

A COMPREHENSIVE STUDY ON ROLE OF FORENSIC SCIENCE IN DEATH INVESTIGATION

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ABSTRACT:

In a criminal investigation and trial, forensic evidence plays a very vital role, which is mainly concerned with materials and the materials associating with men, place & time. Forensic science process the materials & establish their presence or absence with the crime, criminal, victim, weapon allegedly connected with the offence. Forensic science evaluates the available physical evidence and to provide it as better evidence to the cases in court of law. Forensic science plays a crucial role in death investigation cases and to establish the facts and evidence on the alleged crime. Forensic science provides various scientific tools and methodologies that greatly enhance the accuracy, objectivity and creditability of investigation processes. The main component of the forensic death investigation is the autopsy, performed to determine the physiological cause of death in the suspected cases and further analyse the presence of various biological components and other toxic substances in cases of overdose, poisoning or substance abuse. Forensic science aids in determining time since death using variety of indicators which includes body temperature, rigor mortis, lividity, decomposition and insect activity. In cases, where identity of deceased is unknown, forensic anthropologists and odontologists play a critical role by analysing skeletal fractures and dental records.

Key words:

Death investigation, post-mortem examination, time of death, forensic pathology, unnatural death, autopsy, toxicology.

1. INTRODUCTION:

The Crime is any wrongdoing against the state and society, such crimes when heinous in nature is considered as most serious offence against the state and the prosecution is burdened with investigation at utmost care. In such instance, whenever any offence makes a serious impact on human body like Murder, a critical process of death investigation comes into play. The ultimate goal of forensic evidence in death investigation is not only to establish the

cause and manner of death but also to provide clarity, objectivity through scientific validation. The nature of death is determined and relied on the conclusion arrived by the prosecution side. However, the courts are growing for the demand of evidence-based conclusion in such complex matters. Forensic science is the methodology applying scientific principles and techniques to the matter of legal interest. Death investigation includes examination of scene of occurrence, autopsy, toxicological testing,

estimation of time of death and identification of deceased and cause of death.

Traditionally the nature of death is determined and heavily relied on the observation and interpretation of law enforcement officers, witnesses and circumstantial evidence. However, the courts are being having growing for the demand of evidence-based conclusion in the cases and the raising complexity of modern crime, the forensic science in death investigation has an indispensable role in providing the essential facts and the evidence for the conclusion of the case. The forensic science is the application of the scientific principles and the techniques to the matter of legal interest. It serves as the bridge between the science and the law, providing accurate and objective data that can be either confirm or disprove the circumstances surrounding the person's death. A death investigation typically involves multiple steps including the examination of the scene of crime, autopsy procedure, toxicological testing, estimation of time of death and identification of the deceased and the causes of death.

2. OBJECTIVES OF THE STUDY

The main object to study on the role of forensic science in death investigation is to as follows.

1. To examine the contribution of forensic science techniques in determining the cause and manner of death.
2. To analyse the role of post-mortem examination in identifying suspicious, sudden and unnatural death.
3. To evaluate the effectiveness of crime scene investigation in collecting & preserving forensic evidence.

3. RESEARCH HYPOTHESIS:

Forensic death investigation techniques would significantly enhance the accuracy of determining the cause, manner and time of death in criminal investigation.

4. RESEARCH METHODOLOGY:

This study employs the doctrinal research methodology, primarily based on secondary research in utilizing a comprehensive analysis of books, academic journals, research papers,

case studies & legal reports to explain death investigation.

5. REVIEW OF LITERATURE:

1. FORENIC SCIENCE IN CRIMINAL INVESTIGATION & TRIAL

The author *B.R. SHARMA* in his book has provided the various and each part of forensic science in the criminal investigation. It provided with entire study on the elementary forensic medicine i.e, the medico legal analysis.

2. KNIGHT'S FORENSIC PATHOLOGY

Pekka Saukko and Bernard knight's forensic pathology, 3rd edition 2004 describes the autopsy as the cornerstone of death investigation. The text details how internal and external examinations assist in establishing the cause and manner of death, especially in cases of homicide & sudden unexplained deaths.

3. CRIME SCENE INVESTIGATION & RECONSTRUCTION

The authors Fish, Muller and Braswell in their book crime scene investigation highlights the importance of initial scene examination in preserving evidence and reconstructing events. They discuss how improper scene management can result in loss of valuables trace evidence, contaminating the chain of custody.

6. DEATH INVESTIGATION:

Death investigation is a systematic process involving study to determine the cause, manner and circumstances surrounding a person's death. It plays a crucial role in public health & safety by identifying preventable factors contributing to mortality. Death investigation is considered one of the important responsibilities assigned to an investigating officer. Homicide demands a highly specialised set of skills, extensive experience, sharp intelligence in collecting, interpreting and preserving evidence.

1. CORPUS DELICTI – the principle that a crime involving a body has occurred.
2. IDENTITY OF THE DECEASED – confirming who the deceased person is.
3. TIME OF DEATH – estimating when the death occurred based on postmortem changes.
4. MODUS OPERANDI – understanding the method used to commit the act, which can

provide insights into the suspect's behaviour or patterns.

5. CAUSE OF DEATH – identifying the medical reason for the death. [eg. Gunshot wound, blunt force trauma, poisoning]

6. LINKING CLUES – gathering physical & circumstantial evidence that connects a suspect to the crime.

This process of death investigation is completely mandated by legal sanctions and are typically initiated when a death is reported to police or medical examiner.

The investigative process unfolds in several stages:

6.1 Death scene assessment

The investigators secure and document the area thoroughly using photographs, sketches and detailed note observations on the position of body, presence of weapons (or) suspicious objects, signs of struggle, blood patterns and other forensic evidence.

6.2 Identification of the deceased

establish the identity of deceased through visual confirmation by relatives or through their fingerprints, dental records, tattoos (or) at time during DNA testing.

6.3 Postmortem Examination (autopsy)

A process of detailed examination of the body to determine the cause and manner of death, includes both external and internal assessment, inspection of injuries, organ conditions etc.

6.4 Laboratory & forensic testing

It helps to detect the presence of drug, alcohol (or) poison in the body. The finding of such tests enhances the accuracy of conclusion drawn from the investigation.

6.5 Forensic anthropology & odontology

In some cases, where the body may be obtained either in decomposed state or only with skeletal remains, forensic anthropologists help to determine age, sex, stature & ancestry of the deceased while forensic odontologists may analyse dental records for the identification purposes.

7. EXAMINATION OF THE SCENE

The examination of the crime scene is a critical and foundational phase in the death

investigation process in forensic evidence. It lays the groundwork in reconstructing the sequence of events leading to death. The crime scene might always contain essential evidence that help establish the cause, manner & time of death.

A crime scene is defined as the physical location where the suspected crime has occurred or where evidence related to the death may be discovered. The scenes may vary either indoor location such as homes or buildings otherwise on outdoor environment such as fields or roadways etc. The investigators must treat every scene as potential source of crucial forensic evidence.

7.1 INDOOR SCENE EXAMINATION

In indoor crime scene examination, investigators must be thorough in identifying, preserving and documenting potential evidence. There are certain key elements to be scrutinized during the indoor scene analysis.

i) Presence of a suicide note – In matters of suicide cases, the discovery of suicide note can offer potential insights into the psychological state of the deceased.

ii) Hiding places for incriminating objects – Investigators must search for hidden items like weapons used in the crime, belongings of the victim etc. They may carry trace evidence that may link the suspect with the crime.

iii) Condition of the environment – A detailed examination of the overall condition of the scene of occurrence is very essential. The study on the environment includes checking doors, windows, locks, ceilings, wall, washrooms etc.

7.2 OUTDOOR CRIME SCENE EXAMINATION

The outdoor crime scene examination is a challenging step which demand an immediate & careful processing as it is prone to external disturbances. During such examination, investigator must be alert enough to note the signs of struggles (or) resistances that occurred at the scene. Some notable observations include upturned (or) broken furniture, bloodstains on walls, floors (or) objects, pulled hair (or) torn clothing, weapons (or) objects

used in the assault, footprints (or) shoe marks, foreign materials like bullet, cartridges or fragments on victim's body.

There are certain factors that investigators must consider during crime scene examination

- i) Urgency in preserving the evidence as they are prone to external disturbances.
- ii) Protecting the scene from any unauthorised entry & secure the perimeter from tampering.
- iii) Executing a planned examination approach with sufficient artificial technical support.
- iv) Careful collection of biological evidence, as they are highly sensitive to contamination.

8. EXAMINATION OF THE DECEASED (CORPUS):

The examination of the deceased body at the scene often referred as corpus examination which is essential in gathering initial forensic examination. While a full autopsy is conducted later by a forensic pathologist, the preliminary external examination by the investigating officer must be meticulous and documented with precision.

The stage of such examination includes,

- i. Confirming death: The investigator must confirm the absence of vital signs before proceeding with further examination.
- ii. Photographing the body: Multiple photographs must be taken from various angles before any movement, preserving the body's original position and condition.
- iii. Sketching the body position: A diagram illustrating the exact location and position of the body provides context for future analysis.
- iv. Recording descriptive details: Information such as clothing, visible injuries, jewelry, surrounding items should be carefully documented.
- v. Injury documentation: Visible injuries must be recorded thoroughly, including type, location and pattern. This can provide clues about the weapon used and the nature of the assault.

vi. Observation of bloodstains: Bloodstains on and around the body must be photographed and documented without disturbing the scene.

vii. Estimation of evidence: The officer must evaluate the possible evidence present at the scene including physical, biological & trace materials.

Following the scene examination, the investigating officer is required to prepare a detailed inquest report. This report should summarize observations and findings at the scene and serve as a foundational document for further forensic examination.

9. POST-MORTEM EXAMINATION:

Post-mortem examination in cases of sudden and suspicious death holds immense value in forensic science and must be performed with precision and care. The autopsy is a cornerstone of medico-legal investigation, offering crucial insights into the cause, manner and time of death. It plays a pivotal role in bridging the gap between the medical and legal communities, allowing investigators to reconstruct the events that led to a person's death. In forensic terms, post-mortem examination is not only the dissection and observation of the deceased body but also involves the systematic assessment of the death scene whether indoor or outdoor analysis of signs of struggle, evaluation of injuries, collection of evidentiary clues.

A post-mortem is indispensable in cases where death is unexplained, unnatural or suspected to be a result of criminal activity. It offers a scientific basis for legal decisions and supports the administration of justice. A comprehensive forensic post-mortem helps establish the corpus delicti, the fact that a crime has been committed by providing medical confirmation of death and the circumstances surrounding it.

9.1 IMPORTANCE OF POST-MORTEM EXAMINATION:

Post-mortem examination serves as a fundamental step in handling death cases by providing vital evidence that contributes to the investigative and judicial processes. Its

importance can be outlined in the following objectives:

1. To establish corpus delicti
2. Ascertain the nature of death
3. Identify weapon of offence
4. Determine the number of injuries and possible assailants
5. Reconstruct the sequence of events
6. Evidence of sexual offences
7. Confirm or contradict witness statements
8. Identify unidentified victims
9. Collect evidentiary clues
10. Obtain specimens for toxicological testing
11. Assess severity of injuries

9.2 PROTOCOL FOR CONDUCTING POST-MORTEM EXAMINATION:

The following systematic steps are critical to ensure thoroughness and accuracy in post-mortem cases:

1. Photograph the deceased – before and after autopsy, the body to be photographed and special attention to be given to facial features, tattoos, deformities and clothing for identification purposes, particularly in cases involving unidentified, putrefied or mutilated bodies.
2. Gather case history – including the medical history, suspected cause of death and any available eyewitness accounts.
3. Scene Examination – The forensic pathologist should visit the scene when possible or review some photographs, sketches and police reports to understand the environmental context.
4. Mortuary examination – Autopsy must only be conducted in a certified mortuary with proper forensic facilities.
5. Avoid Pre-autopsy Tampering – Fingerprinting, embalming or cleaning the body before examination can lead to loss or contamination of critical trace evidence
6. Secure trace evidence – During body transport and prior to examination, efforts should be made to preserve strains, fibers, hairs or foreign materials

7. X-ray the Body – helps locate hidden fractures, foreign bodies (e.g. bullets) or skeletal abnormalities before dissection.
8. Document injuries – All visible injuries should be photographed before and after cleaning, using a scale and identification tag.
9. Clothing examination – The medico-legal expert should personally remove and examine the clothes, documenting the damage, bloodstains or other markings.
10. Preserve Negative findings – observations inconsistent with preliminary hypotheses must be recorded, as they may later become vital.

10. EXAMINATION OF THE DECEASED:

The examination of the deceased body includes various steps and procedures to look into, consists of general examination, body examination, injury handling and internal examination.

1. General examination

- i. Determine and record age, sex, race, body build and height.
- ii. Note any identifying marks, scars, deformities, old injuries, moles or tattoos.
- iii. Describe the clothing and signs of damage
- iv. Link external injuries with the clothing damage to trace the trajectory and nature of trauma.
- v. Collect and preserve any foreign material (dirt, fibers, plant matter) found on the body or clothes.

All collected evidence must be dried if wet, packaged separately, labelled correctly to avoid contamination or degradation

2. Body examination

- i. Observe livor mortis, rigor mortis and body temperature to estimate time since death
- ii. Examine for any unusual signs, discoloration, swelling or inflammation
- iii. Look for asphyxia signs such as cyanosis, petechial haemorrhages or any ligature marks.
- iv. Document dental status, presence of dentures or dental restorations for identifications.

v. Identify disease conditions or medical interventions That could be contributory.

vi. Detect defensive injuries such as search as abrasions on forearms or knuckles

vii. Record negative findings (NAD – Nothing abnormal detected) where appropriate.

3. Handling injuries:

i. Observe and record all the major or minor, internal or the external injuries.

ii. Observe and evaluate a firearm injury from the site of entrance and describe full about the wound of entrance, the internal track and the lodgement site or the exit wound in detail.

4. Preservation of evidence:

i. Proper collection and preservation of are essential for the integrity of forensic findings.

ii. Items to be preserved includes projectiles, fragments or any other foreign objects found.

iii. It also includes Gun wads, extraneous deposits, charred tissues in case of burns, gunshot residue from the hands.

5. Internal Examination:

This stage involves a meticulous examination of internal organs and systems to determine internal trauma or natural diseases. Observations are to be recorded using standard autopsy procedure and should cover the following systems

i. Examination of head, scalp, skull, brain tissue and intercranial haemorrhages

ii. Examination of neck region including hyoid bone, larynx, trachea for signs of strangulation.

iii. Respiratory system: lungs and bronchi for edema, aspiration or haemorrhages.

iv. Cardiovascular system: heart, vessels and myocardium for infarcts or trauma.

v. Gastrointestinal system: stomach and it's contents, ulcers or perforations.

vi. Reproductive organs in sexually assaulted cases

vii. Kidney, urinary tract and bladder for infection or trauma.

viii. Other internal organs including spleen, pancreas, adrenal glands, biliary tract.

Since, the post-mortem examination is a vital scientific tool to unravel the truth in suspicious death cases. This process to be executed in well established proper manner, in determining the time, manner and cause of death and may help to uncover any evidentiary links associated with the crime.

11. EFFECTIVENESS OF DEATH INVESTIGATION IN CRIMINAL INVESTIGATION:

The death investigation plays a crucial role in the process of criminal investigations particularly in aiding the investigation to provide a determined cause, manner, time and nature of death when the circumstance of the death is unclear or suspicious. In countries like India, the death investigation plays a pivotal role in criminal justice system, seeking coordination of forensic experts, law enforcement agencies and legal authorities with an ultimate goal to uncover the truth. The admissibility, reliability and relevance of evidence collected through such investigation are governed by Bharatiya sakshya adhiniyam, 2023, procedural statutes and tested through the judicial precedents. Section – 39, BSA, 2023 admits the expert evidence from the medical, forensic and scientific experts. BNSS in addition mandates that the admissibility of forensic reports from the government medical or scientific experts may be used as an evidence in the inquiry, trial and other proceeding under the code. The reports of forensic medical examination has a relevancy of evidence as a corroborative and circumstantial evidence in the criminal cases in the court of law which helps in determining the cases.

12. JUDICIAL PRECEDENTS:

1. SHARAD BIRDHICHAND SARDA V. STATE OF MAHARASHTRA (1984) 4 SCC 116

This matter is of where death of wife of the sharad due to alleged poisoning in the sharad's apartment. It has been held that the cause of death from the autopsy report i.e, poisoning must be conclusively proved via forensic toxicology and it must be proved as a circumstantial evidence, mere report couldn't conclusively prove the accusation. It observed

that toxicological findings must clearly prove the cause of death, and the absence of such proof weakens the prosecution.

2. RAM NARAIN SINGH V. STATE OF PUNJAB (1975) 4 SCC 497

In this matter, there has been inconsistency between eyewitness and medical evidence. The court gave precedence to medical/post-mortem evidence which contradicted eyewitnesses. Medical evidence regarding the manner and cause of death can outweigh oral testimony if it is more reliable and scientifically grounded.

3. STATE OF U.P. V. KRISHNA GOPAL (1988) 4 SCC 302

In this matter, it has been observed that forensic evidence was consistent with homicidal nature, time and cause of death were supported by autopsy findings and established a coherent link between post-mortem findings and other circumstantial evidence can lead to conviction.

4. STATE OF MAHARASHTRA V. SURESH (2000) 1 SCC 302

In this matter, the accused was convicted based partly on forensic evidence. The supreme court emphasized that forensic evidence like post-mortem reports, blood analysis, and time of death estimations can be crucial in establishing the link between the accused and the crime. Forensic findings helped corroborate circumstantial evidence and determine the time and cause of death.

5. SHANTI DEVI V. STATE OF RAJASTHAN (2012) 12 SCC 158

In this matter, it has been observed that the dead body was found on the extra judicial confession. The body was sent to the autopsy and where from the post-mortem report didn't conclusively determine the exact cause of death due to decomposition and also the identity of body. Article recovered from the body has only been used to link as corroborating identity through circumstantial evidence. And this case demonstrated that the forensic evidence, even when not definitive in proving the exact manner and cause of death, can be

highly relevant in corroborating circumstantial evidence.

6. TOMASO BRUNO & Anr. V. STATE OF U.P (2015) 7 SCC 178

In this matter, the forensic photography, video and electronic evidence admissibility in murder case was questioned. The court emphasized that in modern investigations, scientific and electronic evidence must be preserved and produced, and such evidence is admissible and vital in death cases. The case has highlighted how forensic tools beyond autopsy like CCTV and digital footprints are relevant and admissible in murder cases.

The role of forensic evidence in death investigation in the Indian criminal justice system is very crucial and inseparable. Judicial precedents, legislative enactments consistently affirm the evidentiary value of such reports, especially when corroborated with circumstantial evidence. Courts have emphasised its importance in resolving the conflicts between oral testimony and scientific findings. Even when inconclusive, as in shanti devi, forensic evidence aids in identification and supports circumstantial links. Thus, forensic death investigation is indispensable in ensuring accurate, fair and evidence-based adjudication in criminal cases.

13. CONCLUSION AND SUGGESTION:

Forensic science plays a pivotal role in modern death investigation by offering a scientific foundation to establish the cause, time and manner of death. It bridges the gap between the law and science, aiding in the pursuit of justice through accurate and objective analysis. Thus, the study concludes that death investigation becomes more effective when multiple forensic disciplines such as pathology, toxicology, anthropology and digital forensics are integrated. Postmortem examinations and toxicological testing reports are very critical in identifying suspicious and unnatural deaths. Forensic evidence along with circumstantial evidence creates a strong admissibility and reliability in Indian courts. The approximate finding of time of death estimations provide a

valuable suggestion that guide the investigators to corroborate the same with witness statements. Indian legal frameworks increasingly recognise the importance of forensic science and thus it is considered to be the cornerstone in the accurate, fair and scientific resolution of criminal death investigations.

Suggestions

1. Enhancement of forensic infrastructure

To establish forensic centres across the nation with potential facilities and resources to avoid any delay and backlogs. The forensic lab should be upgraded with advance tools like DNA sequencers, toxicology analysers and digital forensic systems.

2. Mandatory forensic training

The investigating officers, medical officers and judiciary must be regularly trained in forensic methods, evidence handling and interpretation of expert reports.

3. Legislative Reform and Standardization

The implementation of the new criminal law must be complemented by uniform protocols for forensic procedures to ensure consistency across the country.

4. Establishing an Independent Forensic Authority

An independent forensic authority to be raised which would bring greater transparency and accountability to forensic practices. It would help in oversight, policymaking and maintaining professional standards.

5. Digitization and Record Management

To promote digitization in crime scene investigation and documentation and the forensic data storage can greatly improve evidence reliability and accessibility. A centralised digital database for forensic reports and autopsies would greatly influence the same.

6. Coordination between agency & experts

To promote inter-agency coordination between forensic experts, law enforcement officers and prosecutors is vital to maintain investigative coherence and case efficiency.

7. Awareness and Education

A widespread awareness among public and legal literacy should be promoted to increase understanding and trust in forensic science among the general population and victim families.

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