

Child Sexual Abuse and Forensic Science: An Analysis of the Interplay

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Abstract

Child sexual abuse is a serious social and moral crime, which deeply damages the physical, mental and emotional dignity of children. In such cases, where the victim children often remain silent due to fear, hesitation and social pressure, forensic science plays a decisive role. This science analyzes the physical, biological, digital and psychological evidence related to the crime through scientific methods, which helps the courts to establish the truth of the crime and the identity of the accused. Child sexual abuse cases are investigated in depth with the help of subdivisions like forensic medicine, DNA profiling, digital forensics and forensic psychology. DNA evidence is extremely effective in identifying the culprit, while digital forensics exposes crimes committed through cyber means. Forensic psychology is helpful in understanding the mental state of the victim. In India, forensic evidence is legally recognized under the POCSO Act, 2012 and is considered the basis of the judicial process. Although challenges such as lack of training, resources and awareness remain in this field, forensic science has emerged as a powerful tool in the fight against child sexual abuse. It not only helps in punishing the criminals but also plays a vital role in restoring justice, security and confidence to the victim children. Thus, forensic science should be considered extremely valuable not only from technical but also ethical and social point of view.

Keywords: Child, Abuse, Offence, Forensic Science, Evidence, Criminal Justice

Introduction

Child sexual crimes are those heinous and morally abhorrent acts which harm the physical, mental and emotional dignity of children and obstruct the natural development of their innocence and personality. These crimes are those acts committed against any boy or girl against their will, forcefully or fraudulently for the fulfillment of sexual purposes, which produce extremely destructive effects considering their age, understanding and emotional balance. Child sexual abuse is not limited to physical rape only, but it also includes obscene acts, inappropriate touching, showing obscene pictures or videos, making sexual comments, threatening, or sexually harassing children through digital medium.

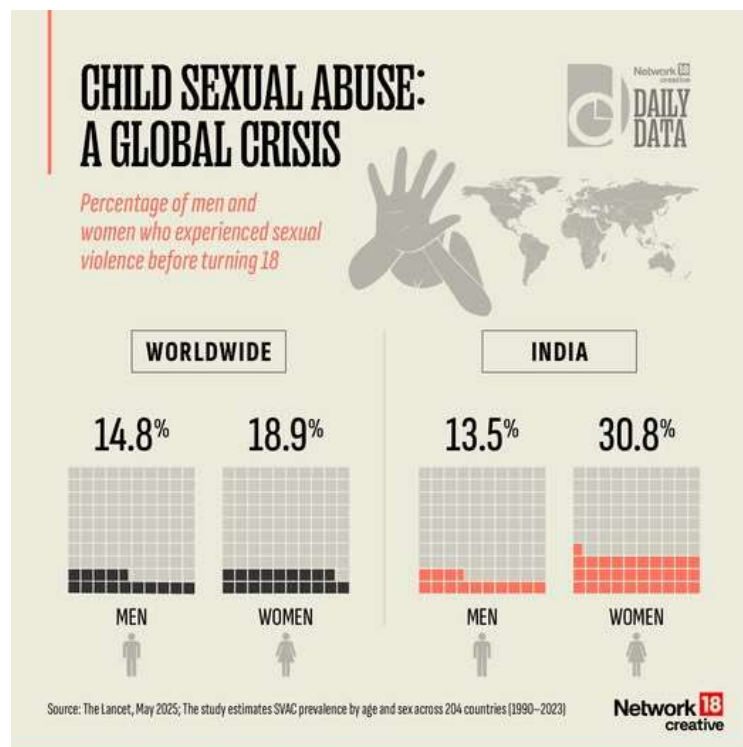
In a developing nation like India, where social taboos and family hesitation prevent children from expressing their pain, child sexual crimes emerge as a hidden social tragedy. Most of such crimes are committed at home, school or by people known to them, due to which the feeling of fear, distrust and self-reproach deepens in the victim children. These crimes have far-reaching effects on child mental health—which can lead to depression, anger, social isolation, and sometimes even suicidal tendencies.

To prevent these crimes and provide justice to the victim, the Government of India has passed the "Protection of Children from Sexual Offences Act, 2012" (POCSO Act), which is a comprehensive and gender-neutral law. This Act brings any kind of sexual abuse, sexual harassment, pornography, and sex-related crimes against children under clear definitions and provides for stringent punishment for them. The specialty of this law is that it not only expands the definition of crime, but also ensures arrangements like recording of children's statement, speedy investigation, and hearing in a child-friendly environment. Apart from this, there is also a provision for punishment for child sexual crimes under various sections of the Bharatiya Nyaya Sanhita 2023

It is also important that in the technological era, cyberspace has become a new threat to children, where they are targeted through processes like pornography, obscene messages, online grooming through the Internet. Hence, the role of digital security and parental vigilance also becomes extremely important.

It is the responsibility of every component of society—family, school, administration, and justice system—to ensure a safe, sensitive, and supportive environment for children. We must create an environment where the child can fearlessly speak up and the process leading to justice is not cumbersome or oppressive. Also, it is the need of the hour to teach children about their rights, understanding good and bad touch, and self-defense techniques. Until society considers the dignity of children paramount, no law can be fully effective. Hence, the fight against child sexual crimes is not only the moral responsibility of the court, but of the entire society.

The situation of child sexual crimes in India is becoming extremely serious and worrying. According to the 2022 report released by the National Crime Records Bureau (NCRB), a total of over 1.62 lakh crimes against children were registered in the country, of which about 53,874 cases were registered under the POCSO Act (Protection of Children from Sexual Offences Act, 2012) alone. This means that one in every three crimes against children was related to sexual abuse. According to the report, in more than 32,000 cases of rape, the victim was a minor girl. What is of particular concern is that in about 94% of these cases, the perpetrators were identified as known to the victim children—such as relatives, neighbors, teachers or family friends. Additionally, cases of sexual abuse of children through digital means such as social media, mobile apps and online platforms are also witnessing a steady increase, highlighting a new and dangerous form of child crime. In the state-wise data, large states like Uttar Pradesh, Maharashtra, Madhya Pradesh and Bihar top the list, while Kerala and Delhi have the highest rate of child sexual crimes per lakh population. Although the central and state governments are trying to provide assistance to victimized children through schemes like POCSO e-courts, Childline helpline (1098) and One Stop Centres, many cases still go unreported due to the slow pace of the judicial process, social stigma, and hesitation in reporting.



Forensic Science

Forensic Science is a special branch of science that uses scientific principles and techniques to investigate criminal incidents and assist in the judicial process. This science is a system of collecting evidence of crime in a scientific

way, analyzing them, and proving them before the court. Forensic Science acts as an important bridge between crime and law, which not only helps in punishing the guilty, but also plays an important role in freeing the innocent from false accusations. This science works with the purpose of "discovering the truth" and enables the judicial system to take decisions based on scientific analysis of facts.

Forensic Science includes many subdivisions, such as forensic biology, forensic chemistry, forensic ballistics, fingerprint analysis, DNA profiling, digital forensics, toxicology, forensic auditing, and forensic psychology etc. All these branches are used to examine physical, biological, chemical, digital or psychological evidence found at a crime scene. For example, blood stains, hair, saliva, fingerprints, weapon residues, handwriting on documents, and data obtained from mobile phones or computers are all examined by forensic experts.

In India, forensic science is used to produce relevant evidence in legal proceedings under the Bhartiya Nyay Sanhita 2023, Bhartiya Nagrik Suraksha Sanhita 2023, and Bhartiya Sakshya Adhiniyam 2023. Forensic reports are presented as evidence in court, which are seen as scientific findings. The report and oral testimony presented by a trained forensic expert can be decisive in the decision of a case.

In modern times, the relevance and utility of forensic science has increased unprecedentedly. It has become an invaluable tool in the investigation of terrorism, cybercrime, human trafficking, rape, murder, financial fraud, and even environmental crimes. Moreover, forensic science is not limited to crimes only; It also helps in identifying the dead in disasters, examining ancient remains, and investigating war crimes.

However, the accuracy of forensic science depends on the objectivity, technical proficiency, and ethical commitment of the scientists working on it. The accuracy of evidence and scientific nature of analysis strengthen the basis of justice. That is why this field requires highly trained human resources, state-of-the-art laboratories, and effective coordination with judicial processes.

Thus, forensic science is not only a technical discipline, but it is the backbone of the modern justice system, which promotes scientificity, neutrality, and evidence-based decision-making. This science is a structured, rational, and evidence-based journey towards truth, which proves helpful in establishing justice, security, and trust in society.

Role of Forensic Science in Criminal Justice Process

Forensic Science, also known as Forensic Science, plays a very important and crucial role in the criminal justice system. This science uses scientific techniques and methods in the investigation of crimes and their judicial settlement, which not only provides clarity about the nature and causes of crime, but also ensures identification of the culprits and protection of the innocent persons. The basic objective of the criminal justice process is to establish justice, and forensic science strengthens this objective with scientific objectivity and authenticity. Various types of evidence obtained at the crime scene—such as blood stains, hair, saliva, fingerprints, weapons, documents, fire residues, explosive materials, voice recordings or digital data—are duly collected and analyzed in forensic laboratories. This analysis confirms when, how and who committed the crime. This not only helps the investigating agencies to determine the direction of the crime, but also provides a scientific basis to the courts while taking decisions.

Forensic science plays a crucial role in cases of murder, rape, cybercrime, fake documents, suicide, arson, drug trafficking and terrorism. Techniques such as DNA profiling, fingerprint analysis, narcotics testing, digital forensics and crime scene reconstruction make the justice system more accurate and reliable. Under the Bhartiya Sakshya Adhiniyam 2023, scientific evidence has been considered admissible in court, and over time such evidence has been taken seriously by the courts. DNA testing and forensic reports have been made the basis of judicial decisions, especially in cases of child sexual crime, murder or rape. In addition, with the help of digital forensics, significant success has been achieved in the investigation of cases such as online fraud, cyber attacks, hacking and pornography.

The importance of forensic science in India is increasing day by day, but there is still a lack of state-of-the-art laboratories, trained human resources and modern equipment in this field. Factors such as delay in the judicial

process and negligence in the protection of evidence can limit the usefulness of forensic reports. Nevertheless, when scientific objectivity and evidence-based methodology are given priority, forensic science proves to be the backbone of crime control and justice system. This system not only helps in scientific investigation of crime but also enables the courts to take decisions that are based on logic, evidence and truth. Therefore, in today's time, forensic science is not just a technical branch but has become an integral part of the fairness and credibility of justice, which is equally necessary for the judiciary, police administration and society.

Discussion- Interplay between child sexual abuse and forensic science

The role of forensic science in cases of child sexual abuse is multi-faceted and extremely sensitive. It includes collection and examination of physical evidence as well as analysis of digital, psychological and circumstantial evidence. When there is a suspicion of sexual abuse of a child, the first thing that is required is a forensic medical examination. In this, trained medical experts examine the victim's body microscopically and ensure that no evidence—such as semen, blood, biological traces found under skin, hair or nails—is destroyed. Special care is taken of medical ethics and sensitivity at this stage, so that the child does not suffer from mental trauma again. If the victim is a child, the presence of a female doctor is mandatory, and if necessary, a psychologist is also present to help the child.

The most crucial aspect of forensic science is DNA profiling, which is considered the backbone of modern criminal investigation. Through DNA analysis, it can be almost ascertained to which person a biological evidence belongs. If the DNA of the accused matches with the evidence obtained from the victim's body, clothes or crime scene in the form of semen, saliva or skin cells, then it is presented as an extremely strong and conclusive evidence in the court. Apart from this, the forensic report also shows what was the nature of the abuse, what was its timing, and what are the types of injuries found on the body. Through this science it can be proved that the incident was not consensual but coerced—although consent has no legal validity in cases of children.

In the current technological era, digital forensics has become extremely important in cases of cybercrime and child sexual abuse committed through digital platforms. In cases of entrapping children through the Internet, sending pornographic content, blackmailing by recording videos, or forcibly involving them in child pornography, evidence obtained from digital devices—such as mobile phones, computers, CCTV, hard drives, etc.—plays a decisive role. Digital forensic experts are also able to retrieve deleted data from these devices, thereby rendering the criminal's attempts to hide the crime futile. Information obtained from sources such as WhatsApp chats, browser history, emails, app usage data, GPS location, and cloud storage is presented as scientific evidence in court.

In cases of child sexual abuse, physical evidence alone is not enough, as many times there are no visible marks on the victim's body. In such a situation, the role of forensic psychology is extremely important. Symptoms such as the mental state of the victim children, behavioral changes, fear, social isolation, sleep disturbances, or sudden silence may indicate abuse. Trained forensic psychologists use techniques such as interviews, play therapy, art therapy or behavioural assessment to understand what the child wants to say but is unable to. The assessment reports submitted by forensic psychologists help the court understand whether abuse has taken place, and if yes, how deep is the psychological impact. This assessment is especially important in cases where the child is very young or mentally incapacitated.

After the crime is disclosed, the report prepared by forensic experts is submitted to the court as scientific evidence. This report is not just a collection of data but forms the basis of the judicial process. The court accepts this evidence as independent, unbiased and technical evidence, and on the basis of this, the accused can be declared guilty or innocent. It is important that the report is prepared on time, is technically flawless, and conforms to international standards. In cases such as child sexual abuse, if the forensic report is conclusive, the victim does not have to appear in court again and again, which reduces her mental trauma.

Considering the gravity of crimes related to child sexual abuse in India, the government enacted the POCSO Act, 2012, which specifically guides the prevention, investigation and punishment of sexual crimes against children. Under this Act, special POCSO courts have been established in every state, where the judicial process has been made more sensitive and child friendly. According to the Act, any sexual crime should be investigated in a child

friendly environment, and collection of forensic evidence is mandatory within 24 hours. This Act not only makes scientific evidence the basic foundation of the judicial process, but it also clearly directs that there should be no contempt or harassment of the victim child.

Although forensic science has made the direction of justice in cases of child sexual abuse progressive and scientific, many challenges still remain in practice. The number of forensic experts in India is limited, laboratories are not state-of-the-art, delays in preparing reports, and procedural negligence by the police during evidence collection is common. These shortcomings can impede the justice process. Moreover, institutions such as society, family and schools themselves sometimes try to cover up the crime, making it difficult to obtain evidence. To overcome this situation, it is important to prioritise forensic services, provide sensitivity and scientific training to police and medical staff, and equip laboratories with high-tech facilities.

Finally, the relationship between child sexual abuse and forensic science is not just technical or legal, but also carries the responsibility of protecting social justice, human rights and the dignity of future generations. When society is silent, relationships are confused and victims are frightened, forensic science becomes the only voice that exposes the truth and brings justice to life. This science transforms the darkness of crime into the light of evidence and ensures that an innocent voice, which may never have been heard, can also become the echo of justice. Therefore, it is imperative that forensic science should not be considered merely as a technical tool but should be accepted as a moral, social and constitutional tool, which not only punishes the criminals but also helps in restoring the victim's lost dignity, security and confidence.

Challenges faced by forensic science in solving child sexual abuse crimes

A high-level analysis Child sexual abuse is a highly sensitive, socially and ethically complex crime, in which the role of forensic science in its investigation process is considered extremely important. However, while investigating this heinous crime, forensic experts have to face many multidimensional challenges, which make the justice process complex, delayed and sometimes even futile. The most important challenge is timely and safe evidence collection. Since such crimes are often reported late by the victim, or remain hidden for a long time due to social pressure, physical or biological evidence such as DNA, semen, skin cells or blood traces are destroyed. As a result, the unavailability of useful samples for forensic analysis raises questions on the reliability of evidence.

The second major obstacle is the lack of trained human resources and state-of-the-art laboratories. In a country like India with a huge population, the number of forensic experts is limited and most state-level forensic laboratories are under-resourced. Outdated investigative equipment, unavailability of state-of-the-art technology, and delayed high-quality testing weaken the effectiveness of evidence. The third challenge is the breakdown of the chain of custody of evidence. When police officers or medical staff do not collect and preserve evidence in accordance with scientific procedures, its validity is questioned, and the evidence may be rejected in court.

The fourth challenge is the complexity of digital evidence and the limitations of cyber forensics. Investigation of digital forms of child sexual abuse—such as online grooming, child pornography, or crimes committed through mobile/social media chats—requires high technical expertise. But the speed of cybercrime, encryption of data, and cloud-based information infrastructure make forensic analysis difficult. Additionally, lack of coordination between law enforcement agencies and forensic experts, excessive workload, and failure to submit reports within deadlines also hamper the justice process.

Finally, the sensitive nature of child sexual abuse, the age of the victim, mental state and social fear pose another major challenge—the reliability of psychological evidence. The forensic psychologist has to extract the truth from the subtle cues of the child's language, gestures and behaviour, which is a very sensitive process. If the child's statement is contradictory or the psychological evidence is ambiguous, the judicial process can be disrupted.

Despite all these challenges, if forensic science gets adequate resources, trained experts, sensitive processes and better coordination with the judiciary, then this science can prove to be an infallible medium in investigating child sexual crimes and ensuring justice. Therefore, it is necessary to adopt an integrated approach on policy, resources and training to strengthen the forensic system.

Conclusion

The role of forensic science is very important in solving heinous crimes like child sexual abuse, but its effectiveness can increase even more when it is further strengthened with technical strength, institutional coordination and sensitive approach. Forensic science, especially through DNA profiling, digital forensics, forensic psychology and forensic medical examination, plays a crucial role in the confirmation of crime, identification of the accused and scientific assessment of the mental state of the victim. If forensic facilities are decentralised to all districts and equipped with state-of-the-art equipment, speedy investigation of cases will be possible. Also, harmonised training programmes and child-sensitive procedures should be developed between the police, doctors and forensic experts to protect the dignity and mental state of the victim during evidence collection. Cyber forensic units can be empowered with advanced technologies such as AI-based data recovery, image analysis, and blockchain tracing to prevent sexual crimes committed on digital platforms. Additionally, by routinely incorporating forensic psychology in the investigation of child sexual crimes, scientific analysis of the behaviour, emotional reactions and subconscious signals of the victim can be done, so that the truth can be confirmed even without direct evidence. Therefore, if forensic science is strengthened with resources, training, technological innovation and sensitization, it can play a transformative role in solving child sexual abuse crimes and make the process of delivering justice to the victims more speedy, authentic and humane.

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