



Justice under the microscope: Forensic science in the Indian criminal justice system

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Abstract

Forensics and law are interconnected. Forensics applies scientific methods to uncover the truth in crimes. The term "forensics" derives from Latin, meaning "related to the law." It is a scientific discipline that aids the criminal justice system by analyzing and evaluating evidence from crime scenes to uncover the underlying truth. In the mid-18th century Madras, the first toxicology laboratory started examining poison-related deaths. They started analyzing viscera, blood, saliva, and semen, for toxicological investigations. Forensics in this era now discusses behavioral genetics and criminal intent reducing the impact of people of the judicial system to prove people guilty. Forensic science doesn't create an impediment and achieves its object effectively while at the same time protecting the fundamental right of a person accused of any offense not to be compelled to be a witness against himself as enshrined in Article 20(3) of the Indian constitution. Article 11 of the Universal Declaration of Human Rights states that everyone charged with a penal offense has the right to be presumed innocent until proven guilty in a fair and public trial, where they have all the necessary guarantees for their defense. This principle is essential to protect individuals from arbitrary detention and ensure their right to a fair legal process. The forensic report is a "professional opinion." This study aims to find the existing correlation between the crime scene, Forensic science, the Indian criminal justice system, and the cases solved in India with the help of forensics.

Keywords: Forensics, criminal justice system, DNA, investigations

Introduction

The term 'Forensics' came from the word 'forensics' meaning which is related to the courts, debate, and discussion about the public. Science is the knowledge where things will be tested, experimented on, and can be verified repeatedly without changes. The term forensic science can be defined as the scientific discipline which helps the criminal justice system after the analysis of the articles with the use of material science to go to the criminal and in turn the justice ^[1].

This science works closely with the offenses rape, murder, cyber-crimes, and nowadays with civil cadre cases too. It also deals with the basic principles of all physical and natural sciences and has evolved many domains e.g. anthropometry, computers, DNA and brain mapping, fingerprinting, etc ^[2]. Justice delivery system consists of courts and others related to the court that coincides with forensic science. It is always required to connect crimes to criminals and achieve convictions while safeguarding the rights of the innocent with a balanced approach that combines both instincts and scientific reasoning. Forensic science serves as a crucial tool in this process by providing objective and reliable evidence, ultimately contributing to the pursuit of justice ^[3]. The purpose of this article is to find the existing relationship between the Indian judicial system, forensic science, and crimes.

History of forensic science in India

The application of forensic science is not new in India. Kautilya's Arthshastra, written more than 2000 years ago, had evidence of forensic science as there is literature about handprints ^[4]. Also, the use of fingerprints illustrated in India has introduced centuries ago, and many still use it ^[5]. The first laboratory examining the death cases due to different types of poisons working on the science of toxicology was introduced in the mid-18th century in Madras

followed up by the same in Calcutta, Agra, and Bombay within a decade. They were equipped to handle toxicological studies and to analyze human strains in the form of viscera, blood, saliva, semen, etc ^[6].

In the 1970s and 1980s, India initiated its first behavioral genetics investigations. These studies investigated the heritability of intelligence, personality, and mental disorders, among other traits and behaviors, within the Indian population. Researchers conducted twin and family investigations to investigate the genetic and environmental influences on behavior. This increased the need for forensics in India, a country where the psychological behavior of criminals is still under many folds of research ^[7].

In India, the major use of forensics is the ways of lie detection, fingerprinting, blood and gene studies, and brain mapping. Central forensic science laboratory with the mission of creating a DNA repository and fulfilling forensic requirements in India was established in 1968 and now has branches in almost every province in India ^[6]. In 1897, the British Raj in India founded the Fingerprint Bureau in Calcutta, making it India's first institutionalized fingerprint identification system. The primary responsibility of the bureau was to acquire and maintain criminal fingerprint records. During this period, fingerprints for criminal identification were widely accepted in India. It was acknowledged that fingerprinting was a reliable method of establishing identity, and it became an integral component of criminal investigations ^[7].

Crime scene evidentiary and its value

The crime scene as defined by Van Heerden gave the name of the scene as the field laboratory which has a locality and availability of various hidden tools mainly the physical ones ^[8]. They can also be classified as primary and secondary ones referring to one where crime has happened and one where possible evidence can be found. Forensic science is

completely dependent upon the data gathered from a crime scene. It is nearly impossible for a person to commit a crime and leave without any evidence^[9].

The evidence can be physical, testimony, or documentary evidence. In criminal investigations and legal proceedings, the physical evidence is of immense importance. It enables the investigators to determine facts and arrive at reliable conclusions. Unlike testimonial evidence, which can be subjective and influenced by biases or faulty memory, physical evidence provides an unbiased record of events. Physical evidence has the power to support or challenge witness testimonies and enhances the reliability of an investigation. It aids investigators in piecing together the chronological order of events, understanding how the perpetrator operated, and pinpointing possible suspects. By adopting a more scientific approach and advancement of technology the usefulness of physical evidence may increase tremendously which ultimately leads to better justice^[10, 11].

We must overlook the importance of creating crime scene documentation in crimes involving, the importance of eyewitnesses, and the collection of physical evidence. As far as documentary evidence is concerned it also has a significant place for crime scene investigators, as it assists the investigators to look at the sequence of events, and gives a more lucid picture of the crime scene which holds importance for the conviction of criminals. In certain cases like the State of Assam v. IN Rajkhot and Santa Singh V. State of Punjab, physical evidence or 'corpus delict' and its proper documentation played an important role in the branch to pass the jurisdiction against the convict^[12].

National Crime Record Bureau (NCRB)

NCRB was set up in India with the mission of empowering the Police with all possible information with the use of technology and criminal intelligence to uphold the law and protect people from wrongful convictions and crimes. It is continuously working and maintaining a secure sharable national database on crime and criminals. The DNA examination after a crime scene investigation plays a very important role for the same^[13].

Role of forensics in solving crime

One of the important aspects of criminal justice as already stated is forensic science or the collection and investigation of the crime scene to know the criminal and the interest of the criminal in a particular type of crime. The evidence reveals the nature of the offense. The circumstance clarifies the timing of the incident. Forensic evidence establishes the crime scene^[11]. The modus operandi can provide valuable insights into the techniques and behaviors of the perpetrator, which can help in identifying patterns, linking crimes, and narrowing down potential suspects. Additionally, understanding the motivation behind a crime can aid in establishing a motive, determining the intent of the offender, and building a comprehensive understanding of the case^[7]. The cases like Nithari serial killings where there was no witness to the crime scene and the prosecutors doesn't have a solid ground to work with, forensic science played an important role. In the places where human remains are found in decayed conditions and cannot be recognized forensic scientists use DNA from the body to examine the skeletal structure or in turn the probability of someone being a criminal. This also narrows down the possibility of delayed judgments and wrongful convictions. Sex crimes

where DNA evidence can be recovered from the body of the victim can help the Police to find out the suspect behind bars^[14]. The evidence collected at the scene of a crime is of utmost significance in court trials, as physical evidence carries greater weight than any other form of evidence. Forensic science plays a vital role in enhancing the methods used to solve crimes.

Forensic science is a powerful tool in protecting the innocent by exonerating the wrongly convicted, identifying the true perpetrators of a crime, uncovering false evidence, challenging biased or subjective testimony, improving investigative techniques and standards, and promoting reliable investigative practices. It helps to exonerate the wrongly convicted, identify the true perpetrators, expose false evidence, counter biases, and promote reliable investigative practices^[15].

Techniques of Identification and Investigation

Analysis through Narco Test: Narcoanalysis, commonly referred to as the "truth serum" test, is a contentious investigative method utilized in certain nations. It entails the utilization of specific drugs like sodium pentothal or sodium amytal to induce a state of reduced inhibition and heightened susceptibility to suggestion in an individual's consciousness. The method is to use the memory of the witness. The basic principle says that the person can tell a lie where he can use his imagination and by these drugs, the person is in a half-conscious state where the imagination is blocked and the person is not able to tell a lie. This technique was first used in the Godhara case of 2002. The techniques have certain drawbacks too. The major area of concern by the Supreme Court of India is physical assault on the body due to multiple stimuli and mental assault which is majorly due to the use of psychotropic medicines^[16, 17].

Lie detection: Lie detection is a method in legal culture where the pieces of evidence consisted of oaths and testimony was of great importance, taking an oath on Geeta used to be the lie detection method of choice in ancient India. However, with the advancement of technology, lie detection has become more scientific and accurate. Polygraph tests are commonly used to detect lies in criminal investigations and employment screenings. Lie detection is based on the principle of having physical and psychological changes that occur in the human body when a person tells a lie. The lie detector detects the raised heart rate, blood pressure, and the rush of flight or fight hormone that is adrenaline when accuse lies on an answer to a crime-related question^[18, 19].

Brain Mapping Test: Brain mapping is a technical study of functions of the brain by the sensors attached to the brain when he is asked about information related to the crime. During this test, the accused is asked for the relevant information, and the electric waves are recorded throughout the interview. The suspect is shown and made to hear certain images and voices. The changes related to specific perceptual events are called event-related potentials. The examiner can make the interface between the familiarity of the individual with the crime scene. This test measures the memory and knowledge of the crime scene. The same memory can also be from a movie or some story or play that's why the accused cannot be proven as criminal or

innocent but can only tell if the accused has any such memory or not ^[20].

In the 2010 case *Smt. Selvi v. State of Karnataka*, the Supreme Court ruled that brain mapping and lie detector tests violated Article 20(3) of Fundamental Rights and were thus unlawful. Any use of these methods must have the willing participation of the target ^[21]. A forensic laboratory in Bangalore, India, is the first in the country to employ this method. The Court gives due weight to the scientific expert's opinion, but it is only one piece of evidence among several that must be considered and evaluated ^[22].

DNA Profiling: DNA profiling is a very accurate method of forensic inquiry. DNA stands for deoxyribose nucleic acid, an organic compound present in all cells that serve as a blueprint for each person's unique genetic makeup. Blood, sperm, bone, saliva, and other bodily fluids and tissues may all be mined for DNA. Frederik Miescher made the initial discovery of DNA in 1869. Because everyone's DNA is different (except for identical twins), DNA testing is quite accurate. There is a one in three billion chance that our DNA is identical. As a bonus, it is trustworthy since it is immune to manipulation. The results of a DNA test may be used to solve many mysteries, from determining paternity to identifying disfigured corpses ^[23, 24].

Fingerprints: Crime scene investigators have long relied on fingerprints as a crucial piece of evidence. Every human person is born with a unique fingerprint, a series of ridges along each fingertip ^[25]. Rich in sweat pores, the ridges generate a permanent design. When the skin is cut and sewn back together, the same pattern will emerge. Arches, loops, and whorls are the most common fingerprint patterns. At a crime scene, investigators need to gather fingerprints, which are an essential part of the investigation ^[26].

The field of forensic science relies increasingly on these methods. The legal system can't function without the use of scientific evidence gleaned from a forensic investigation. The criminal justice system in India must catch up with the times and adopt the latest innovations in law and technology.

DNA profiling and the Indian legal system

India is improving scientifically so as does the Indian legal system. In the pursuit of both Indian judicial system is using forensic evidence such as tracing fingerprints, post-partum reports, serology, DNA profiling, etc. DNA profiling or testing is not new in India, but it sometimes feels to be directionless. DNA tests are admissible in Indian courts and over time due to their accuracy are used frequently. In the case of *Maryland v King*, the supreme court of India stated that DNA technology is one of the most significant advancements of the era ^[2, 14, 27, 28].

Legal Provision of Forensic Science in India

Forensic science's usefulness in the investigation and prosecution of crimes must be protected by the rule of law. Forensic science's veracity and applicability are at the heart of the issues that arise. Because of Article 20(3) of the Indian Constitution, forensic science is restricted when an accused person is required to testify against themselves. Also, it stops the accused from giving a forceful testimony ^[29]. In *Justice K.S. Puttaswamy vs Union of India and Ors.* Dated 24 Aug 2017, the bench said in the age of information

technology governed by aspects of our lives the court needs to be sensitive to the opportunities and dangers posed to liberty in a digital world. They also said that the right to privacy is closely linked to other rights and this can also act as a game changer ^[30].

As mentioned in Article 11 of the Universal Declaration of Human Rights, individuals accused of a criminal offense have the entitlement to be presumed innocent until proven guilty in a fair and public trial, where they have access to all necessary safeguards for their defense. In a significant legal judgment, the Bombay High Court, in the case of *Ramchandra Reddy and Ors. v. State of Maharashtra*, ruled that the use of P300 or Brain fingerprinting, lie detector tests, and narcoanalysis is legally permissible. In 2005, the Code of Criminal Procedure, 1976 was amended to allow for the collection of various medical information from suspects at the time of their arrest, expanding the scope of permissible evidence gathering ^[15, 31].

According to Section 53 of the Criminal Procedure Code of 1976, there are valid grounds to believe that conducting a medical examination of an arrested suspect will provide evidence related to the crime. In 2005, the scope of items eligible for examination was expanded to include a broader range of biological materials such as blood, blood stains, semen, swabs (in sexual offense cases), sputum, sweat, hair samples, and fingernail clippings. This expansion was made possible through the application of modern scientific techniques, including DNA profiling and other tests that are considered appropriate by the responsible registered medical practitioner overseeing the particular case ^[32, 33].

Some doctors may not be able to gather and store DNA evidence properly, raising questions about whether all doctors can. The reliability of DNA evidence relies entirely on the quality of the sample and its storage conditions. The sample might get contaminated via ignorance or carelessness, rendering it useless ^[34]. The forensic report is treated as an "opinion offered by an expert" under the Indian Evidence Act, of 1872. A specialist is someone who has acquired extensive knowledge in a particular field by study, experimentation, and/or practical application. He is an expert in the topic since he has studied that area extensively and has gained extensive practical experience ^[35]. An expert's testimony will have more weight if the tools, methods, and materials used to reach their conclusions are described in detail. However, the court need not agree with the expert's findings to reach a verdict; it may instead rely on other evidence presented to it.

Cases solved by the use of Forensic Science

In *Anil @ Anthony Arikswamy Joseph ... v. State of Maharashtra*, where a 10 yr boy was murdered by strangulation after carnal intercourse solved with the taking help of DNA profiling by taking samples from the semen collected from the pants and anal area of the boy and oral pieces of evidence, the accused was sentenced for death ^[36].

Vishal Yadav vs State of UP, Nitish Katara was a murder case where the identification of the deceased victim was difficult to even by the parents as the body was completely burned except a small part of the hand. When the DNA profiling was done and matched with that of the parents the body could be identified leading to the sentence of life imprisonment of the accused ^[37].

Another case was *State by the Inspector of Police vs Manoharan*, in this Manoharan committed the rape and

murder of 10 yr old minor girl child and the use of DNA profiling helped the police in solving the crime. The samples were taken and matched from the Omni van of the accused where he committed a crime [38].

In the case, State of NCT Delhi vs Sujeet Kumar, where a 3yr old girl child was raped the court after detailed analysis of the DNA reports taken from the perineal area of the child after rape when she was then to the hospital and of the accused gave the decision [39].

The Noida double murder case, also known as the Aarushi-Hemraj murder case, was a high-profile murder of Aarushi Talwar and Hemraj Banjade in 2008. Brain mapping tests were conducted on the suspects to extract information and gather evidence. However, the admissibility and reliability of brain mapping as evidence can vary across jurisdictions and may not always be considered conclusive or admissible in court. The case underwent multiple twists and turns, with different suspects being implicated and acquitted [40].

Another case using DNA evidence is Dharam Deo Yadav vs the State of Uttar Pradesh, where the Supreme Court said, "Crime scene needs to be scientifically addressed without any error" [2]. Mohinder Singh Pandher and Surender Koli, the two primary suspects in the Nithari case, underwent narcoanalysis tests to learn more about their involvement and gather evidence for the crimes. The purpose of conducting a narcoanalysis test on Pandher and Koli was to obtain insight into their behavior, awareness about the consequences of committing a crime, and any other possible information useful to the investigation. Nithari killings are a live example where these tests were conducted keeping in view the aim to accumulate data to uncover the truth.

Forensic science plays a crucial part in criminal prosecutions that rely heavily on circumstantial evidence, since it may help establish the proof of crime, identify the suspect, and determine whether the accused is guilty. Investigating officers spend a lot of time at crime scenes, and one of their main tasks is to look for evidence that might help them solve the case. Physical evidence collected from a crime scene must be safeguarded against the possibility of contamination that arises during the packaging, transporting, and opening of the evidence by the investigating officer. Safeguards must be in place to prevent the destruction of evidence and protect it against contamination and misuse [41, 42].

The DNA Technology (Use and Application) Regulation Bill is a proposed legislative measure in India that aims to govern the utilization of DNA technology for diverse objectives, such as criminal inquiries, identification of absent individuals, and determination of paternity. The document comprises clauses for the creation of both national and regional DNA databases, the gathering and examination of DNA specimens, measures to ensure consent and privacy protection, the certification and regulation of quality control, and the availability of DNA information. In the year 2020, the NFSU Act was implemented to establish the National Forensic Sciences University (NFSU) within the borders of India. In 2022, the Lok Sabha introduced the Digital Personal Data Protection Bill (DPDP Bill) to regulate the collection, processing, storage, and transfer of personal data within India. The legislation confers upon individuals the entitlement to be informed about the personal data that is being gathered about them, to obtain access to their data, to request rectification or erasure, to raise objections to processing, to transfer their data to

another service provider, and to impose responsibilities on entities that collect, process, or retain personal data. The characteristics are poised to bring about a significant transformation in the management of individual data in India, while also safeguarding the privacy rights of its citizens [32, 37].

Conclusion

DNA analysis and the recreation of crime scenes are two examples of how forensic science has grown in prominence in recent years. However, there are insufficient experts in the field of forensic science who can apply their knowledge to legal matters. The Indian legislation and forensic practices need to be improved to adapt to changing circumstances and advancements in technology. These include strengthening forensic infrastructure, standardization and accreditation, training and skill development, legal framework and admissibility of forensic evidence, and collaboration and information sharing between different stakeholders. Adequate funding and resources should be allocated to ensure timely and effective processing of forensic evidence. Enhancing digital forensics capacity and expertise, adopting a victim-centric approach, and prioritizing research and development in forensic science is crucial. These measures ensure effective analysis of digital evidence, prioritizing the needs of victims, and advancing scientific techniques to uncover truth and justice in the field of forensics. These suggestions should be tailored to the specific requirements and challenges of the Indian forensic system, and consultation with forensic experts, legal professionals, and relevant stakeholders is essential.

As science and technology have advanced, a more effective and reliable tool for spotting criminals has been available to the globe. There is no denying the importance of forensic science today when it comes to uncovering illegal activity and apprehending offenders. For the criminal justice system, providing fair justice is a top priority. Forensic evidence is undeniably more reliable than eyewitness testimony. Forensic science helps the court system because it provides scientific proof.

Future Scope of the study

The purpose of this research was to investigate the relationship between crime scenes, forensic science, the Indian criminal justice system, and the successful resolution of cases in India. Integration of technology can be added to improve the effectiveness and precision of forensic investigations and evidence analysis. Legal and ethical implications of forensic science practises in the Indian criminal justice system can contribute to the preservation of individual rights, privacy, and the use of forensic evidence fairly.

Based on the study's findings, future policy recommendations for standardisation, quality assurance, and accreditation of forensic laboratories and personnel can also be proposed. Collaboration and interdisciplinary approaches can also be added to enhance the incorporation of forensic science into the criminal justice system by providing valuable insights for enhanced coordination and cooperation.

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