

# Advantages and disadvantages of use of DNA fingerprinting technology in criminal cases of India

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**Abstract-** The contemporary social structure has plunged into a dark environment due to the growing number and types of crimes taking place. Advancements in technology have proven to be a boon for the criminal justice system globally, however, criminals are attempting to catch up with it through innovative methods. DNA fingerprinting is one such technological advancement made in the criminal justice system. It has helped the system make remarkable progress in recent years, despite the presence of certain challenges. The present study intends to assess the advantages and disadvantages of DNA fingerprinting technology in resolving criminal cases. The innovation of DNA fingerprints and its prevalence in India are discussed along with the challenges faced during DNA fingerprint implementation. For this purpose, five lawyers were interviewed to share their insights on the advantages and challenges of the technology. The findings from the study indicate that DNA fingerprint and its applicability in the context of resolving criminal cases offer numerous advantages as compared to the shortcomings. Hence, DNA fingerprinting continues to assist the judiciary in giving fair judgements, and presents a broad scope for future developments.

**Index Terms-** DNA fingerprinting, technology, judiciary

## I. INTRODUCTION

In the contemporary societal structure the rising number and types of crime have given rise to concerns regarding safety and effectiveness of the judiciary. This has made it imperative for the justice system to continuously fuel technological innovations for assisting the investigation process in an effective manner. DNA fingerprinting has proven to be one such groundbreaking technology which has in the recent years enabled solving difficult cases. The present study intends to evaluate the use of DNA fingerprinting technology in resolving criminal cases in India. On the other hand, it also aims to evaluate the advantages and disadvantages of the DNA fingerprinting technique in the crime investigation process as well.

## II. USE OF DNA FINGERPRINT IN SOLVING CRIME TODAY

In the context of crime investigation the essentiality of DNA fingerprinting as a manifestation of science and law, for facilitating the process of dispensing justice, has been recognised. DNA fingerprinting also generates a key repository of DNA profiles, possessed by the government, which helps in identifying criminals. The usage of DNA fingerprinting by forensic scientists further allows the testing and establishing of the link between a crime and criminal. Therefore, DNA

fingerprinting is imperative in convicting criminals, absolving the wrongly accused persons, identifying the victim, establishing parentage, and other purposes. The methods of analysing DNA fingerprints are identified through Single Nucleotide Polymorphism (SNPs) which have over the time evolved from Short Tandem Repeats (STRs) and other lineage markers, such as, Restriction Fragment Length Polymorphisms (RFLPs). These genetic markers help in illustrating the DNA evidence, collected from various possible sources from a crime scene, such as blanket, pillow, fingernail, bite marks, bullets and others<sup>1</sup>. DNA fingerprinting also holds a substantial advantage over the traditional serological tests, having a wide range of application, and dispensing more investigative power to the forensic examiner<sup>2</sup>.

## III. PREVALENCE OF DNA FINGERPRINTING IN INDIA

The DNA fingerprinting technology has also assumed an important stance in Indian jurisdiction, as it holds significant power in resolving cases, and also helps in saving innocents by facilitating exclusion. There are several public forensic laboratories in India demarcated into Central FSLs, State FSLs, and Regional FSLs, which are solely dedicated to DNA investigations ordered by the judiciary only. On the other hand, a number of private labs also operate, which are open to investigations for private individuals as well. The admissibility of DNA technology in the courts of law under Indian jurisdiction is governed by the following laws, as there is no specific act pertaining to DNA evidence.

- i) Article 51 (a), (h), (j) and fundamental duties
- ii) The Indian Evidence Act 1857
- iii) Article 20 (3)
- iv) Article 21, 22, 226 and 227, right to life along with right to privacy, information and so on.

The above mentioned articles have paved the way for DNA fingerprints in the judicial systems<sup>3</sup>. In 2007 the DNA

<sup>1</sup> Vanessa Lynch, Carolyn Hancock, "Solving crime with DNA: What is the real story around DNA and crime scenes", 8 *Quest* 3 (2012).

<sup>2</sup> Victor Walter Weedn, G. Sue Rogers, Berch E. Henry, "DNA testing in the Forensic Laboratory", 29 *Laboratory Medicine* 484(2015).

<sup>3</sup> IACP Summit Report. (2015). "Data, Privacy and Public Safety: A Law Enforcement Perspective on the Challenges of Gathering Electronic Evidence", 57.

profiling bill was put forward, which aims to govern the current DNA lab practices, proceeding towards establishment of DNA database of criminals along with volunteers and victims as well.

#### IV. LITERATURE REVIEW

The increased sophistication and unrestricted nature of crime, has simulated the need to incorporate better technologies for the purpose of conducting investigations. However, using technology for the purpose of solving crime is associated with a number of advantages.

#### V. ADVANTAGES OF THE USE OF TECHNOLOGY IN CRIMINAL CASES

The application of technologies in crime investigation enterprises has come to facilitate the purpose of law enforcement and maintenance. The leveraging of web technologies such as Internet of Things (IoT), semantic tagging, and other intelligent agents, serve to enhance information sharing between relevant authorities, helping them to develop a common criminal history especially for cross border criminals. This poses the great advantage of building networking infrastructure between the investigative authorities, courts, and correctional facilities<sup>4</sup>. Besides the communication technology, the scientific technology such as DNA fingerprinting, could improve the state of entire justice system. The significance of DNA evidence is enhanced when facilitated by national databases, such as National DNA Database of United Kingdom. NDD helps in performing the comparative references of evidence, allowing the officers across country to compare the forensic evidences against a central DNA information repository. Other technologies for behavioral investigations, such as, narco analysis, lie detector, brain mapping and others help in extracting the truth. Moreover, other technological advancements such facial recognition unit, biometrics, speech recognition, voice detectors and others, have made the process of crime investigation smooth and efficient at the same time<sup>5</sup>.

#### VI. RECENT PATH-BREAKING TECHNOLOGIES IN CRIMINAL CASE-SOLVING

The forensic toolkit is one of the recent technological advancement meant for assisting cybercrimes. A type of digital forensic software developed by AssessData, it can scan any hard drive in order to recover data that has been destroyed. For instance, the deleted Emails or any other significant documents that could form evidence in relation to the criminal investigation could be retrieved using the digital forensic software. On the

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<sup>4</sup> John S. Hollywood, Dulani Woods, Richard Silbergliitt, Brian A. Jackson, "Using Future Internet Technologies to Strengthen Criminal Justice" RAND Corporation (2015).

<sup>5</sup> Hakan Hekim, Serdar K. Gul, Bahadur K. Akcam, "Police use of information technologies in criminal investigations", 9 *ESJ*221 (2013).

other hand, Memgator is another significant tool that would help in analysing the hard disk memory for evidence as well<sup>6</sup>. Along with this, geographical information system and crime mapping are also effective tools in terms of generating crime investigation. *Geographic Information System* refers to the spatial analysis process that supports decision making. Moreover, the crime mapping is another process that provides the scope to the law enforcement agencies to understand the crime factors and take relevant decisions in this regard. Apart from this, fingerprints are one of the significant biometrics that has helped the law enforcement agencies all over the world to investigate the crime scene and purpose<sup>7</sup>. Hence, the technology aided tools are evident in contributing to crime investigation effectively.

#### VII. CHALLENGES AND SHORTCOMINGS TO IMPLEMENTATION OF THE SAME

Though the rain is beautiful, it has the cruelty and terror of thunder as well, likewise, the technological advancements also suffer from several challenges and shortcomings. Firstly, it is very important for the law enforcement agencies to understand that generalising the technology implementation to all the cases of different nature may create problems. Hence, successful DNA testing has become a challenge now days as many cases have different requirements in terms of laboratory data automation and restrictive acceptance of policies. Non-fulfilment of the results or outcomes could be considered as another challenge and the technological devices are prone to fail at any time<sup>8</sup>. Moreover, the challenges related to the human incompetency are also influential as handling such technology needs expert practices and invasion for generating desired results. Thus, lack of proper knowledge and experience may create barriers as well. Along with this, the unintended cost is also there that impacts the facts related to crime investigation<sup>9</sup>. Therefore, it is quite clear that technological advancements have several shortcomings as well that could be identified in terms of technical failure, lack of experience of handlers, budget failure and so on.

#### VIII. EMPIRICAL REVIEW

Several empirical sources could be explained in order to provide a clear and concise understanding of DNA fingerprint and its use in India. Firstly, from one source it is observed that innovative technique in forensic science is the most important

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<sup>6</sup> Butler, J. M. *DNA Extraction Methods. Advanced Topics in Forensic DNA Typing: Methodology* (Academic Press, 2014)

<sup>7</sup> Das, M., "The Curious Case Of Technology And Crime Prevention : *The Indian Perspective*", 3 *IJTEEE* 9-22(2013).

<sup>8</sup> Tombul Fatih, Bekir Cakar, "Police Use of Technology To Fight", 11 *ESJ* 286-296 (2015).

<sup>9</sup> Inga Hofer, *The Rise of Courtroom Technology and its Effect on the Federal Rules of Evidence and the Federal Rules of Civil Procedure* (2007)

innovation in forensic fingerprinting<sup>10</sup>. The empirical study intends to manifest the impact of DNA fingerprint on criminal justice cases and it is realized that the impact is relatively low on the judiciary system, but it is increasing with time. In the second study talks about another DNA profiling tools in terms of DNA profiling database that also helps in resolving cases and it also highlights the disadvantages of DNA profiling such as the revelation of family history, personal medical history and so on<sup>11</sup>. The third study reveals the aspects like the contribution of information technology in the context of criminal case investigation as well<sup>12</sup>. Thus, the empirical review has manifested the importance of DNA fingerprinting technology in the context of resolving criminal cases in India.

## IX. METHODOLOGY

Primary data consisting of interviews was collected using a set of questions in questing 5 lawyers (A, B, C, D, & E, for the purpose of maintaining anonymity) practicing in the Mumbai high court, regarding the advantages and disadvantages of DNA fingerprinting technology in solving criminal cases. The questions pertained to three sections; which were constructed in alignment with the availability and ethics of the information accumulation. The first section helped in recording the demographic details, the second section discussed the advantages, whereas the last and third section of the questionnaire discussed the disadvantages of DNA fingerprinting in law

## X. FINDINGS

The advantages and disadvantages of DNA fingerprint in criminal cases, as identified by interviewing five lawyers, are stated in the following manner.

### Advantages

**Lawyer A: DNA fingerprint or profiling has helped many innocents from being victimized, as it helps in exclusion of the possible suspects by serving as definite evidence upon a**

<sup>10</sup> William Schwabe, Davis M. Lois, Jackson A. Brian.

“Challenges and Choices for Crime-Fighting Technology Federal Support of State and Local Law Enforcement”. Rand Corporation 25–29 (2001).

<sup>11</sup> William Schwabe, Davis M. Lois, Jackson A. Brian.

“Challenges and Choices for Crime-Fighting Technology Federal Support of State and Local Law Enforcement”. Rand Corporation 25–29 (2001).

<sup>12</sup> Frank III Hartle, Michael Parker, Christopher Wydra, “Issues in Information Systems The Digital Case File: The Future of Fighting Crime With Big Data”, 15 *IIS* 257–266 (2014).

**negative match.** For example, a case in MP involved DNA fingerprinting for a case of the physically challenged girl who gave birth to a child and the alleged father was accused of raping that girl. Through DNA profiling of the mother and the alleged father had been conducted<sup>13</sup>. Therefore, the DNA profiling has proved that the DNA of the dead child did not match with the alleged fathers and hence, the accused person was saved from being guilty. Therefore, the DNA profiling has proved that the DNA of the dead child did not match with the alleged fathers and hence, the accused person was saved from being guilty.

**Lawyer B: DNA fingerprinting helps in reaching the accused, acting as substantial secondary evidence.** In *State of Uttar Pradesh v. Amaramani Tripathi*, DNA fingerprinting helped in sentencing the accused former Uttar Pradesh Minister Amaramani Tripathi for murdering Madhumita Shukla. The DNA fingerprint profiles of the accused and the unborn child of the deceased helped in establishing paternity, and henceforth establishing the basis for undertaking the crime<sup>14</sup>.

**Lawyer E: the DNA profiling is also effective in terms of validating the parenting origins, for the purpose of identifying the anonymous dead body.** For example, the Sheena Bora murder case could be explained in this in which in a farfetched forest of Mumbai police had found skeletons. The thigh bones were sent for DNA test along with the blood samples of Indrani Mukherjee mother of the deceased and brother Mikhail. The tests revealed and proved that Indrani Mukherjee was her mother and she was Sheena Mukherjee.<sup>15</sup>

**Lawyer D: DNA evidences prove to be of high importance in rape cases, wherein DNA serves as primary evidence.** In the case, Raghuvir Dessai vs State, a school peon sexually assaulted and raped a minor, and the case was of denial simpliciter. DNA test proved to be clinching evidence, as the semen samples from the accused and those on victim’s clothes were found to be a positive match<sup>16</sup>. Hence, the advantages of DNA fingerprinting have contributed in simplifying the criminal investigation process for the law enforcement, especially in establishing paternity.

### Disadvantages

The disadvantages or challenges in terms of implementing DNA fingerprinting in the context of resolving criminal cases were stated as follows.

**Lawyer C: Firstly, the disadvantage of DNA fingerprints is realized in terms of lack of accuracy, and as a result, an innocent person might convicted.** The Arushi Talwar case could be mentioned in which the lack of expertise in DNA testing had comprised the entire case. DNA testing of the vaginal swabs proved to be insignificant, and the swabs were questioned

<sup>13</sup> Krishan, K., Kanchan, T., & Bumrah, G. S. The Fingerprint Sourcebook. 19 *J Forensic Leg Med* 182–183 (2012).

<sup>14</sup> A.I.R. 2005 S.C. 3490

<sup>15</sup> Krishan, K., Kanchan, T., & Bumrah, G. S. The Fingerprint Sourcebook. 19 *J Forensic Leg Med* 182–183 (2012).

<sup>16</sup> A.I.R. 2007 CriLJ 829

to be either Arushi's or not<sup>17</sup>. The judicial system as not sure whether the evidence indicated towards physical assault or consensual intercourse, terminated it.

**Lawyer A: Secondly, other disadvantages could be realized in terms of cost and time management. In India due to the lack of expert analyst many cases get delayed in presenting the results of the DNA profiling.** In this regard, the example of Arushi case could be repeated as the case has been continued for so many years and it had involved quite a long time and also encompassed high cost in conducting DNA fingerprinting<sup>18</sup>. Therefore, it is quite evident from the case that not only the case lasted for a long time involves cost and time as well.

**Lawyer B: Thirdly, DNA fingerprinting has social implication in a negative manner. The disadvantage could be realized from two prospects such as from individual and other is from government perspectives.** Many fear that the government could compel individuals to go through DNA fingerprinting as it may expel them socially. Also, there are questions of violating an individual's privacy, unraveling the genetic makeup of the person without his/her consent, thereby paving way to social, ethical, and legal concerns.

**Lawyer D: Fourth, DNA evidence is kind of fragile and could be contaminated in an easy manner. Therefore, as the DNA test goes through several different processes, its results could easily be contaminated and the accuracy could also be destroyed in this regard.** In this context, the case of historical DNA fingerprinting of human bones in a genetically order could be assessed for delivering understanding its impact. Therefore, the DNA separated from the sample could easily be contaminated as it is already in a fragile state. Instance of the Seena murder case could be provided as here the identity of the remaining skeletons were ensured through running DNA testing of the bones of the dead body.

## XI. CONCLUSION

Hence, from the evaluation of the information gained from the respondents, it is quite evident that despite having disadvantages, DNA fingerprinting proves to be significant in solving criminal cases in India. The statement could be justified through the above cases as examples of success of DNA technology application in terms of criminal case investigation. Though DNA fingerprinting proved to be a major failure in the Arushi Talwar case, but it had delivered successful results in

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<sup>17</sup>Henry Osborne Quarshie. "Using ICT to Fight Crime -A Case of Africa", 5 *IJETTC* 21-24 (2014).

<sup>18</sup> William Schwabe, Davis M. Lois, Jackson A. Brian. "Challenges and Choices for Crime-Fighting Technology Federal Support of State and Local Law Enforcement". Rand Corporation 25-29 (2001).

Sheena murder case. Hence, it was realized that DNA fingerprinting has several impacts in terms of criminal cases and specifically in the sexual abuse cases in which DNA fingerprinting helps in detecting the criminal without any further evaluation<sup>19</sup>. Apart from this, in most of the cases of sexual assault, DNA profiling refers to the results in a contested manner, but it also suggests presenting the results in a pre-trial format as well. Along with this, it is also understood that DNA profiling has actively contributed in extracting evidence in terms of delivering channel to the judiciary branches to concentrate on actual aspects.

Also, the admissibility of DNA testing before the court of law depends on the proper processes of collection and result documentation of the samples and on its reliability as well. Along with the mentioned disadvantages, the respective respondents have delivered the fact that there is no accurate regulation under Indian Evidence Act 1872 and Code of Criminal Procedure 1973 in relation to DNA fingerprinting<sup>20</sup>. Due to the lack of proper implementation regulation, the investigating officers have to face several challenges in proving the accused person guilty. Moreover, it is also evident that Code of Criminal Procedure 1973 allows a police officer to get the assistance of health practitioners during the investigation process, but does not allow the complainant to be used for taking samples of blood or semen. Thus, finding section has effectively delivered insight into the role of DNA fingerprinting in the context of solving criminal cases.

The advantages of DNA fingerprinting have been mentioned in terms of exonerating people from being victimized, identifying missing identity, parenting identification is also performed through DNA fingerprinting, whereas the disadvantages seem less influential in this regard. The future of DNA fingerprinting is quite evident in India as it is continuously rising in the field of criminal investigation, but it also needs certain improvements and other technological advancements for better outcomes. There are the certain things that needs to be highlighted in order for Indian police and judiciary system to be aware of, such as the violation of DNA fingerprinting for impacting social norms for an individual. Thus, the government needs to be aware of the security issues of DNA testing labs and technological failures in order to prevent mishaps during criminal case investigation. The future challenges in relation to DNA fingerprinting could be delivered in terms of implementing more effective legislative regulation for enhancing its admissibility before the courts of law. Therefore, through involving more strict rules about taking samples and technology installation the DNA fingerprinting and its impending challenges could be handled in an effective manner in the future course of practices.

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<sup>19</sup> William Schwabe, Davis M. Lois, Jackson A. Brian. "Challenges and Choices for Crime-Fighting Technology Federal Support of State and Local Law Enforcement". Rand Corporation 25-29 (2001).

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