to children and parents alike [15].

Limitations and Challenges

In spite of its advantages, DNA evidence is not free of limitations. Laboratory missteps, sample contamination, and mishandling during collection (chain-of-custody problems) can make it unreliable. Judges have underlined the importance of strict compliance with procedural protections, such as certified laboratories, recorded handling procedures, and expert validation of test results [16]. Ethical considerations are also very important. Mandatory DNA testing threatens to invade privacy, bodily integrity, and the right against self-incrimination (Article 20(3) of the Constitution). The gathering, storage, and possible misuses of genetic information pose confidentiality and data protection issues, especially where there is no overriding legislative protection. Furthermore, social and cultural determinants could influence the voluntary nature of participation in DNA testing, with ensuing consent and coercion issues [17,18]. They need to find their way through these ethical and procedural hurdles, ensuring that DNA evidence is applied judiciously and proportionally, in conformity with constitutional safeguards and the well-being of the child. DNA evidence is a revolutionary instrument in paternity cases, linking scientific accuracy with judicial utility. Its exceptional precision and objectivity render it valuable in determining disputed parentage, yet its technical, ethical, and legal limitations underscore the need for procedural controls, consent, and judicial oversight [19]. By striking a balance between scientific reliability and constitutional and ethical requirements, courts can make DNA evidence an honest and useful tool of justice.

Judicial Approach in India (Landmark Cases)

Indian courts have been instrumental in defining the legal norms for the admissibility of DNA testimony in paternity cases. Key decisions between 1993 and 2014 reflect the refinement of judicial reasoning, the tension between scientific evidence, constitutional protection, and the interest of the child. Courts have increasingly shifted from a restrictive, discretionary mode to a more formal acknowledgment of DNA as extremely credible evidence, yet with continued insistence on consent and procedural protection.

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

In Goutam Kundu v. State of West Bengal, the court considered the application of blood tests to establish paternity. Although DNA tests were not yet standard, the rule developed in this case paved the way for subsequent decisions. The court highlighted the fact that scientific tests cannot be ordered mechanically; judicial discretion has to sanction any order to provide testing [3].

Significance: The case pointed out the significance of balancing truth-seeking with party rights. It emphasized that courts have to look at the background of the dispute and the possible incursion into personal rights prior to forcing any biological testing. This careful attitude paved the way for the sensitive treatment of DNA evidence in the coming years.

Banarsi Dass v. Teeku Dutta (2005) 4 SCC 449.)

In Banarsi Dass v. Teeku Dutta, the Supreme Court considered specifically a plea for DNA testing in the case of maintenance. The court ruled that DNA tests cannot be issued mandatorily and need to consider the alleged father's consent and the circumstances [20].

Importance: This ruling supported the doctrine of judicial discretion and emphasized the preservation of constitutional rights, especially privacy and autonomy of the body. The court was adamant that although scientific evidence is important, it cannot be used to supersede absolute rights or be made mandatory.

Bhabani Prasad Jena v. Orissa State Commission for Women (2010) 8 SCC 633)

The Bhabani Prasad Jena case further perfected the method of DNA testing in cases of disputed paternity. The court permitted DNA tests only on a consent basis and underlined the fact that such testing must be in the best interest of the child [21].

Significance: This case brought a proportionality-based approach, balancing the requirement of proper parentage determination with the rights of the alleged father. It emphasized that child welfare is imperative, but constitutional protections must be an integral part of any order involving DNA testing.

Nandlal Wasudeo Badwaik v. Lata Nandlal Badwaik (2014) 12 SCC 1.)

In this historic 2014 ruling, the Supreme Court identified DNA testing as the most genuine scientific process to determine paternity. The court declared that scientific evidence could override conventional legal presumptions, like the presumption of legitimacy under Section 112 of the Indian Evidence Act [4].

Significance: This ruling saw a movement toward the acceptance of DNA as final proof in paternity suits, with procedural protection—laboratory certification and consent—still being vital. Courts recognized that though DNA evidence is compelling, its application must be used judiciously and responsibly, keeping constitutional safeguards in mind.4.5 Analysis of Evolution

The judicial approach to DNA evidence in paternity disputes can be traced through three distinct phases:

1. **1993–2005: Cautious, Discretionary Approach**

- Courts emphasized judicial discretion and rights protection over scientific certainty.

- DNA or blood tests were not considered decisive; science was secondary to consent and context.

2. **2010: Balancing Child Welfare and Privacy**

- Courts began integrating the child's welfare as a guiding principle in ordering DNA tests.
- Consent and proportionality became central to judicial reasoning.

3. **2014: Recognition of DNA as Decisive Evidence**

- DNA testing emerged as highly reliable and potentially conclusive.
- Courts maintained procedural safeguards, ensuring that constitutional rights, particularly privacy and bodily autonomy, were respected.
- This period reflects a mature, balanced approach where science and law coexist to achieve both truth and justice.

Comparative Jurisprudence

Evaluating the strategy of foreign jurisdictions toward DNA evidence in paternity cases is most informative for India, showcasing the manner in which courts weigh scientific evidence, privacy rights, and child well-being. Although DNA analysis is globally known to be reliable, courts vary in the level of judicial intervention, consent, and precedence of the child's interest.

United States

In the US, the admissibility of scientific evidence, including DNA testing, is controlled mostly by the Daubert Standard (Daubert v. Merrell Dow Pharmaceuticals, **(509 U.S. 579** [22]. It demands that the scientific evidence must be both reliable and pertinent to the case, determined based on considerations such as peer review, known rates of errors, and general acceptance among the scientific community. As to paternity contests, American courts generally regard DNA testing as highly probative and admissible, usually precluding traditional presumptions of legitimacy [23]. Courts weigh this against privacy interests and consent, however, particularly in compelling an unwilling party to undergo testing. State legislatures and courts often insist that DNA testing orders are proportional to the issue at stake, balancing the rights of the child and the alleged parent. The U.S. model emphasizes the blending of strict scientific standards with procedural protections, which ensures that DNA evidence is both scientifically valid and legally sound. The model shows that courts can preserve scientific validity without infringing on human rights [24].

United Kingdom

In the United Kingdom, paternity disputes are first and foremost regulated by the Family Law Act 1986 and the Human Fertilisation & Embryology Act 1990. These laws establish DNA evidence as the chief means of proving biological parentage, given its probative strength and scientific accuracy. UK courts place paramount importance on the best interests of the child. Consent is generally required for testing, but courts may order DNA tests even against an individual's objection if it is essential for determining parentage in the child's interest [25]. The law also provides detailed guidelines regarding sample collection, laboratory certification, and data confidentiality, ensuring that ethical and procedural standards are maintained. This strategy highlights the UK courts' emphasis on child welfare and proportionality, evidencing a balanced combination of scientific findings and social responsibility. DNA proof is paramount in decision-making, but its use is governed by norms of fairness, consent, and protection of privacy [26].

European Court of Human Rights (ECHR)

The European Court of Human Rights has also dealt with cases in which DNA testing overlaps with the right to privacy under Article 8 of the European Convention on Human Rights. Significant cases, for example, Labassee v. France, show the approach of the Court in seeking a balance between the state's interest in determining paternity and the right to privacy of the person. The ECHR applies proportionality, consent, and necessity [27]. Forced DNA testing is only allowed where it is necessary to settle a genuine dispute and when less intrusive means are not possible. The Court also emphasizes the necessity of protection of data, insisting that genetic data be treated with utmost confidentiality and utilised only for the proposed legal purpose. The ECHR jurisprudence reflects a balanced approach, where scientific truth-finding is not permitted to prevail over essential human rights, but where regard is also shown for the child's interest in determining biological parentage [28].

Comparative Analysis

Throughout these jurisdictions, a number of recurring themes are present:

1. Scientific Reliability – DNA evidence is uniformly accepted as the most reliable means of establishing paternity.
2. Consent and Autonomy – Courts take careful note of the person's rights, frequently insisting on consent or judicial control prior to coercive testing.
3. Child Welfare – The child's interests take precedence in determining whether DNA testing is to be ordered.
4. Procedural Safeguards – Laboratory certification, chain-of-custody procedures, and confidentiality procedures are all part of the admissibility and ethical use of DNA evidence.
5. Balancing Rights and Truth – Jurisdictions vary in the balance to be struck between privacy and pursuit of biological truth, but proportionality is sought in court orders everywhere.

Comparative jurisprudence points out that while India is increasingly accepting DNA as irrefutable proof, experiences from the U.S., UK, and ECHR point toward consent, proportionality, child protection, and procedural stringency. These principles can infuse India's system with more strength to end disputes justly, morally, and constitutionally. The comparative analysis proves that DNA evidence is universally accepted as a first-line tool for establishing paternity, but courts everywhere emphasize procedural safeguards, consent, and proportionality. The Indian judiciary can learn a lot from these models, especially child-focused decision-making, ethical concerns, and privacy protection while maximizing the probative value of DNA evidence.

Constitutional and Ethical Considerations

The use of DNA evidence in paternity disputes presents significant constitutional and ethical challenges, particularly in balancing

individual rights with the child's interest. Indian courts have recognized that while DNA evidence provides highly accurate biological proof, its application must not infringe on fundamental rights under the Constitution of India. Ethical considerations also demand careful handling of consent, data privacy, and potential societal stigma.

Bodily Autonomy and Privacy

The right to privacy and bodily autonomy is an integral part of Article 21 of the Indian Constitution that guarantees the right to life and personal liberty. In Justice K.S. Puttaswamy v. Union of India [6], the Supreme Court reaffirmed that privacy includes informational privacy (protection of personal information) as well as physical autonomy (autonomy over one's body). In terms of DNA testing, this means that courts must see that any taking of genetic information is proportional, no more invasive than necessary, and justified [29]. Forcing DNA testing without consent might violate a person's right to bodily autonomy and the constitutional right to liberty. Accordingly, courts usually insist on informed consent from the purported father before authorizing DNA testing, other than where refusal would severely undermine the child's right to know biological parentage. Judicial discretion is central in weighing these colliding interests, so that privacy will not be sacrificed in the interest of scientific certainty [30].

Child Welfare vs. Father's Rights

Paternity cases inevitably present a conflict between the welfare of the child and the rights of the putative father. It is acknowledged by the courts that children do have a legitimate interest in ascertaining their parentage, which can affect maintenance, inheritance, and identity. While this should be respected, the right of the father to privacy and against self-incrimination has also to be preserved [31]. Landmark decisions, such as Bhabani Prasad Jena v. Orissa State Commission for Women [21], require that child welfare be the determinative factor in judicial decisions, but not by compromising the basic rights. A proportionate approach has been taken by courts, mandating DNA testing only where it is vital in protecting the child's interests and less invasive options are inadequate. This balancing act protects both parties' rights and leads to justice and truth [32].

Data Protection and Confidentiality

The processing of genetic information is of grave concern with respect to protecting data and maintaining confidentiality. The Digital Personal Data Protection (DPDP) Act, 2023 provides for safe collection, processing, and storage of sensitive personal information, such as genetic information. Courts need to safeguard DNA samples and test results for use only for the sole purpose of law and against unauthorized access or misuse. Not safeguarding such information may result in invasions of privacy, identity theft, or discrimination based on social identity. Procedural measures such as anonymization, limited access, and safe laboratory practices are vital in maintaining legal and ethical standards. Effective data protection not only complies with constitutional obligations but also enhances public trust in the judicial process [33].

Ethical Issues

Ethical issues in DNA testing go beyond consent and privacy. Social stigma for the parties concerned, abuse of genetic information, and coercion in taking samples are major issues. Courts have to make the testing voluntary wherever practicable, ensure that results are treated in confidentiality, and that judicial reasoning is not prejudiced by societal prejudice [34]. The threat of improper use of DNA data—e.g., for extrajudicial paternity cases, employment discrimination, or insurance reasons—requires stringent ethical guidelines. Judicial and legislative controls must be put in place to avoid these risks so that DNA data is applied for its correct legal purpose [35].

The constitutional and ethical aspects of DNA evidence in paternity cases reiterate the requirement for a balanced approach that respects rights. Courts have to balance the welfare of the child and the privacy, autonomy, and protection from self-incrimination of the father. Ethical protection—such as consent, confidentiality, and safe handling of data under the DPDP Act, 2023—is an essential part of ensuring DNA evidence is used fairly, responsibly, and constitutionally. The judiciary can ensure public confidence with these balancing factors incorporated into the process while using scientific progress to deliver justice [17,18].

Policy and Reform Recommendations

The application of DNA evidence in cases of dispute over paternity, though scientifically strong, necessitates systematic policy action and legislative changes to make it ethical, constitutional, and judicially compliant [36]. From Indian jurisprudence, comparative analysis, and ethical points of view, a number of concrete recommendations emerge to enhance the administration of justice in these cases.

Uniform Guidelines for DNA Testing with Consent Mechanisms

A critical necessity is presented to develop consistent standards for DNA testing - in paternity disputes. These standards must clearly define:

- Conditions under which DNA testing can be sought.
- Informed consent processes that are compulsory on the alleged father.
- Exceptions under which testing can be mandated over refusal, subject to strict judicial supervision.

Standardization will minimize arbitrary judicial orders, promote respect for constitutional rights, and enhance uniformity between courts, while at the same time safeguarding the child's interests [37].

Judicial Training in Forensic Science and Constitutional Protections

Balancing scientific evidence and constitutional rights is a function that is key to judges. There should be specialized training schemes to increase judicial familiarity with:

- DNA technology, laboratory standards, and procedural reliability.
- Ethical concerns, including privacy, consent, and possible coercion.

- Constitutional protections, specifically Articles 21, 14, and 20(3).

Training thus would enhance judicial competence to critically assess DNA evidence, issue well-informed orders, and avoid abuse or overreach in paternity matters [38].

Strong Data Protection and Anonymization Protocols

The Digital Personal Data Protection (DPDP) Act, 2023 lays down a blueprint for safe handling of genetic data, but additional steps are necessary to assure stringent compliance in forensic applications. Suggestions include:

- Compulsory anonymization of DNA samples and test results.
- Restrictive access to courts only and laboratories.
- Penalties under the law for unauthorized disclosure or misuse of genetic information.

These measures would safeguard both the child's and the alleged father's privacy, prevent abuse of sensitive information, and increase public trust in DNA testing as a judicial process.

Mediation and Alternative Dispute Resolution

Prior to resorting to mandatory DNA testing, courts should induce mediation or alternative dispute resolution (ADR). This strategy:

- Offers parties a chance to arrive at voluntary agreement regarding paternity matters.
- Lessens adversarial conflict and social stigma attached to DNA testing.
- Ensures testing is utilized only where its application is imperative for ascertaining biological truth.

ADR mechanisms are in synchronization with constitutional protection and child-friendly judicial philosophy, minimizing invasion into private rights while safeguarding the child's welfare [39].

Legislative Reform to Codify Rules Balancing Truth and Rights

Lastly, legislative reform to codify rules regulating DNA evidence in paternity cases is needed. A special statute would:

- Implement judicial guidelines, ethical protections, and consent procedures.
- Specify the admissibility, standards of reliability, and procedure requirements for DNA tests.
- Specifically balance the child's right to biological truth and the father's constitutional rights.

Such codification would ensure legal certainty, minimize inconsistencies in judicial judgments, and establish a strong framework for ethical and constitutional application of DNA evidence. With the help of standardized guidelines, judicial training, strong data protection, ADR mechanisms, and overall legislative reforms, India can provide guarantees that DNA evidence in cases of paternity disputes is applied ethically, scientifically, and constitutionally [18]. These reforms would strengthen the quality of judicial rulings, safeguard basic rights, and uphold the best interests of children, providing a sound and efficient legal system for resolving paternity cases in contemporary times.

Conclusion

DNA evidence has transformed the landscape of paternity disputes, providing a scientifically robust and highly accurate tool for establishing biological parentage. Its precision has enhanced the capacity of courts to resolve disputes objectively, reducing reliance on circumstantial evidence, presumptions, or testimonial accounts. However, the legal and ethical implications of DNA testing render its application complex and nuanced, requiring a careful balance between the pursuit of truth and the protection of constitutional rights. The Indian judiciary has shown a gradual progress in its handling of DNA evidence. In earlier cases, like Goutam Kundu v. State of West Bengal [3], the courts were focused on judicial discretion, prudence, and safeguarding the rights of the putative father. Later rulings, such as Banarsi Dass v. Teeku Dutta [20] and Bhabani Prasad Jena v. Orissa State Commission for Women [21], showed a more even-handed approach, combining the best interests of the child with constitutional protections. By 2014, in Nandlal Wasudeo Badwaik v. Lata Nandlal Badwaik, DNA evidence was established as determinative and authoritative, although courts still maintained procedural protections, consent, and privacy guarantees. This development exhibits a judiciary sensitive to both scientific developments and constitutional compulsions, identifying a direction of harmonizing science, ethics, and law.

Application of DNA evidence is always to be couched within the constitutional rights of privacy, dignity, and bodily integrity, especially under Article 21, and the personal liberty against self-incrimination under Article 20(3). Ethical issues—such as coercion, confidentiality, and social stigma—also need to be met to avoid misuse or discrimination. Comparative perspectives from the United Kingdom, United States, and European Court of Human Rights bolster that though DNA evidence forms the heart of truth-finding, proportionality, consent, and the well-being of children should override all proceedings. For DNA evidence to be used in serving justice effectively, there is an urgent necessity for standardized guidelines, ethical protection, and legislative enshrining. Established procedures for consent, secure handling of genetic information, judicial education in forensic science, and utilization of alternative mechanisms of dispute resolution can reduce clashes between constitutional rights and the search for scientific truth. Institutionalization of these steps will not only make the judiciary more efficient but also safeguard the rights of all concerned, especially the child.

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