THE ROLE OF FORENSIC EVIDENCE IN CRIMINAL INVESTIGATION IN INDIA

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ABSTRACT

The research paper explores the vital role that forensic evidence plays in India's criminal investigations. It explains how modern forensic techniques like DNA analysis, fingerprinting, and digital forensics help law enforcement agencies connect suspects to crime scenes with accuracy. The study also highlights challenges such as limited resources, training gaps, and variations in forensic standards across the country. Legal frameworks governing the collection and use of forensic evidence are examined, emphasizing the need for clear protocols and scientific rigor to ensure fair trials. Overall, the paper underscores forensic science as a key pillar of the justice system in India, calling for further improvements to maximize its impact in solving crimes and delivering justice effectively.

The article examines the crucial role of forensic evidence in the Indian criminal justice system. Forensic science serves as an essential tool in establishing facts, identifying offenders, and ensuring justice in criminal investigations. The study highlights the historical development and application of forensic science within India, emphasizing its evolution from rudimentary practices to the adoption of sophisticated modern techniques. A key focus is on the legal framework governing forensic evidence admissibility in Indian courts. The article reviews relevant statutory provisions from the Indian Evidence Act, Code of Criminal Procedure, Indian Penal Code, Information Technology Act, and Narcotic Drugs and Psychotropic Substances Act.

INTRODUCTION

Forensics evidence plays a crucial role in the criminal justice system in India, forensic evidence plays a crucial role in criminal investigations by helping law enforcement establish facts, identify offenders, and guarantee justice. To identify suspects and connect them to the crime scene, methods such as facial recognition, DNA profiling, and fingerprint analysis are employed. Post-mortem tests and autopsies yield important information. Using technology, digital forensics is essential for looking into cybercrimes and recovering evidence from electronic devices. By identifying the presence of drugs, alcohol, or toxins in the body, forensic toxicology can establish a link between drug use and criminal activity. In court, expert testimony has a big impact on how trials turn out. The outcome of cold cases also heavily relies on forensic evidence, and technological advancements may yield fresh clues. Standards and quality control are crucial to the validity of the evidence. India's legal systems guarantee due process and the defence of the rights of the accused.

RELEVENCE OF STUDY

The justice system, policy formulation, legal reforms, training, public awareness, cold case resolution, ethical considerations, international collaboration, technological advancements, and crime prevention and deterrence can all be enhanced by research on the use of forensic evidence in criminal investigations in India. The legal system can be strengthened by incorporating forensic methods, standardising processes, and guaranteeing the admission of evidence. This can be accomplished by defining criteria for the training of forensic professionals, creating and accrediting forensic laboratories, and establishing rules for the collection of evidence. In order to ensure that the legal system keeps up with advances in forensic science and promotes more efficient and impartial criminal investigations, research can also be used to inform legislative improvements. Additionally, tactics for crime prevention and deterrence can be informed by knowledge of how forensic evidence aids in the investigation of crimes. All things considered, forensic evidence research in Indian criminal investigations can have a good effect on public opinion, legal procedures, policy, and international cooperation in the sector.

STATEMENT OF PROBLEM

India confronts a number of obstacles when it comes to using forensic evidence in criminal investigations, such as a lack of quality assurance and accreditation, a lack of training and

resources, difficulties with admissibility in court, and a restricted integration of methodologies. Insufficient public knowledge and confidence in the legal system could potentially affect the efficacy of forensic evidence. Regional adoption of technological advancements may not be consistent, and ethical issues must be carefully considered. Reopening and successfully resolving cold cases present challenges as well, but knowing these obstacles can help victims and their families receive justice. The goal of this study is to thoroughly examine these issues and offer suggestions for bettering laws, regulations, training courses, and public awareness campaigns in order to strengthen the use of forensic evidence in criminal investigations.

OBJECTIVE OF STUDY

1. The study evaluates the integration of forensic techniques in Indian criminal investigations, identifying challenges and gaps in their application at crime scenes and during the investigative process.

2. The study examines the legal frameworks and practices governing the admissibility of forensic evidence in Indian courts, identifying challenges and proposing recommendations for improved legal proceedings.

3. The study explores strategies for resolving cold cases using forensic evidence, proposing methods to re-examine unsolved cases and provide closure to victims' families.

HYPOTHESIS

Forensic science provides for admissible and reliable evidences than provided by witness statement.

RESEARCH QUESTION

1. How do various forensic techniques currently integrated into criminal investigations in India impact the effectiveness of investigations?

2. What are the legal frameworks and practices that govern the admissibility of forensic evidence in Indian courts and their influence on court proceedings?

3. How can forensic techniques be effectively leveraged to resolve unsolved cases and provide justice for victims and their families?

LITERATURE REVIEW

Robin Feldman, in his 'The Role of Science in Law' described the interaction between law and science while examining attempts to both import science into law and export legal issues to science. But he could not specifically mention why forensic evidence is essential for criminal investigation.

Richard Saferstein, in his 'Criminalistics: Introduction to Forensic Science' introduces the non-scientific reader to the field of forensic science. He also described the abilities and limitations of the laboratories. However, he merely focused on applying forensic evidence in court proceedings.

CONTENT

Forensic science and history of forensic science

Forensic Science is described as "the application of science to civil and criminal laws enforced by police agencies in a criminal justice system." The term forensic is derived from the Latin adjective forensis, which means "of or before the forum." Forensic science serves as a bridge between medical and legal scientists. It's the science that comprises of the matters that provide a common platform to both scientists and legal professionals.[1] The word "forensic science" has been defined by Peter White in two ways, one narrower and one broader. This broad definition includes criminal prosecutions in the broadest sense, as well as patrons and environmental safeguards and physical condition and protection at work, as well as civil proceedings such as breach of contract and negligence. On the other hand, in universal practice the term is applied more narrowly to use of science in the in the investigation of crime by the police and by the courts as evidence in resolving the issue in any subsequent trial.[2]

The Midwest Forensics Resource Center of the United States Department of Energy defines

[1] Deepak Ratan&Mohd.H.Zaidi ,Applications Of Forensic Science In India And World(Alia Law Agency, Allahabad, edn. 2008),page 28.
[2] Peter White (ed.), Crime Scene to Court The Essential of Forensic Science(RSC Publication, Cambridge), 1998

forensic science as "Forensic science is the application of natural sciences to the procedures of law. In practice the subject of forensic science draws its Principles and Methods from the subjects like physics, chemistry, biology and other science subjects" [3]

The California Criminalistics Institute defines forensic science as "the application of fundamental science principles and procedures to legal challenges."

Forensic Science is a huge subject of research. It comprises Crime Laboratory Scientists, often known as Forensic Scientists or Criminalists, who work with physical evidence acquired at crime scenes." The application of natural sciences to legal issues is known as forensic science. Physics, chemistry, biology, and other scientific procedures and techniques are all intertwined with forensic science.It involves recognition, identification, individualization and evaluation of physical evidence for the purpose, of administration of criminal justice. It's one of most energetic, charismatic and contemporary and exhilarating branch of science used in identifying crimes and criminals.[4]

In the criminal justice system, the notion of forensic science is not new. It has been around for thousands of years. In 1902, Argentina was the first country to use forensic evidence in a criminal case. Sir William Herschel was among the first to argue for the use of fingerprinting to identify criminal criminals. By the late 1700s, forensic science had become an important role in determining guilt or innocence in significant criminal trials, including murder allegations. The study of DNA, the genetic coding present on all living things, is one of the major responsibilities of forensic science. By the end of the twentieth century, forensic scientists had access to a wealth of high-tech instruments for examining evidence, ranging from DNA analysis to digital fingerprinting techniques.

Investigation and Analysis of Crime Scenes

Forensic science begins at the scene of the crime, when a thorough examination takes place under the supervision of specialists. They accurately differentiate, document, and gather physical evidence such as fingerprints, bloodstains, hair strands, clothes, guns, and other items. Experts rebuild the pattern of conditions that resulted in misbehaviour by decrypting the

[3] Grover, N., & Tyagi, I. (1910). Development of Forensic Science and Criminal Prosecution-India. *Nature*, *23*(578), 76.
[4] Nayan Joshi, Medical Jurisprudence and Toxicology (Kamal Publishers ,New Delhi, 2008), P.23

surroundings and the arrangement of testimonies. This method is essential for creating the original skeleton of the research.

Collection and Preservation of Evidence

The precise use of well-known procedures is essential for the acquisition and protection of proof. Forensic professionals make certain that evidence is handled with care to avoid contamination, deterioration, or exploitation. Each piece of evidence is processed through documentation, identifying and confirming its sincerity and competency for use in court. The continuous evidence trial is carefully contested in order to move evidence from the scene of the crime to the research centre or lab, and finally to the court chamber. Collecting and keeping evidence in forensic science plays an important function in bolstering the criminal justice system's dependability and fidelity. These actions aid in ensuring the precise investigation and presentation of evidence during judicial proceedings, so helping the pursuit of justice and protecting individual rights or immunities.

Laboratory Analysis

Following proof accumulation, an aggressive approach to laboratory analysis is taken. Various forensic scientific subfields, including DNA analysis, toxicology, ballistics, and digital forensics, begin to have an influence. Specialists use cutting-edge tools and procedures to properly assess evidence. To instance, DNA profiling gains the capacity to correlate suspects, patients, or crime scenes, whereas toxicological testing detects the presence of drugs or poisons in the body.

Examination of Fingerprints

Fingerprint analysis is a fundamental cornerstone of forensic science. Distinctive fingerprints are created by discernible arrangements on the skin's ridges. Forensic experts compare concealed fingerprints discovered at crime scenes to recognised prints stored in databases, establishing plausible suspect ties. This approach has been shown important in several occasions, forming an influential link between identities and places.

Uncovering Digital Traces

In today's criminal investigative scenario, the world of digital markings has taken centre stage,

and forensic science remains a critical endeavour in unravelling the complicated web of digital proof. As criminal activities leave more electronic footprints, forensic professionals expertly direct this digital sector, employing novel methodologies and cutting-edge equipment to extract, evaluate, and analyse the electronic evidence left behind by criminals. The convergence of technology and examination procedures has established forensic science as a necessary instrument for retrieving digital evidence and shedding light on modern crimes.

Decoding Firearm Evidence

Within the field of forensic science, the careful investigation of ballistics evidences stands as a decisive investigative approach with the ability to find a crucial knowledge of criminal occurrences involving weapons. Ballistics analysis demands a thorough examination of bullets, cartridge casings, and the different patterns they leave behind. Forensic specialists untangle these sensitive indicators by using scientific rules and sophisticated processes, untangling the confidence of firearms-related incidents and facilitating a comprehensive picture of crime scenes.

Expertise in Forensic Anthropology

Forensic anthropology is concerned with identifying human residue, particularly when it has deteriorated. Specialists evaluate the skeletal remnant to determine age, gender, appearance, and potential causes of death. This knowledge assists in identifying patients and planning for their deaths.

Reconstruction of Crimes

By combining proof, inquiry, and scientific principles, forensic professionals reconstruct the sequence of events leading up to a crime. This procedure assists law enforcement in understanding the mechanics of crime, the roles of persons involved, and potential aims. Crime restoration enables academics and legal specialists to create a reasonable narrative for the legal forum.

Expert Witness Testimony

The declaration of expert witnesses, particularly those well-versed in the field of forensic science, plays an important role in the convoluted movement of the court system. These

professionals, who have extensive expertise and experience, play a critical role in clarifying difficult scientific perspectives and proof to magistrates and committees. The combination of scientific professionals and legal processes enables expert witnesses to provide fair and well-informed views, bridging the gap between sophisticated forensic investigations and the comprehension of those charged with giving judgement.

Revitalizing Cold Cases

Cold cases, which are distinguished by their long-standing unresolved status, have gained new life via the application of forensic technology. These dormant situations have seen a reemergence of consciousness and growth as a result of the evolving procedures and techniques within the area of forensic science. This resurgence has given fresh life to investigations, providing a glimmer of hope for solving mysteries that have befuddled jurisdictions and associations for years.

Role of forensic science in criminal investigation

In today's world, technology plays a crucial role. Forensic Science is equally important in the criminal justice system. In a criminal investigation, it identifies physical and scientific evidence. This technology identifies the perpetrator of the crime and precisely determines the sort of crime committed. It also provides results of when it is completed. It can also indicate the location of criminal activity. This form of inquiry shows the technique of crime, or how it is carried out. To summarise, forensic science has fundamentally altered the types of evidence and their accuracy. It establishes a direct link between the perpetrator and the crime. The investigation procedure involves gathering evidence at the scene of the crime or gathering evidence from the individual with whom the crime was committed, and then presenting the findings of the investigation in a court of law. Although the circumstances of each case change, this raises fresh challenges for the courts. This sort of technology is critical in identifying a person's personal belongings, identification, fingerprints, blood, hair, weapons, and other items. It mostly identifies criminals by the things used in their crimes. Because of its accuracy, it also plays an important part in determining the innocence of the accused. As a result, forensic science not only aids in the identification of criminals, but it also plays a significant part in demonstrating the innocence of individuals. It is only because of this technology that investigations have gotten easier due to the accuracy of results, and they play an important part in the criminal justice system.

Statutory framework for forensic science in India

Various legislative requirements control the admissibility and use of forensic evidence in courts in the Indian criminal justice system. These regulations guarantee that forensic evidence is collected, kept, and evaluated in a way that is scientifically valid and credible.The following are some of the key legal provisions related to forensic science in India:

a. The Indian Evidence Act, 1872 (IEA):

It establishes the legal foundation for forensic evidence admittance and appraisal in Indian courts. The Act and forensic science have a close link since the Act governs the admission, relevancy, and weight of evidence in Indian courts, which includes forensic evidence. 'Forensic specialists,' on the other hand, play an important role in offering expert views, interpretations, and analysis of forensic evidence, supporting courts in reaching reasonable and fair judgments in criminal cases.Some of the relevant provisions of the Indian Evidence Act that are closely related to forensic science are:

• Section 45: It is concerned with professional opinion. It makes expert opinions, especially forensic specialists, admissible as evidence in court. Forensic specialists can give advice on a variety of topics, including handwriting analysis, fingerprinting, DNA profiling, ballistics, and other scientific or technological issues.

• Section 47: It is concerned with the examiner's assessment of electronic evidence. It makes the expert opinions of digital forensics or other similar areas admissible as evidence in instances involving electronic records such as computer-generated documents, emails, or other digital evidence.

• Section 73: It is concerned with comparing signatures, handwriting, or finger imprints. It permits expert views to be admissible in trials requiring the comparison of signatures, handwriting, or finger imprints, which can be critical in disputes regarding the identity or validity of documents.

• Section 165: This section discusses the court's authority to interrogate witnesses. The court may examine forensic specialists or other witnesses in order to explain or illustrate technical or scientific issues concerning the evidence provided.

b. The Code of Criminal Procedure, 1973 (CrPC):

The CrPC and forensic science collaborate to guarantee that forensic evidence in criminal trials is "collected, evaluated, and presented" in an appropriate and legal manner. They have a close link since the CRPC establishes procedural standards for the investigation, prosecution, and trial of criminal matters, including those using forensic evidence.Some of the relevant provisions of the CRPC that are closely related to forensic science are:

- Section 46: It addresses the police's authority to conduct arrests as well as the processes to be followed during arrests. During the arrest process, forensic procedures such as fingerprinting, DNA profiling, and other types of identification may be employed to establish the identify of the accused.

- Section 53: This section deals with medical practitioners' examinations of accused people, including the gathering of body samples for forensic investigation. To determine the accused's guilt or innocence, forensic testing of body fluids, DNA samples, or other physical evidence may be performed.

- Section 207: It is concerned with the provision of copies of papers and statements to the accused. As part of the due process, forensic reports, laboratory findings, and other relevant papers may be supplied to the accused, allowing them to contest or refute the forensic evidence produced against them.

- Section 293: This section addresses the admissibility of government scientific expert reports. Under specific situations and standards, forensic reports or scientific analyses done by government specialists may be admitted as evidence in court.

c. *The Indian Penal Code, 1860 (IPC):*

The Act is a comprehensive criminal legislation in India that defines many acts and their penalties. In contrast, forensic science uses scientific procedures and techniques to gather, analyse, and interpret evidence in criminal investigations. The Act and forensic science are closely intertwined, with forensic analysis often playing a crucial role in investigating and prosecuting crimes. The relevant provisions in the IPC provide a legal framework for the use of forensic evidence in criminal cases, helping to establish guilt or innocence and ensuring

justice is served. Several provisions in the IPC pertain to forensic science, such as:

- Section 328: It addresses offences involving the use of poison, caustic chemicals, or other noxious substances to cause harm or injury, as well as the penalty for such acts.

- Sections 272 to 278: These sections deal with charges involving adulteration of food or drink, counterfeit pharmaceuticals, and virus propagation, which may need forensic examination to determine the existence of hazardous chemicals.

- Sections 195 and 463: These sections deal with forgery and document tampering, which may need forensic investigation of handwriting, signatures, or other evidence linked to documents.

- Sections 304B and 498A: These sections deal with offenses related to dowry deaths and cruelty to married women, which may require forensic investigation of injuries, causes of death, or other forms of evidence.

d. ***The Information Technology Act, 2000 (IT Act):***

In India, it is a critical piece of law that oversees several elements of information technology and cybersecurity. It establishes a legal framework for digital evidence collection, preservation, investigation, and prosecution, while also protecting data security and privacy. For instance - Section 65B of the Act deals with 'Admissibility of electronic record' - It specifies the criteria under which electronic records can be used as evidence in court, including the need that electronic documents be certified by someone in a responsible official position. By following the specified processes and presenting expert evidence in court, forensic experts can play a critical role in assuring the admissibility of electronic information.

e. ***The Narcotic Drugs and Psychotropic Substances Act, 1985 (NDPS Act):***

In India, the NDPS Act has a symbiotic connection with forensic science, since the former deals with offences involving narcotics, drugs, and psychotropic substances, while the latter plays an important part in the investigation, prosecution, and conviction of such offences.Some of the relevant provisions of the NDPS Act that are closely related to forensic science are:

• Section 50: This section addresses an authorised officer's authority to search and arrest without a warrant, as well as the procedures to be followed during such searches. In order to

determine the kind and quantity of the narcotics or drugs, forensic science procedures such as drug identification, analysis, and weighing of confiscated items are required.

• Section 67: This section addresses the penalties for publishing or transmitting anything that encourages the use of narcotic drugs or psychotropic substances. To determine the content and type of digital or printed material, forensic investigation may be required.

CONCLUSION

Forensic evidence is critical in criminal investigations in India, since it ensures justice, truth, and legal integrity. It assists law enforcement in establishing facts, linking suspects to crime scenes, and providing incontrovertible proof as technology and forensic science develop. Modern approaches and intensive professional training improve efficiency and dependability. However, issues like as limited resources, obsolete infrastructure, and established protocols must be addressed. A complete methodology combining scientific rigour, ethical principles, and legal scrutiny is required to properly use forensic evidence.

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