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GENETIC JURISPRUDENCE: REIMAGINING INDIAN LEGAL SYSTEM'S APPROACH TO DNA EVIDENCE AND PRIVACY PROTECTIONS

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ABSTRACT
Within the area of justice delivery system all over the globe, incorporation of DNA information has emerged as a crucial instrument in establishing truth, guaranteeing fairness, and preserving the ideals of justice. In India use of DNA information in criminal justice system has sparked extensive deliberation regarding its potential, as well as ethical, human rights, privacy concerns it entails. This research paper explores the complex terrain of DNA technology deployment, with a particular focus on delicate balance between individual rights and societal welfare. It shall examine two key legislative initiatives i.e., the DNA Technology (Use and Application) Regulation Bill, 2019 and the Criminal Procedure (Identification) Act, 2022. It shall delve into the implications of these laws on the judicial system's handling of criminal offenses, analysing the potential impact on due process, privacy, and the fundamental rights of citizens. The deliberation on this topic is significant to evaluate legislative intent, scope of DNA data collection, usage, and safeguards (or lack thereof) incorporated to protect individual liberties. By examining the Indian context within the broader global discourse on the use of DNA evidence in the justice system, this paper seeks to contribute to the ongoing dialogue on redefining the boundaries of genetic governance and striking a delicate balance between the imperatives of national security, public welfare, and individual rights in the face of an ever-evolving technological landscape.

KEYWORDS: *DNA, Privacy, DNA Bill, the Criminal Procedure (Identification) Act of 2022.*

1. INTRODUCTION

Technological advancements in science have reaped exponential benefits for human race. The culmination of sequencing of human genome represents a pivotal moment in comprehending molecular foundation of life. The vast insight garnered from genomics is yielding substantial dividends for healthcare and is heralded as a transformative instrument for upholding fairness. Progress in scientific understanding and technological prowess has fundamentally redefined society's temporal and spatial fabric. The swift proliferation of scientific and technological capacities has facilitated the accumulation of extensive genetic material and data of superior quality, accessible via online repositories worldwide. It has rapidly transformed the landscape of crime and criminal investigations with forensic science[1] becoming the bedrock of criminal investigation and inquiry. The advancements such as DNA analysis, fingerprinting have not only expedited criminal investigations but help in exonerating individual wrongfully charged and convicted.[2] The governments of Developed Nations like United States of America, United Kingdom, Australia, alongside emerging powers like India, has established comprehensive human

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1 The application of science for the criminal investigation is termed as Forensic Science.
2 S.J. Walsh, *Legal perceptions of forensic DNA profiling Part I: a review of the legal literature*, FORENSIC SCI. INT., 51–60 ((2005).

genetic databases or facilities to enable varied applications of genetic material and data. Nevertheless, the escalating dependence on genetic data for legal objectives poses challenges, including breaches of genetic confidentiality and deepening disparities between affluent and developing nations across various spheres, thus giving rise to new rifts. The establishment of balance between optimal use of technological advancements and modifications in present time regulations and regimens, is a significant issue of debate. Ensuring that fundamental rights such as privacy, protection against self-incrimination, and personal freedom are not infringed upon by any technological developments is essential.[3]

The DNA profiles[4] are valuable for identification purposes, encompassing recognition of victims, suspects (individuals accused of sexual assault, homicide), parentage authentication, and immigration disputes concerning familial ties. The identification of Deoxyribonucleic Acid[5] in 1950 as the fundamental genetic material has revolutionised landscape of scientific inquiry and unlocked new potential, catalysing significant progress in genetic studies and medical science.[6] The British origin geneticist Alec Jeffrey introduced genetic fingerprinting in 1984, used to convict Coin Pitchfork for raping and murdering two girls in 1983 and 1987.[7] The DNA genotype may be extracted from several biological specimens, including bone, blood, semen, saliva, hair, skin, etc. A cell contains a unique DNA composition, making it sole decisive factor in distinguishing individuals. DNA profiling or fingerprinting, is increasingly utilized for human identification in legal proceedings globally. Forensic DNA technology is employed to scrutinize DNA profiles derived from samples, collected either at the crime scenes or from bodies of suspects or victims. While fingerprints and palm prints are for identification in forensic science, DNA profiling extends beyond mere identification, potentially disclosing sensitive details about an individual's race, familial lineage, susceptibility to diseases, allergies, physical characteristics, behavioural tendencies, and even legality of birth.

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3 M. Kirby, *DNA evidence: Proceed with care*, AUST. J. FORENSIC SCI., 9–13 (2001).

4 DNA profiling help to establish correct parentage in disputed paternity cases, incest cases, abandoned children, murdered infants, blood relationships among persons claiming blood relationships to claim inheritance, property, or entry to another country, alleged adultery cases, homo or hetero-logus nature of twins, false charges relating to rape, fatherhood, and gang rape cases.

5 DNA, known as Deoxyribonucleic acid, acts as the genetic blueprint for each person.

6 A.J. Jeffreys, V. Wilson, S.L. Thein, *Hyper variable minisatellite regions in human DNA*, NATURE, 67–73 (1985).

7 Rakesh Kumar Singh, *Justice through DNA Technology*, (Jun. 22, 2024, 10:04 AM), ujala.uk.gov.in.

1.1 OBJECTIVES OF STUDY

- To explore the significance and implications of incorporating DNA information in the justice delivery system in India;
- To provide a comprehensive analysis of the legal, ethical, and practical implications of using DNA evidence in the Indian criminal justice system;
- To explore potential solutions to address the challenges and concerns associated with this emerging technology.

2. RESEARCH METHODOLOGY

The research methodology is doctrinal in nature with analytical research plan using qualitative methods to provide a structured approach for evaluating the impact of DNA technology on human rights and privacy within India's legal system to ensure comprehensive and robust research findings.

3. CURRENT STATUS OF LAW ENFORCEMENT IN REGARD TO CRIMINAL OFFENCES IN INDIA: LEGAL AND CONSTITUTIONAL PERSPECTIVE

The incorporation and use of DNA profiling in evidence has resulted in significant progress in the dispensation of justice, yet it has also presented intricate regulatory hurdles. The regulatory landscape overseeing DNA profiling in India comprises a varied array of legislative measures, institutional structures, and procedural directives aimed at guaranteeing the proper acquisition, examination, preservation, and admissibility of biochemical proofs in court proceedings. These innovations are significantly altering criminal justice system, requiring a thorough examination of changes to identify and exonerate the wrongfully accused. The antiquated Code of Criminal Procedure dating back to 1973 and the Indian Evidence Act from 1872 lacked a robust basis for integrating forensic science into the criminal justice apparatus. These statutes were formulated in an era when scientific evidence was not as sophisticated, despite some legal amendments, the assimilation of modern forensic technologies has been deficient. A necessity was felt for comprehensive legal provisions for efficacious utilisation of forensic technologies, like DNA profiling, in crime detection and justice dispensation. Recently, the Government introduced the Bharatiya Nagarik Suraksha Sanhita, 2023 (BNSS) and the Bharatiya Sakshya Adhiniyam, 2023 (BSA) with an objective to fortify position of forensic evidence and improving forensic practices.

3.1 THE FORENSIC FRONTIER: DNA AND CRIMINAL JUSTICE

The landmark immigration case-law in the United Kingdom marked the first instance where genetic substance has been put to use for resolution of a civil dispute. In the renowned *Colin Pitchfork* case, the evidence not only pinpointed true culprit but also exonerated an innocent individual, earning DNA evidence

the moniker "genetic eyewitness" for its pivotal role in legal proceedings.[8,9] In court of law, reports of DNA are generally deemed admissible due to their basis in experimental science, underscoring notion that it represents a unique genetic signature, with no two individuals sharing an identical genetic profile. The strides in genetic science have influenced criminal justice system[10], with DNA evidence hailed as an exceptionally reliable tool for accurate identity verification, often termed the "new gold standard" in criminal forensic science.[11] Furthermore, the credibility of DNA evidence has spurred a growing dependence on forensic science, propelled by technological developments.[12] Despite of various challenges and questions, integration of DNA technology has revolutionized domain of judicial proceedings.[13] Legal discussions, judicial proceedings have rigorously evaluated credibility of DNA evidence, utilizing global benchmarks such as the Frye standard[14], Daubert standard[15], prejudicial effect test, and the usefulness criterion. These stringent measures ensure that evidence is relevant and admissible, while also safeguarding against any potential for misleading interpretations.[16] The admissibility of evidence also depends upon the way collection, packaging, shipping processes are carried out, as well as proper laboratory procedures. The authenticity of a judgement made by an expert is determined by a variety of elements. With respect to this, a person's expertise, certification as an expert, laboratory accreditation, and robust quality control and meticulous management processes are indispensable to prevent allegations of evidence tampering. Such claims could result in the accused being granted the

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8 A. Srivastava, A. Harshey, T. Das, *Impact of DNA evidence in criminal justice system: Indian legislative perspectives*, *EGYPT J. FORENSIC SCI* 12, 51, (2022).

9 The role of DNA evidence in civil, criminal cases has established it as “Genetic eyewitness”. Robert Melia case, case of Ghanaian boy (immigration case in the UK), Andrew v. Florida, etc. are some flagship cases in the history of forensic genetics (Bureau of Justice Statistics 1991).

10 S.K. Verma, G.K. Goswami, *DNA evidence: current perspective and future challenges in India*, FORENSIC SCI. INT.,183–189, (2014).

11 M. Lynch, *Gods signature: DNA profiling, the new gold standard in forensic science*, 27(2) ENDEAVOR, 93 (2003).

12 A. Grubb, *Legal aspect of DNA profiling*, 33(4) JFSS, 228–233, (1993).

13 K. Virkler, I.K. Lednev, *Analysis of body fluids for forensic purposes: from laboratory testing to non-destructive rapid confirmatory identification at a crime scene*, 188 FORENSIC SCI INT,1–17, (2009).

14 Frye Standard is used to determine the admissibility of an expert's scientific testimony and other types of evidence, established in *Frye v. United States*, 293 F. 1013 (D.C. Cir. 1923).

15 The “Daubert Standard” provides a systematic framework for a trial court judge to assess the reliability and relevance of expert witness testimony before it is presented to a jury. Established in the 1993 U.S. Supreme Court case *Daubert v. Merrell Dow Pharmaceuticals Inc.,* 509 U.S. 579 (1993), this standard transformed the landscape of expert testimony by placing the responsibility on trial judges to act as "gatekeepers" of scientific evidence.

16 M. Lynch, R. Mc. Nally, *“Science,” “common sense,” and DNA evidence: a legal controversy about the public understanding of science*, 12 PUBLIC UNDERST. SCI., 83–103, (2003).

benefit of doubt due to flawed scientific or analytical procedures.[17] The Indian judiciary has placed significant trust in DNA evidence for criminal investigations and identifications, recognizing its reliability. This reliance has been evident in numerous cases where DNA testing has served as a pivotal ground for appeals in higher courts.[18,19]

3.1.1 DNA EVIDENCE: REVOLUTIONIZING INDIAN LEGAL PROCEEDINGS

Equitable inquiry stands as cornerstone of legal apparatus, where the synergy of scientific and technological advancements bolsters criminal, civil probes, thereby ensuring equitable and expeditious dispensation of justice. A watershed moment in annals of Indian jurisprudence was witnessed in case of *Kunhiraman v. Manoj*[20], where DNA technology was deployed for the first time to adjudicate a paternity dispute. Since that landmark event, DNA evidence has emerged as a linchpin in resolution of numerous high-profile cases. Concurrently, the Indian Evidence Act now known as the BSA has been promulgated to delineate the standards of evidence and its admissibility as factual testimony.

3.1.2 FORENSIC FRONTIER: BHARTIYA SAKSHYA ADHINIYAM AND DNA EVIDENCE

The notion of admissibility has undergone transformation following the inception of Indian law of evidence. Within purview of the Act of 1872 now known as the BSA, forensic gene-profiling assumes the mantle of recognised evidentiary value, deemed pertinent for both documentary, oral testimony. Expert testimony, documentary evidence related to DNA profiling are admissible in court proceedings. The BSA under section 7 specifies that evidence should elucidate facts pertinent to the issue at hand, support or counter suggested inferences, and contribute to the understanding of relevant facts. DNA profiling serves as

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17 N. Patel, V.K. Gautaman, S.S. Jangir, *The role of DNA in criminal investigation–admissibility in Indian legal system and future perspectives*, 2(7) INT. J. HUMANIT SOC. SCI. INVENT,15–21, (2013); R. Gupta, S. Gupta, M. Gupta, *Journey of DNA evidence in legal arena: An insight on its legal perspective worldwide and highlights on admissibility in India*, 2(2) J FORENSIC SCI MED, 102–106 (2016); E. Murphy, *Forensic DNA Typing*, 1(1), ANNU. REV. CRIMINOL, 497–515, (2018).

18 *Supra* note 7.

19 In India, the first forensic DNA test was conducted at centre for Cellular and Molecular Biology in 1989. Later, Centre for DNA Fingerprinting and Diagnostics was founded in 1998, for forensic DNA testing. Additionally, Central and State Forensic Science Laboratories are providing DNA expertise to the court of law (Central Forensic Science Laboratory, Kolkata, Directorate of Forensic Science Services, Ministry of Home Affairs Govt. of India 2007).

20 *II (1991) DMC 499.*

compelling evidence for establishing individual identity beyond doubt, making it a cornerstone in legal proceedings.

Section 3 stipulates that evidence may be presented concerning both principal fact in question and the pertinent associated facts. The expression fact in issue means matter over which dispute exists or which form subject of investigation.

Section 4 addresses relevance of facts that are integral components of same transaction. It deals with relevance of facts forming part of source transaction. Facts, though not part of question, if they are so closely linked to a fact in question which form part of the same transaction, are significant, whether those facts happened at same time, place or at a different time and location.

Section 7 outlines importance of facts necessary to explain, introduce, support, refute, establish identity, time, place, or show party relationships in case. It provides acceptable facts like place, name, date, party identification, circumstances, and relations. In matter of Fakhruddin vs State of M.P.[21], the Apex Court gave decision with respect to opinion of a witness, that if such evidence is brought before with specialised knowledge, then it is admissible where the subject matter is complex and unskilled individuals are unable to develop an accurate judgement.

Section 39 explains that when court needs to decide on matters related to foreign law, science, art, handwriting or finger impressions, it considers opinion of experts in such fields. Paternity test is significant use of DNA technology, helps to settle disputes about parentage and addresses issues like marriage, property, and surrogate motherhood. The significance of expert testimony was deliberated in case of *State of H.P. v. Jailal*[22], wherein the expert is regarded as a factual witness. The responsibility of an expert witness is to provide court with the required scientific standards for verifying accuracy of conclusion, allowing the judge to establish his independent judgement by applying such standards to the facts shown by evidence in case. In the matter of *Bhagwan Das and Another v. State of Rajasthan*[23] it has been decided that if a rule is established where an expert witness's report may be dismissed by referring to some literature on the issue without having such material shown to expert, then it shall prove to be dangerous idea. Modern scientific methodologies have caused fundamental shifts in domain of expert evidence. In the matter of *Mukesh and Another v. State (NCT of Delhi) and Others*[24], it was held that India has also started depending more and more on DNA evidence, just like a number of other nations. It is noteworthy that DNA profiling has now been integrated into statutory framework with the

21 AIR 1967 SC 1326.
22 2007 SC 2100.
23 AIR 1957 SC 589.
24 2017 (6) SCC 1.

incorporation of Sections 53A[25] and 164A[26] of CrPC, 1973. These sections specifically address the inspection of victims of sexual offences such as rape and accused, respectively. The Court decided, after citing a number of earlier rulings, that a DNA report should be accepted unless it is completely dented. Rejecting a DNA result requires proof of inadequate quality control or assurance. If there are no indications of sample manipulation or sampling problems, then the DNA result may be accepted.[27] In the matter of *Santosh Kumar Singh*[28], when discussing the validity of DNA evidence, it was ruled that a judge cannot replace an expert's view with their own, especially where the science involved is DNA profiling. Consequently, the Court acknowledged that DNA report was scientifically accurate and an exact science.

3.1.3 ADMISSIBILITY OF DNA PROFILE AND RELEVANT PROVISIONS OF THE BHARATIYA NAGARIK SURAKSHA SANHITA:

Section 51 grants police officer's authority to have certified medical practitioner conduct a medical inspection of an apprehended individual as part of an ongoing investigation. The explanation states that examination process must involve analysis of blood, blood-stains, semen, swabs (in cases of sexual offences), sputum, sweat, hair samples, finger nail clippings. This analysis should be conducted using scientific techniques, including DNA profiling and any other tests that registered medical practitioner deems necessary for a specific case.

Section 52 When an individual is taken into custody on accusations of committing rape or attempted rape, and there are valid grounds to believe that thorough assessment of health of person evidence related to the purported offense can be provided, then a licensed medical professional working in government hospital or one run by regional authority, or unavailability of someone within 16 km radius, licenced healthcare professional, can conduct examination. The examining medical practitioner must promptly conduct the examination and prepare a detailed report- accused's name, address, age, any visible injuries, materials collected for DNA profiling, and other relevant details. This report has to be submitted to concerned officer who is investigating, so that it shall subsequently be submitted to Magistrate as process of necessary documentation. The conviction of accused could be overturned in a case where prosecution neglected to carry out the required DNA test, as held by the Apex Court. In case of *State of Haryana v. Krishana Kumar Malik*[29] similar observation was made that with introduction of provisions of section 53 (A)[30] to CrPC, the side of

[25] Bhartiya Nagrarik Suraksha Adhiniyam, 2023, section 52.
[26] Bhartiya Nagrarik Suraksha Adhiniyam, 2023, section 184.
[27] *Anil v. State of Maharashtra*, 2014 (4) SCC 69.
[28] *Santosh Kumar Singh v. State through C.B.I*, (2010) 9 SCC 747.
[29] (2011) 7 SCC 130.
[30] Bhartiya Nagrarik Suraksha Adhiniyam, 2023, section 52.

prosecution is now mandated to submit to a DNA test in such types of situations for surety of supporting its case against the defendant. It's important to note that even after being granted bail, an accused individual can still undergo medical examination under Sections 53[31] and 53A[32]. This is because the individual was initially arrested under these provisions triggers their application. Therefore, even after being released on bail, the individual is required to cooperate for medical examination.

Section 184 It addresses the crucial aspect of medical examination and gathering genetic material from victims of rape. This legal provision recognizes delicate nature, gravity of sexual offenses, emphasizing the need for a meticulous examination. The examination conducted ensures comprehensive data about victim's physical and psychological state with consent under supervision of a licenced medical professional working in government hospital or maintained and administered with help of regional authority within 24 hrs beginning from time of receiving the information with respect to happening of offence. **Section 326** provides that the acceptance of DNA depositions depends on adherence to legal protocols and ensuring the dependability and authenticity of the DNA analysis procedure.

Section 329 allows courts to send items for scientific testing to government forensic science labs or other reputable institutions to ensure that DNA evidence undergoes thorough scientific examination by trusted labs, making it more reliable in court. Clause 4 allows experts to be questioned by both sides in a case, giving the defense a chance to challenge opinions on how DNA evidence was collected, analysed, and understood.

3.2 DNA PROFILING AND ITS CONSTITUTIONALITY

Forensic DNA profiling stands out as a highly reliable and scientifically sound investigative tool within the legal realm. Collecting DNA samples from individuals can be placed similar to an external bodily search, involving physical intervention, which poses threats to several basic rights. These include right to physical integrity, protection against degrading treatment, preservation of moral integrity, privacy rights, and right against self-incrimination. The Indian Constitution reflects a commitment to foster genetic science, evident in provisions Article 20(3) and Article 51A clause (h), which described development of scientific temper among citizens. This constitutional framework aims to balance individual rights with pursuit of public justice. Furthermore, legislative provisions, outlined in the Union List entries 64 and 65, empower the Parliament to prioritize scientific, technical education and research, including specialized training for law enforcement officers and assistance in crime

[31] Bhartiya Nagrarik Suraksha Adhiniyam, 2023, section 51.
[32] Bhartiya Nagrarik Suraksha Adhiniyam, 2023, section 52.

investigations.[33]Article 20(3) safeguards fundamental right of accused against self-incrimination, emphasizing prosecution's burden to establish guilt without coercing statements from the accused.[34] The issue of the right against self-incrimination in DNA analysis does not arise, as DNA analysis is akin to routine medical examinations such as blood alcohol measurement and blood tests. These types of tests are not deemed to violate the fundamental right against self-incrimination, both in national and international legal systems.

To redefine the concept of justice, it's imperative to engage in a thorough debate on the use of ostensibly neutral scientific technologies and their potential encroachment on civil liberties. Central to this debate is the principle that every individual is to be considered innocent until proven guilty beyond reasonable doubt. Establishing guilt necessitates fair trial, inclusive opportunities for defence and scrutiny of crime detection methods and techniques.[35] Issues arise when genetic material for DNA profiling is collected from suspects without their informed consent. This stems from notion that individuals have the right to determine how their bodily tissues are utilized, and it becomes the state's duty to safeguard their rights to life and personal liberty. From the perspective of individual autonomy, DNA profiling represents an unjustifiable intrusion into personal integrity. Where DNA profiling is conducted using genetic material obtained through legal processes requiring individual consent, ethical concerns are mitigated. Examining the Supreme Court's verdict on the Right to Privacy within this context is pertinent. In *Justice K.S. Puttaswamy v. Union of India*[36], the Supreme Court affirmed that the Right to Privacy is a fundamental right under Article 21 of Indian Constitution. It highlights significant advantages of DNA evidence and genetic fingerprinting over traditional methods of evidence and crime detection but also emphasizes that to harness benefits in criminal administration, the state must ensure constitutional compliance, particularly to safeguard individuals' privacy in India.

Given that human DNA contains highly personal information, the recognition of the Right to Privacy necessitates caution in employing DNA fingerprinting as a routine practice in criminal investigations. While DNA profiling enhance investigative capabilities, its routine application beyond criminal cases could

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33 The Constitution of India 1950, Seventh Schedule, Union List, Entry. 64, Entry 65.

34 The Bhartiya Sakshya Adhiniyam, 2023. s. 2(e). Evidence" means and includes (1) all statements that the Court permits or requires to be made before it by witnesses, in relation to matters of fact under inquiry; such statements are called oral evidence. (2) all documents including electronic records produced for the inspection of the Court; such documents are called documentary evidence.

35 Sufiya Ahmed, Dinesh Kumar Singh, *DNA Profiling and Human Right: Issue and Challenges for Application in Administration of Criminal Justice*, ILI LAW REVIEW, Summer Issue, (2022).

36 AIR 2017 SC 4161.

infringe Right to Privacy of innocent individuals and empower the state to retain genetic data of both citizens and non-citizens. Considering that court rulings on DNA profiling preceded the recognition of privacy as a fundamental right, the constitution inherently imposes constraints on the state's use of DNA technology. Therefore, storing DNA data or utilizing it as a routine practice in solving criminal, civil, or matrimonial cases not only violates individuals' Right to Privacy but also contravenes fundamental principles of Indian law. Consequently, the limited and controlled application of DNA profiling technology remains a recognized aspect of the Indian legal system.

4. DNA TECHNOLOGY (USE AND APPLICATION) REGULATION BILL, 2019 AND THE CRIMINAL PROCEDURE (IDENTIFICATION) ACT OF 2022

In Indian criminal justice system, DNA evidence holds considerable importance, yet specific legislation governing the use and regulation of DNA profiling in criminal investigations is lacking. A DNA Profiling Bill 2006 is drafted by the DNA Profiling Advisory Committee in collaboration with Centre for DNA Fingerprinting and Diagnostics[37]. Unfortunately, this bill never made it to parliament. Subsequently, in 2019, Dr. Harsh Vardhan, the Minister for Science and Technology, introduced the DNA Technology (Use and Application) Regulation Bill, 2019 in Lower House[38], to provide specific laws governing use of DNA technology for identifying individuals, authorizing DNA examination only for specified purposes outlined within the legislation. The bill also establishes National and Regional DNA Data Banks responsible for maintaining various indices related to crime scenes, suspects, offenders, missing persons, and unidentified deceased persons[39].

In addition to these, board's responsibilities also include: advising government on the creation of DNA data banks, laboratories; advising government to accredit DNA laboratories; and establishing guidelines for such banks, laboratories, and experts to ensure the appropriate confidentiality of DNA profiles. The Bill stipulates that violating any of the prescribed offenses such as utilizing DNA samples without authorization or violating the confidentiality of DNA profiling will result in imprisonment for a maximum of three years and a fine of up to one lakh rupees. Furthermore, the Bill makes provisions for removing DNA data from the Bank, but it says nothing about removing DNA data from labs. This might present a significant risk of DNA theft that violates the person's privacy.

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37 Elonnai Hickok, *Rethinking DNA Profiling in India,* 4 ECO'S. & POL. WKLY., (2012).

38 DNA Technology (Use and Application) Regulation Bill, 2019, (Feb. 2, 2024, 9:35 pm), https://pib.gov.in/PressRelese Detail.aspx?PRID=1559099#.

39 Law Commission of India Report, *185th Report on Reform of Criminal Justice System*, GOVERNMENT OF INDIA, Ministry of Home Affairs, (2003).

It has been claimed that the Bill violates people's privacy since it gives the government access to a person's DNA profile and there are no procedural safeguards[40]. In *Lata v. Nandlal Wasudev Badwaik*[41], the Evidence Act's section 112[42] requires the court to follow a conclusive legal assumption, but the DNA profile test will take precedence. While rendering a verdict the scientific method of DNA profiling did not exist, and the legislators were not even considering the accuracy of results, according to Chandramauli Kr. Prasad, J. The conventional approach to evidence has to give way immediately to one that is both acceptable and accurate from a scientific standpoint. The major reasons for withdrawal were potential threats to individuals' privacy and potential abuse. Some of its provisions introduced in the Criminal Procedure (Identification) Act 2022 has come into force after being passed by Parliament in April 2022. It replaced Identification of Prisoners Act, 1920, a colonial-era law, grants authorization to police officers to collect data from individuals convicted, arrested, or facing trial in criminal cases. The Bill, 2022, outlines permissible types of data for collection, specifies the individuals from whom such data be collected, and designates the authority responsible for authorizing such collection. It mandates the storage of collected data in a centralized database, overseen by the National Crime Records Bureau, that will share this data with law enforcement agencies, while States/UTs may designate agencies within their jurisdictions to collect, preserve, and share data. The collected data will be retained digitally or electronically for 75 years, with provisions for destruction in cases of acquittal or release without trial. However, a Court or Magistrate may order retention of details in exceptional circumstances, duly recording reasons in writing. The expansive approach raises issues about indiscriminate gathering of personal information, which may not always be relevant to the case at hand. Concerns are heightened by diluted safeguards, as the bill lowers level of officials authorized to collect data, potentially increasing the risk of abuse. Additionally, ambiguity surrounds the definition of biological samples, potentially allowing for invasive collection methods of DNA without safeguards. These provisions raise concerns about compliance with constitutional rights, particularly Article 20(3), which safeguards against self-incrimination. In essence, while aiming to bolster criminal investigation procedures, the bill must address these concerns to uphold constitutional principles of privacy, equality, and protection against self-incrimination.

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40 DNA Profiling Bill Introduced in Lok Sabha, THE DECCAN HERALD, Jul. 8, 2019, https://www.deccanherald.com/national/national-politics/dna-technology-bill-introduced-in-ls-745765.html (Nov. 2, 2021).

41 AIR 2014 SC 932.

42 Bhartiya Sakshya Adhiniyam, 2023, section 116.

5. CONCLUSION

In conclusion, the evolution of forensic justice represents a significant stride towards a more accurate and efficient criminal justice system. Despite persistent challenges such as resource constraints and regulatory ambiguities, recent advancements, particularly in DNA profiling, voice spectroscopy, and deception detection techniques, have propelled forensic science into the forefront of modern investigations. India's legislative initiatives, exemplified by the Criminal Procedure (Identification) Act, 2022, underscore the nation's commitment to embracing forensic justice. However, the absence of specific legislation governing DNA technology in criminal administration necessitates urgent attention to safeguard individual rights and ensure ethical practices. Moving forward, it is imperative to enact comprehensive legislation regulating DNA technology, recognize DNA evidence as expert opinion under the Bharatiya Sakshya Adhiniyam, and uphold the fundamental right to privacy enshrined in the Constitution. Additionally, the establishment of trained investigative authorities, transparent monitoring agencies, and well-equipped laboratories will be essential for the effective utilization of forensic techniques. By incorporating these recommendations, we can foster a criminal justice system that not only relies on empirical evidence but also upholds ethical standards, protects individual rights, and ensures the swift and fair administration of justice. Forensic justice is not merely a concept; it is a dynamic force reshaping the landscape of justice, with India leading the way through its progressive measures and global collaboration efforts.

6. THE WAY FORWARD: RECOMMENDATIONS

6.1 Data Management and Sharing: The Criminal Procedure (Identification) Act, 2022 has expanded scope of permissible measurements for identification and investigatory purposes, necessitating a methodical approach to data governance and sharing. To address the challenges, policymakers must establish centralized data repositories[43] that can house and manage forensic data from various sources i.e., Central and State Forensic Science Laboratories, law enforcement agencies etc. It can offer advantages- enhanced accessibility, data integration, efficiency, data security, interoperability, and long-term storage. Authorized law enforcement agencies should have streamlined access to these repositories, enabling more comprehensive understanding of cases. Centralized repositories should also be designed with robust security measures, encryption, access controls, and data protection mechanisms. Data protection legislation should be complemented by the 2022 Act to safeguard individuals' privacy rights.

[43] J.R. Klaasse, L. Alewijnse, J. Van Der Weerd, *TraceBase; A database structure for forensic trace analysis,* 61 (4) SCIENCE & JUSTICE, 410–418, (2021), https://doi.org/10.1016 /j.scijus.2021.03.001.

However, centralization raises challenges related to scalability, resource allocation, and data protection. Additionally, India lacks a comprehensive legal framework for data protection, that policymakers must address concurrently.[44]

6.2 Quality Control and Standardization: The forensic justice system in India is aimed at ensuring the highest quality and standardization of forensic procedures. This requires stringent quality control measures and standardized protocols, which are crucial for credibility and reliability of forensic evidence. Quality control in forensic science involves various aspects such as laboratory certification, workload management, certified forensic experts, and uniform reporting patterns. Laboratory certification signifies a commitment to global best practices in forensic analysis along with technological advancements to equip laboratories with modern instrumentation, enhancing the precision and accuracy of forensic analyses. Workload management is essential to handle incoming exhibits promptly, reducing delays in forensic analysis and case resolution. Certified forensic experts, whether government or private, meet predefined standards of competence and ethical conduct. Uniform reporting patterns ensure that forensic reports are easily understandable by legal professionals, judges, and jurors, even without specialized scientific knowledge. These efforts aim to instill confidence in forensic evidence within the criminal justice system, benefiting all stakeholders, including law enforcement agencies, legal practitioners, judges, and the general public.[45]

6.3 Research and Development in pursuit of forensic justice: The National Forensic Science University Act 2020, enacted by the Ministry of Home Affairs in India, aims to promote and provide global standards of learning and research in forensic science. The university is empowered to establish educational centres in States, UTs across India, enhancing crime investigation, detection, and prevention processes. It shall also contribute to the formulation of policies related to forensic science at the central government level. Key aims and objectives include scientific aid in crime investigation, evidence handling, photographic, video documentation, timely examination of reports, assistance to courts, database generation, crime scene reconstruction, forensic education, preventive forensics, and disaster victim identification. By committing to these principles, India can bolster its forensic capabilities, contribute to effective law enforcement, and ensure a more equitable, efficient criminal justice system.[46]

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44 P. Johnson, *Genetics and Forensics: Making the National DNA Database*, PUBMED CENTRAL (PMC), (2003), https://www.ncbi.nlm.nih.gov/pmc/articles/ PMC1351151/.

45 Purvi Pokhariyal, Deepa Dubey, *The Imperative of Forensic Justice in Modern Legal Systems: A Comprehensive Analysis,* FORENSIC SCIENCE AND HUMAN RIGHTS, 3-22, (2023), https://nhrc.nic.in/sites/ default/files/ Fotrensic_Sc_HR_Book_2024_0.pdf.

46 *Id.*

6.4 Privacy Concerns: Advancements in forensic technologies, such as biometric data acquisition, raise privacy concerns.[47]The Criminal Procedure (Identification) Act of 2022 allows for the collection of various measurements and biological specimens for identification and investigation, but it lacks a clear framework for data utilization, analysis, and safeguarding. The potential for misappropriation or exploitation raises concerns about the privacy and potential victimization. To address concerns, India should establish a comprehensive data protection framework that regulates entire process of forensic data acquisition, preservation, and utilization. This framework should include safeguards to protect individuals' privacy and define the permissible scope of data analysis. Additionally, it should require informed consent from the individuals before collecting sensitive data for forensic purposes. Legislative provisions should specify the temporal parameters for data retention and deletion, reducing the risk of misuse and potential misuse.

6.5 Regulation of Emerging Technologies: The rise of Deception Detection Techniques has highlighted need for strict regulation and oversight to prevent potential misuse and infringements of rights. DDTs, like narco-analysis and polygraph examinations, have inherent limitations and are susceptible to error. To address these concerns, regulatory frameworks should be structured to include stringent accuracy standards, admissibility criteria, ethical guidelines, error rate thresholds, unambiguous criteria governing evidence admissibility, ethical guidelines ensuring informed consent, and accountability measures to address misuse or infringements. As forensic technologies continue to advance, the balance between veracity in criminal investigations and individual rights and privacy remains crucial. Legislative and regulatory paradigms must provide directives on data protection, informed consent, precision benchmarks, and ethical utilization of DDTs to create a criminal justice system characterized by equity and rectitude.

6.6 Capacity Building & Training: Governments play a crucial role in establishing conducive infrastructure for forensic justice, including allocation of resources for state-of-the-art forensic laboratories with advanced diagnostic capabilities. In India, there is a significant gap between available resources and the burgeoning populace, with shortage of experts in critical forensic disciplines such as DNA analysis, toxicology, biology, document examination, and cyber forensics. Urgent governmental intervention is must to fill vacancies, augment the number of laboratories, and modernize existing facilities. A well-educated and adept forensic workforce is essential for efficient operation of forensic justice. Prioritizing training programs, capacity-building initiatives is essential, as well as reforms in forensic science education at university level. Universities must commit to providing quality

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47 H. M. Wallace, A. Jackson, J. Gruber, A. Thibedeau*, Forensic DNA databases–Ethical and legal standards: A global review*, 4(3) EGYPTIAN J'NAL OF FSC SCI, 57–63, (2014), https://doi.org/10.1016/j.ejfs.2014.04.002.

education in forensic science to bridge this chasm and engender employment prospects. The programs should educate the public about the capabilities of forensic science and emphasize ethical and legal considerations, including privacy protection. The National Forensic Science University has emerged as a linchpin in capacity-building and modernization efforts, with the establishment of Centers of Excellence across various forensic disciplines and the conception of a model Mobile Forensic Van. These initiatives contribute to global progression of forensic sciences, development of a robust forensic justice system.[48]

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