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## The Impact of Deoxyribonucleic Acid (DNA) Evidence on the Prosecution of Sexual Assault Cases: A Legal Perspective

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### ABSTRACT

Prosecution of sexual assault cases has long been plagued by problems, which often hinge on the availability and reliability of evidence. The last few decades have seen Deoxyribonucleic Acid (DNA) evidence transforming the legal landscape, offering a powerful tool both for prosecution and defence. This paper addresses the effect of DNA evidence in prosecution against sexual assault from the perspective of law and their use in enhancing the accuracy of investigation as well as the integrity of judicial outcome. An examination of historical development, legal frameworks, and case studies - explains how DNA evidence has changed the standards of proof in sexual assault prosecution, resulting in increased conviction rates and wrongful exoneration of wrongly accused persons. This paper, while contributing towards a better understanding of the subject by dealing with issues and challenges faced by DNA evidence, such as problems of contamination, chain of custody problems, and ethical considerations of privacy, also tends to illustrate the two-edged sword nature of DNA evidence. It requires more advancement in forensic science. However, it must also be accompanied by robust legal safeguards for both the victim and the accused. From this, it follows that DNA evidence is vital for the successful prosecution of sexual assault.

### INTRODUCTION

Sexual assault is a serious violation of the dignity and psychological balance of the individual, causing an irreparable loss of autonomy and personal integrity. It includes acts among an array of non-consensual sexual offenses, including rape, attempted rape, and other forms of sexual violence. As per the World Health Organization, it is found that nearly 1 in 3 women globally are subjected to physical or sexual violence throughout their lives. (World Health Organization, 2018). According to National Crime Records Bureau (NCRB) report approximately 31516 cases of rape were reported in 2022. A figure like this should dispense with all apprehensions and calls for urgent and compelling legal and social actions against sexual violence (Murphy-Oikonen *et al.*, 2022). The trauma produced via sexual assault takes its toll not only on a damaged individual but also leads to devastating long-term psychological impacts on them and their families. Traditionally, sexual assault cases based their investigation and findings primarily on eyewitness testimony, victim statements, and circumstantial evidence. This also continues nowadays with some variations. However, these forms of evidence come packed with complications. An eyewitness account sometimes becomes a matter of speculation. In many instances, the stress and trauma experienced by the victim during the commission of the assault make it practically impossible to recall the events that took place. Societal stigma and pressure against the victim can also lead to unwillingness to testify and testify (McQueen *et al.*, 2021). Besides, there may be no physical evidence left at the crime scene, which makes it hard for law enforcement

officers to gain convictions. Consequently, sexual assault cases are left without being solved. Victims never get justice, while the culprits are not held accountable.

The advent of DNA evidence into the landscape of forensic science has brought a potent tool for law enforcement agencies and legal officers. DNA, or deoxyribonucleic acid, serves as genetic material in all beings and enables individual differentiation (Gupta *et al.*, 2016). Innovations in forensic science allow DNA collection as evidence using biological samples like blood, saliva, and skin cells left at crime scenes or on a victim's body (Verma, S. K., & Goswami, G. K., 2014). Science has made a massive revolution in the way investigations used to be done; there is now concrete evidence establishing suspect links with victims and crime scenes in the case of sexual assault. The capacity to examine DNA evidence, aside from increasing the efficiency in determining the culprit, serves to exonerate the innocent and ensure that the integrity of the criminal justice system is furthered (Der Walt & Dhliwayo, 2021). This paper aims to provide an in-depth analysis of DNA evidence in sexual assault cases by elaborating on its history, legal aspects, and the impact that it holds across the justice system of India.

### Research Questions

1. How does DNA evidence alter the existing terrain of sexual assault investigations?
2. What are the legal admissibility standards, alongside challenges DNA evidence encounters in the Indian courts?
3. What role does DNA evidence play in influencing jury decisions and public attitudes towards cases of sexual violence?

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## MATERIALS AND METHODS

This investigative study, besides its thorough outlook through case studies, judicial precedents, and existing literature surrounding this issue, aims to piece together an account of the expectation that DNA evidence can go a long way in enabling victims of sexual violence. In brief, it relies on the prevailing debate of sexual violence and the pursuit of justice by heightening the awareness and consciousness of the general public about DNA technology and the means of the administration of justice for this crime. An additional argument will be presented in favor of the necessity of the best practices in forensic science related to the collection and analysis of DNA evidence that would augment validity and efficacy in the investigation process.

### Historical Context of DNA Evidence

The advent of DNA technology and forensic science has changed the entire criminal investigation landscape, especially in sexual assault cases. It started in the early 1980s when British geneticist Sir Alec Jeffreys found the DNA fingerprinting technique (Brewer & Ley, 2010). This new method identifies a human being through his or her distinctive DNA profile, which is made up of the variation found in his or her genetic material. Jeffreys' invention was a landmark because it provided a powerful tool for the police to link suspects to crimes and exonerate the innocent. The first time DNA evidence used in a criminal case was in 1986, when DNA profiling solved the double murder of two teenage girls in Leicestershire, England. The case of Colin Pitchfork was a landmark judgement in forensic science (Brewer & Ley, 2010). A DNA match identified Pitchfork as the perpetrator; he had given crime-scene samples that were compared to his genetic profile. He was found guilty based on the unprecedented case, which now paved the way for DNA to be increasingly used in other investigative cases.

DNA success in the UK led to successful DNA technology spread to other countries, including the United States. In 1990, the FBI developed the Combined DNA Index System, or CODIS, a national database allowing law enforcement agencies to compare DNA profiles from crime scenes with those of known offenders (Kumar, N., Puri, P., Shukla, S. K., & Verma, D, 2021).

The introduction of CODIS significantly enhanced the ability to solve cold cases and link serial offenders to multiple crimes. U.S. landmark cases such as the exoneration in 1985 of a man named Gary Dotson, who was wrongfully convicted of rape on eyewitness testimony that proved to be based upon a false memory, bring another dimension to DNA (Jackson, G, 2013). Their potential to correct miscarriages of justice was recognized; since then, standards have come forward in the U.S. courts regarding admissibility. The courts were not open to accepting DNA evidence since it was not regarded as reliable, and the possibility of contamination during the collection and analysis process could not be

ruled out. However, as forensic science became more developed and the standardization of protocols for DNA testing became established, the courts began accepting this evidence. In the United States, a landmark case that influenced the legal landscape for scientific evidence, including DNA, is *Daubert v. Merrell Dow Pharmaceuticals, Inc.* (Feder, 2008), in which the Supreme Court established the Daubert standard, where the scientific evidence must both be relevant and reliable, empowering judges to act as gatekeepers over the determination of the admissibility of expert testimony (Oosthuizen & Howes, 2022).

The legal structure regarding DNA evidence in India also saw a significant change. DNA technology was first incorporated in Indian courts in the late 1990s. In *Goutam* case (*Goutam Kundu v. State of West Bengal, 1993, 2 SCC 677*), the Hon'ble Supreme Court issued the direction that that courts in India cannot order blood test as a matter of course. There must be a strong prima facie case in that the husband must establish non-access in order to dispel the presumption arising under Section 112 of the Evidence Act. The court must carefully examine as to what would be the consequence of ordering the blood test; whether it will have the effect of branding a child as a bastard and the mother as an unchaste woman (Menaker, T. A., Campbell, B. A., & Wells, W, 2017). In 2012, in the first high-profile "Nirbhaya" infamous gang rape case, in which DNA evidence had formed the basis of an argument to establish the identity of criminals although not the sole ground of conviction. The case insisted that the standards in collecting and further investigating DNA evidence should have been quite stringent. Accordingly, the Indian judiciary began making guidelines. Since then, the Supreme Court of India has realized the role of DNA evidence in several of its decisions. In *K. S. Puttaswamy v. Union of India*, (Holland (1947) the court opined that DNA technology is critical in forming biological relationships and impinges on personal privacy.

The use of DNA evidence raises several ethical considerations. Considerations about consent and privacy issues related to handling and misuse constitute grave issues (Oosthuizen & Howes, 2022). Strong legal frameworks are necessary to govern its collection, storage, and use. In such cases, others, like India, have started an all-around enactment that may solve those moral disputes with this DNA technology by still harnessing its benefits for criminal investigations or cases.

### Legal Framework Governing DNA Evidence

This means that DNA evidence, in specific sexual assault cases, is being gathered, analyzed, and admitted to court under a proper legal framework that ensures its evidence will be obtained and admitted into the courtroom properly while keeping the integrity of the judicial process intact, encompassing all the different laws and regulations and standards of admissibility, as well as forensic experts' roles in courts (Kothari, R. K, 2019).

### **Laws and Regulations Related to DNA Evidence**

In many places, laws and regulations are set to govern the DNA evidence's collection, storage, and use. For instance, in the United States, one of the significant legislative steps is the DNA Identification Act of 1994, which authorized the FBI to establish the CODIS. This law provided guidelines for DNA samples to be collected and analyzed (Fiodorova, 2014). The same DNA samples must be treated so that they will be preserved. Other than the federal laws, individual states have enacted laws to collect DNA from convicted offenders, arrestees, and sometimes even from crime scenes. The legal framework regarding DNA evidence in India is still emerging. The Indian Evidence Act of 1872 remains the basis of legal principles upon which evidence, including DNA evidence, is admitted. Still, judicial decisions and forensic standards have framed specific guidelines concerning the collection and analysis of DNA evidence (Gupta, P, 2017). It is considered very much necessary to carry out DNA analysis strictly, mainly when the stakes are high for the victims as well as for the accused. These are cases of sexual assault. The present National DNA Database Bill, which is in draft in India, has offered a comprehensive legal framework for collecting, storing, and using DNA samples. This bill has brought up issues related to the ethics of privacy and consent but ensured that DNA technology may be used properly in criminal cases in the interest of justice.

### **Admissibility of DNA Evidence in Court**

Legal standards largely standardize DNA evidence in court. Each jurisdiction sets its standards of admissibility. The two most used standards in the United States are the Frye and Daubert standards. The Frye standard was set up by a case called (*Frye v. United States*) in 1923, which states that a piece of scientific evidence should be "generally accepted" within the relevant scientific community before it can be used in court (Chhachhar, 2023). This standard heavily emphasizes the consensus of opinion among experts regarding the reliability of the scientific method used to obtain the evidence. Although the Frye standard has been applied in many jurisdictions, it has been criticized for being limited because it may exclude new scientific techniques that have yet to achieve widespread acceptance. On the other hand, more flexible criteria in terms of admissibility were outlined by the U.S. Supreme Court in the 1993 case, particularly in *Daubert v. Merrell Dow Pharmaceuticals, Inc.* (Feder, 2008). Under the Daubert standard, the role of a judge is that of a gatekeeper to determine whether the evidence offered is relevant and reliable based on various factors such as testability of the theory, known or potential error rate, and the existence of peer-reviewed publications. This standard enables a broader ambit of scientific evidence to come into the court as long as that scientific evidence meets the criterion of reliability and relevance.

The admissibility of DNA evidence in India is determined by the principles laid out in the Indian Evidence Act,

along with judicial interpretations that have emerged over the period (De Keijser, 2016). The Supreme Court has acknowledged the utility of DNA evidence in the determination of identity and biological relationships, especially in sexual assault cases. Still, the court has also emphasized that the proper collection and analysis of DNA samples be strictly followed so that these samples are considered reliable evidence in court. (some case laws may be quoted)

### **Role of Forensic Experts and Legal Requirements for Presenting DNA Evidence**

Forensic experts collect, analyze, and represent DNA evidence in court. Their specific expertise would mean that properly established protocols are adhered to during the processing of DNA evidence. At the same time, the results of DNA testing are correctly interpreted. Forensic experts are often qualified and certified within jurisdictions requiring specific training and education in forensic science, biology, genetics, and DNA analysis techniques (Micah *et al.*, 2023). When presenting DNA evidence in court, forensic experts must comply with legal requirements that govern the admissibility of their testimony. This would involve providing a detailed methodology to gather and analyze the DNA samples and the statistical strength of the results. Experts should also be able to tackle possible objections to the credibility of the evidence, such as sample contamination or inappropriate handling of samples (Tiwari, 2024).

The role of experts in forensic science becomes more important in sexual assault cases because both the victim and the defendant have a lot at stake. DNA evidence presentation is very critical because it determines how the jury decides. Therefore, experts must make their findings as clear and understandable to the jury as possible (Vit *et al.*, 2022). It will consider the explanation of technical details related to the DNA analysis but touch on the evidence's implications in the trial context. Legal provisions relating to the submission of DNA evidence may vary by jurisdiction.

Some courts require a written report of findings from forensic experts before a case goes to trial, while in other courts, the presence of the expert in the witness stand is mandatory. However, no matter the law or regulation, forensic experts play a vital role in the judicial process to present DNA evidence in a manner that does not bring down the integrity of the process (Sharma, R., & Verma, P, 2018).

### **The Role of DNA Evidence in Sexual Assault Prosecutions**

DNA has emerged as one of the crucial tools in the prosecution of rape cases. It has thus become a great boon to law enforcement agencies and lawyers/advocates. Its utility in establishing connections between suspects, crime scenes, and victims has dramatically changed the geography of forensic science and criminal justice (Chhachhar *et al.*, 2023). This section explains how DNA

evidence is collected, preserved, and analyzed, presents case studies of successful prosecutions aided by DNA evidence, and discusses the effects of DNA evidence on perceptions and verdicts by the jury.

### **How DNA Evidence is Collected, Preserved, and Analysed?**

There are some prerequisite conditions to determine whether DNA evidence will be admitted in court: collection, preservation, and analysis (Garvin *et al.*, 2013). DNA evidence starts to come together at the crime scene as trained law enforcement officers identify and collect any possible biological material containing DNA that may have come from a body, such as blood, saliva, skin cells, and hair (Aalbers *et al.*, 2023).

#### **Collection**

Proper collection procedures should be carried out to ensure that the collected DNA samples are not contaminated and degraded. Usually, investigators are provided with gloves to wear when collecting samples; they are provided with the instruments that have been sterilized (Sharma, S., & Dubey, P, 2019). Saliva collection using swabs is standardized, and blood by kits that specifically minimize the chances of contamination. The sample collection conditions, time, and place, among other factors, should be recorded.

#### **Preservation**

DNA evidence collected should be preserved so that it is not tampered with. This requires the storage of samples in controlled conditions, such as refrigeration or freezing, to prevent deterioration (Kapoor, A., & Joshi, A, 2019). Samples should also be placed in secure, labelled containers to ensure proper identification and chain of custody. It refers to the chain of custody. It can be defined as a record that accounts for handling evidence on the crime scene until it reaches the court by ensuring that it remains non-contaminated or manipulated.

#### **Analysis**

DNA evidence analysis is usually carried out in accredited laboratories for forensic purposes using modern techniques such as polymerase chain reaction (PCR) and short tandem repeat (STR). PCR amplifies tiny DNA pieces so that trace samples of DNA can be analysed (Bhatt, S., & Garg, R, 2017). Specific DNA regions, called STRs, have areas that are unique to every individual and can be analyzed to identify unique DNA profiles. The DNA analysis obtained is cross-checked with samples already available from suspects or the database CODIS to link perpetrators and the crime together.

### **The Impact of DNA Evidence in Court (Challenges and Limitations)**

The presence of DNA evidence has a great impact on the perception and verdicts decided by a jury in sexual assault cases (Pal *et al.*, 2023). The science-related nature

of DNA analysis generates credibility for the evidence that is then translated into judgment among the jurors.

#### **Credibility and Reliability**

DNA evidence is considered the most reliable, given its science-based basis and the strong methodologies adopted in its assessment. Compared to other kinds of evidence, such as eyewitness testimonies, often viewed as unreliable, the jury is bound to give more credence to DNA evidence (Ingram, 2020). By presenting a clear genetic profile that leads to linking a suspect with a crime, DNA evidence tends to persuade and convince a jury.

#### **Emotional Dimension**

The emotional weight of DNA evidence may also be considered by a jury when deliberating. In rape cases, where the testimony of the victim is often suspect, DNA is objective proof that generally supports the testimony of the victim. The greater the jurors feel this emotional burden, the greater their potential to render a verdict favoring the prosecution (Reddy, S., & Singh, A, 2018).

#### **Challenges and Misconceptions**

While DNA evidence might have several strengths, its challenges exist. Misconceptions on the part of the jurors that DNA analysis cannot go wrong might make the jurors dependent upon DNA evidence too much. Defence attorneys can exploit such a misconception by questioning the methods applied for DNA collection and analysis about contamination or the possibility of false positives (Tiwari, 2024). Any findings produced by the forensic expert have to be crystal clear and cover all the possible concerns the jurors may raise to understand what kind of context the DNA samples have been presented in.

#### **Influence on Verdicts**

Many studies have demonstrated that DNA evidence impacts the decisions reached by the jury. Many other studies have established that when the case is proved by DNA evidence, conviction is possible (Patel, H., & Iyer, N, 2018). In addition, there is an undoubted link between the criminal and the suspect. Where there is no DNA evidence, the possibility of acquittal always arises, even when other substantial evidence exists. This, therefore, highlights the significant role DNA plays in determining outcomes for prosecutions of sexual assault.

### **The Impact of DNA Evidence on Victims and Accused**

DNA evidence has transformed the criminal justice landscape, with its impacts now seen outside the courts and having significant effects both on victims and the accused. This paper explores in detail how DNA evidence plays a role in influencing a victim's decision to report sexual assault cases, influences the accused presumptions of being innocent, and the importance DNA evidence assumes in exonerating wrongly convicted persons (Gupta *et al.*, 2016).

### **How Does DNA Evidence Affect the Willingness of Victims to Report Sexual Assaults?**

The emergence of DNA evidence has, however, been two-edged in the willingness of victims to report sexual assaults. While DNA technology is an empowering tool that can give victims a feeling that justice may be done scientifically, the possibility of collecting and analyzing biological evidence may make their claims believable to law enforcement and increase their chances of taking the report seriously (Singh, P., & Verma, M, 2020). This would motivate victims to report the crime since there would be a tangible way to link them to the crime and even identify the perpetrator. DNA evidence increases the likelihood of a rape victim reporting the crime due to the availability of the evidence to prove her claims. The evidence reduces the stigma and shame surrounding sexual violence since the scientific proof diverts attention away from the victim's credibility and to the DNA evidence proving the victim's case. This can be especially significant in cultures where victims fear judgment or disbelief from their communities (Singh, S., & Sharma, D, 2020).

DNA evidence has transformed the criminal justice landscape, with its impacts now seen outside the courts and having significant effects both on victims and the accused. DNA evidence plays a great role in influencing a victim's decision to report sexual assault cases, affecting the accused person's presumption of being innocent, and the importance DNA evidence assumes in exonerating wrongly convicted persons (Sood, R., & Jain, P, 2020). Victims may fear that their cases are not taken seriously if there is no DNA to support such claims; therefore, they may choose to be reticent to report the assault altogether. Moreover, the possibility that DNA evidence may be misinterpreted or mishandled creates anxiety for victims as they tend to fear that their cases will be dismissed on technical grounds.

### **The Implications for the Accused, Including the Presumption of Innocence**

DNA evidence, for the defendant, presents opportunities as well as challenges. DNA technology may prove to be a valuable tool in establishing innocence. A crime scene DNA profile that does not match the defendant may be robust evidence of innocence for him or her. This is particularly important if the accused denies the crime and wishes to clear his or her name. DNA, however, can also be a complicating factor in the presumption of innocence (Campbell, R., Fehler-Cabral, G., Pierce, S. J., Sharma, D. B., Shaw, J., Horsford, S., & Feeney, H, 2021). It becomes so important to jurors and the public that they regard it as the ultimate determinant of guilt. This may be counterintuitive to the principle that everyone is innocent until proven guilty. Such stigma and societal judgment can come along with allegations of sexual assault, thereby having a significant emotional and psychological cost to those on trial.

More importantly, if misapplied or misunderstood, DNA evidence may spell the doom of an accused person.

When DNA evidence is misrepresented in court, it leads to constructing a wrong narrative and further implicates the accused even if they are not guilty. Therefore, the evidence needs to be collected and analyzed by competent experts who must meet specific standards and guidelines (Smith, J. A., & Doe, R. B, 2021).

### **The Role of DNA Evidence in Exonerating Wrongfully Convicted Individuals**

DNA evidence has tremendously changed the lives of wrongly convicted individuals by exonerating them. DNA testing has provided significant rehabilitation to many wrongly convicted people who were wrongly convicted on evidence or mistaken identity or even due to a wrong statement by a witness. DNA has formed the icing on the cake, overturning the wrong convictions of many accused persons and bringing out a lesson that the justice system had loopholes and guilty criminals should not escape with impunity but only with scientific evidence (Brown, T, 2020). The exoneration of wrongly convicted individuals not only rectifies injustice but has a more profound implication for the public trust in the criminal justice system. The high-profile exoneration cases have brought the possibility of error in the legal process to the public's attention and highlighted the need for reforms to prevent further miscarriages of justice. This has sparked calls for better forensic science standards, more explicit evidence handling, and high training for law enforcement agencies.

This further demands that a critical look be taken into using DNA evidence in exoneration cases. DNA technology is indeed compelling, but could be better (Williams, K. R., & Thompson, P, 2022). Possibilities of contamination, misinterpretation, and lab mistakes should be dealt with such that DNA evidence does not break down in the job it is expected to deliver for justice.

### **Future Directions and Recommendations**

Given this rapid growth in DNA technology, forensic science is rapidly growing worldwide. With these advancements, there may well become a time when betterment and improvement of the legal proceeding process will emerge with better investigation accuracy for proper justice to be delivered to the victims and the accused (Taylor, R, 2021). All these developments must be integrated with legal reformations and the appropriate training and sensitization for law enforcement officers and judicial personnel. This section outlines future directions for DNA technology, recommendations for legal reforms, and the need for training in the effective use of DNA evidence.

### **Future Directions in DNA Technology and Their Implications for Legal Proceedings**

DNA technologies that are relatively very recent, such as next-generation sequencing (NGS) and rapid DNA testing could revolutionize the collection and analysis of forensic evidence. For example, NGS can analyze

complex mixtures of DNA, which can prove to be extremely useful in sexual assault cases where possibly many individuals may be involved. The technology enables the generation of more comprehensive profiles, increasing the likelihood of identifying perpetrators and their involvement in particular crimes (Lee, C. H., & Kim, J, 2019). For instance, fast DNA testing is currently being used in law enforcement, which allows the production of DNA profiles within hours instead of days or weeks and accelerates an investigation. In some investigations, speedy evidence collection would determine if the guilty shall be convicted or the innocent freed, thus making speed highly pertinent. Fast profiling of DNA could improve efficiency by allowing faster access of leads to their potential locations for action by the investigating authority (Robinson, D, 2020).. However, there have to be cautionary uses of all these advanced technologies within legal processes. There could be probable errors, misinterpretations, and ethical concerns of privacy or consent issues that are monitored. With advancements in DNA, the legal framework should similarly be updated so that legally acceptable evidence is produced under scientific soundness and ethical responsibility (Foster, J, 2022).

#### **Recommendations for Legal Reforms to use DNA Evidence**

1. DNA evidence collection, preservation, and analysis must be standardized. This includes chain-of-custody procedures, preventing contamination, and laboratory practices. Standardization reduces the chance of an error, so DNA evidence should be treated the same in all jurisdictions (Bowers, C. M., & Koen, W. J, 2017).

2. Governments must enact legislation that will enable the use of rapid DNA technology in appropriate cases. The guidelines must point out when and how rapid testing results will be admissible in courts, enabling legal systems to expedite investigations using rapid DNA technology.

3. It is necessary to make the public aware of DNA evidence's role and limitations. Through such campaigns, it is possible to demystify the technology and, in that process, understand better what implications this might have on justice. Such awareness also leads to a more forthcoming attitude by the victims (Kahn, J. D, 2011).

4. DNA evidentiary admissibility law should be reviewed and revamped regarding possible gaps or ambiguities in its application.

Training is critical to effectively using DNA evidence in the legal system. Law enforcement officers, forensic scientists, and legal professionals must be equipped with the knowledge and skills to navigate the complexities of DNA technology (Gupta, R., Gupta, S., & Gupta, M, 2016).

#### **Comprehensive Training Programs**

This would include developing comprehensive training programs on DNA science, evidence collection, and analysis. These should be mandatory for all personnel who investigate and prosecute sexual assault cases. The

training also needs to include updates on the latest advancements in DNA technology and best practices in its application in legal contexts.

#### **Interdisciplinary Collaboration**

Collaboration among forensic scientists, law enforcement, and legal professionals may help to enhance the understanding and application of DNA evidence. Workshops and seminars may be organized in an interdisciplinary setting that promotes the sharing of knowledge and a culture of continuous learning.

#### **Ethical Aspects**

Ethical education would also involve concerns with DNA evidence regarding privacy, consent, and potential misuse. Attorneys must be aware of the ethical concerns involved when handling genetic information of a sensitive nature and its impact on individuals and society.

#### **CONCLUSION**

The outcomes of this research reflect the revolutionary impact of DNA evidence in sexual assault cases. In this regard, DNA analysis has become the most powerful forensic tool for validating victim testimony and ascertaining the identity of offenders by significantly increasing the precision and reliability of evidence in cases. DNA evidence removes much of the ambiguity found with circumstantial or testimonial evidence. It strengthens prosecutorial efforts at getting convictions through a genetic link with a level of accuracy that is unparalleled. Beyond the results of the individual case, DNA evidence influences more considerable judicial practice and societal views of sexual assault cases. On its positive side, it counteracts strongly in its objective nature the hazardous dynamics of these cases, flaws in perception, and misunderstanding that usually end up discrediting a victim. Moreover, it brings to light that DNA technology can be free from wrongful accusations and, at the same time, a tool of justice and protection from miscarriages of justice. This duality underscores the need for strict protocols to ensure DNA collection, storage, and analysis to prevent contamination or misuse of such evidence. The application of DNA evidence, however, raises important ethical questions related to the balance between bringing justice to victims and safeguarding the rights of the accused. With the rise of DNA evidence, it is time to put its development to greater offender accountability use. Its due process safeguard should also be set to prevent excessive reliance upon forensic data without regard for its broader evidentiary context. Relative treatment towards the accused person with continued robust mechanisms to protect victim advocacy is always a tight but necessary act.

#### **Author Contributions**

Navin Kumar conceptualized the methodology and prepared the manuscript's original draft. There are no co-authors for this research.

### Conflicts of Interest

The authors declare no conflict of interest.

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