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Forensic Science and the Judicial System: An Analysis of Post-Conviction Review and Exoneration

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KEYWORDS

Forensic science, Indian judiciary, post-conviction review, exoneration, wrongful conviction.

ABSTRACT

This paper critically examines the complex relationship between forensic science and the judicial system in India, with a particular focus on post-conviction review and exoneration, mainly in light of the newly enacted Bharatiya Nyaya Sanhita. This analysis delves into how these new criminal laws, replacing the Indian Penal Code, the Indian Evidence Act, and the Code of Criminal Procedure, influence the admissibility and interpretation of forensic evidence, thereby impacting the pathways for wrongful conviction redressal. It investigates the historical development of forensic science in India, tracing its growth from basic initial stages to its existing state, and assess the challenge faced in integrating scientific strictness with legal principles. In addition, this research investigates how recent advancements in forensic modalities, and digital evidence processing, offer opportunities and challenges for the legal framework in India creating efficient protocols for corroboration, use, and retention so as to allow for fair trials. The role of forensic evidence in criminal investigations in India is vital, and plays a major role in the exoneration of the not guilty by advanced scientific processes.

INTRODUCTION

Integrating forensic science into the Indian legal system should be a significant aim to improve effectiveness and fairness within the criminal justice framework [1]. This is important because India has initiated reform efforts to change the post-colonial criminal laws that is crucial, as the Bharatiya Nyaya Sanhita, the Bharatiya Nagarik Suraksha Sanhita, and Bharatiya Sakshya Adhiniyam are approaching reform [2]. The new criminal codes will prompt a fresh consideration of how forensic evidence should be used in the process, particularly with respect to post conviction review and exonerating individuals on the edges of the law [3],[4]. While the new legislation is aimed to again provoke change in the criminal justice landscape in India, mainly with the Bharatiya Nyaya Sanhita being the most powerful position; it will increase police powers and generate broad-spectrum, ill-defined offences that can infringe the accused's rights and the opportunities for the introduction of forensic evidence [4]. Thus, this broad-spectrum analysis will review the circumstances in which forensic science could serve to protect the integrity of the evidence produced at trial, which in turn will reduce the likelihood of wrongful convictions, and increase chances of exoneration. This report will also consider the complications created with admissibility and court barriers that will be present with the digital evidence utilitarian in the emerging Indian legal framework, and how its implications will change the accused's rights and a dual role of the expert witness to turn complex technical evidence into legally significant evidence [5]. We will also consider how we can facilitate discussion of ethical dilemmas and the need for strong regulatory structures to minimize the chances that forensic advancements will cripple the fight for justice, comply with due process standards, or exacerbate existing systemic bias. It will highlight the need for greater forensic capacity and training to ensure that any scientific knowledge created is demonstrably valid, relevant, and can contribute to convicting the guilty, and exonerating the innocent [6]. This will include consideration of the ways in which judicial reasoning interprets implications of using forensic evidence, and the judicial limitations placed on it, such as human error, and human mistakes which should be understood to ensure forensic evidence serves its intended purpose within the legal process [7]. Further, we will examine through an example such as judicial determinations in Selvi v State of Karnataka, and its implications for forensic methods, including and especially with respect to individual rights and liberties.

POST-CONVICTION REVIEW MECHANISMS IN INDIA

In India, although post-verdict review practices are not usually realized as a singular, but comprehensive set of practices, they typically use the appeal process, writ jurisdiction, and inherent powers at the superior courts, so long as it is a threshold

1 In this study, the words "app" and "platform" are used interchangeably

for compelling findings of verdicts based on new evidence, or errors associated with law. This practice and process is, in such ways as are seen, is heightened when new forensic material appears on the scene, which can greatly alter the certainty of considered the basis of the judgment, thus requiring a new review of the original decision process [8]. Forensic evidence is crucial to the precision of the Indian criminal justice process to establish facts, to identify criminal behaviours, and to seek justice [6]. However, inadequate procedural accountability arising from the investigation and the trial phases, such as lagging behind initial filings of First Information Reports or collecting flimsy evidence will typically undermine the reliability of forensic evidence, and via that collection limit the standard for conviction or acquittal [9][10]. This circumstance underlines the need for sufficient post-verdict conviction review procedures which will allow and engage new forensic findings without too much opposition in order to ensure justice is being pursued and contingent on believed to be done, in particular reference to the outlines of the new criminal laws [6].

LEGAL FRAMEWORK FOR POST-CONVICTION REVIEW

There is some minimal then helpful amendments in the foreword, to the Bharatiya Nyaya Sanhita, Bharatiya Nagarik Suraksha Sanhita, and Bharatiya Sakshya Adhiniyam, which implies responsibility on dealing remedy and how you apply these reviews, at least as it relates to the purpose when created regarding new material evidence, and the reviews of previous convictions [2]. The hoped for amendments are again, progress in perhaps, better evidence collections methodologies for investigative processes in criminal investigations, providing additional layers towards independently verified evidence [6]. This evolution of legislative challenges will also need to share thorough understanding on the proper intersection regarding forensic science and ceilings/protocols, as well as both modern usages, digitized and traditional, and really get at ensuring basic powers, liberties and procedure triangulated provisions [7][11]. There is some evidence that we are only really expanding and now beginning to test limits of proactively expanding procedure triangulation for practical adherence by lawyers, and due process, and rule of law regarding regulation through preventative jurisprudence to limit the miscarriages of justice [12]. Of equal importance is properly responding to these approaches under these legislative changes, regarding how forensic evidence is regarded legally, and governed legally regarding its admissibility, independently and as to its evidentiary scope of value [1]. The navigation of a way to validate new forensic techniques has got to be on the table along with forensic practitioners that have been encouraged to practice good science, with safeguarding the evidence [13]. The Courts have to navigate the constantly moving target of how legal processes deal with new challenges in complexities of digital forensics/cyber investigation realities affecting how or if review processes will occur, and how to review all evidence [together in types] looking at personal authenticity, integrity and representations of personal authenticity against the electronic based evidence in Court [11][14]. Then there is the whole issue of how we assess how new technologies, such as artificial intelligence, block chain [and other] will affect or shape what we consider the future of forensics, and how we consider its purposes in regulating -or its potential to be used in post-conviction review processes [12].

CHALLENGES IN ACCESSING POST-CONVICTION RELIEF

There are many delays in post-conviction relief cases in India, not just from little things, and from the cost of lawyers for society's poorest; and not just because pro bono caseworkers are scarce; and because in many cases, the appeal process can be so complex, lengthy and often confusing for certainly for the poorest people, it could hinder their progress. The international experience of wrongful conviction burdens a defendant on appeal with the additional step of finding new forensic evidence, or even going back to re-evaluate existing forensic evidence, and often requires special knowledge or resources that are unavailable for the great majority of prisoners [6]. The justice system also must now keep pace with the advancements in forensic science technology when retaining and/or hiring lawyers, while still facilitating ongoing training opportunities to appropriately navigate and analyze the scientific evidence for the purposes of supporting a post-conviction review [1]. The lack of forensic laboratories and forensic practitioners in most areas of India, as well as the enormous demand for forensic evidence, will lead to significant delays in timely access to important evidence—further compounding challenges to obtaining timely, reliable, and reproducible forensic evidence to support a post-conviction review [6][1]. Furthermore, lack of operational standards regarding the methods of collection, preservation, and analysis of forensic evidence, result in validity issues during subsequent proceedings [6]. There is a clear and significant need for systemic change to address issues related to forensic infrastructure, expand legal aid services, and reform judicial processes and procedures to provide equitable access to justice and remedies for unlawful conviction for all.

EXONERATION CASES: A CRITICAL ANALYSIS

This section focuses on a handful of exoneration cases in the Indian criminal system and sets out procedural and substantive deficiencies underlining wrongful conviction, and post-conviction review in confirming procedural deficiencies. These case studies highlight the systemic impact of faulty forensic analysis, improper witness identifications and flawed police investigations on court outcomes, and the value of serious errors and forensic evaluations as related to the law.

Notable Exoneration Cases in India

Close examinations of the cases reveal similar shortcomings in other cases; inconsistent interpretations of evidence, poor legal advice, systemic pressures, etc., lead to the conviction of innocent individuals. The urgent urgency for state forensic conditions, while equal legally expediting impartiality in interviewing implied a step towards addressing systemic bias [6]. The case, more correctly, the media frenzy represented in the murder indictment of Aarushi Talwar, exemplified the potential

[1] In this study, the words “app” and “platform” are used interchangeably.

of evidence in questioning the effectivity or implication of forensic evidence built, what was frequently proclamatory; and ultimately swayed the public from being proponents to simply accompany the public discourses; whether the evidence persuaded a conclusion to a verdict [6]. A similar discourse concluded the Naina Sahni Tandoor Murder home case, professing the false uses of forensic evidence, and evidences of judicial false practices [6]. And yet, forensic science practices ultimately contributed some quality of evidence towards decisions of conviction for the Naina Sahni case implicating both notions in the meanings forensic science bears in the Indian context [6]. All of the cases implied the need for some structured post-conviction review steps and the constraining means whether there was any need to adhere to respectively erroneous steps, monopolizing and overstepping the regard of scientific practices during forensic investigations i.e. misuse injectable inferences from wrongful convictions to mitigate risk. A more turning stone study of these cases necessarily pointed to courtroom education in forensic science as a way for potential appraisal, or legitimacy of an expert witness, to at least disturb efficiencies in the presentations and, seek purpose in demonstrating scientific principles in a courtroom situation [6]. In short, the application of limited or state-of-the-art forensic practices, as ballistic matching, and DNA profiling has gone a long way in advancing the debate surrounding wrongful convictions or appropriate convictions, but even thorough the implementation of effectively utilizing forensic practices thus far have been governed by limited use as informed by the context of a crime scene.

Role of Forensic Evidence in Wrongful Convictions

Forensic evidence can be crucial in determining an individual's guilt or innocence; however, forensic evidence can also contribute to wrongful convictions if forensic evidence is subject to or may have been subject to improper handling, improper presentation, misinterpretation, or non-compliance with proper protocols from identified unreliable or unproven methodologies [1]. The lack of a national standardization and protocols for how evidence should be collected and how investigations are conducted, along with a lack of independent oversight, can cause unreliable forensic evidence to enter a courthouse as admissible evidence and damage the entire adversarial system of justice [7]. Moreover, the lack of scientific literacy amongst legal practitioners adds to these problems and can limit their ability to critically examine the validity and reliability of any forensic evidence issues, presented by the expert witness as evidence, [1]. As a result, the continued acceptance and reliance upon the observations of forensic experts is performed unquestioned and will only increase wrongful convictions where at the time of the conviction, the forensic evidence is later proven to be unreliable or incorrect [6]. In India, there are numerous examples of how the mishandling or misinterpretation of forensic evidence has materially caused wrongful convictions meaning the introduction of strong post-conviction reviews to identify and correct those errors [6]. All of these recent acts recognize the value of forensic science to investigations and trials, mandate that forensic examinations be conducted for certain serious offenses, and may contribute to the ubiquity, where the day of trial is greeted with expert evidence to back claims, and the growth and reliance on expert testimony will continue to grow [6].

THE ROLE OF FORENSIC EVIDENCE

The evolving legal context as a result of new legislation means there will need to be careful consideration of how to introduce forensic evidence particularly DNA profiling into the investigation and court process as legislation is decades in the making on criminal justice [15]. Nonetheless, the existing infrastructure, readiness and ongoing commitment to scientific future considerations in the different forensic disciplines including digital forensics, that is growing more crucial than ever to the investigation process, poses challenges for this new addition [6][16].The complexities of modern crime investigations are utilising digital forensics for the collection, examination and interpretation of digital evidence, which is vital in reconstructing the crime scene and identifying suspects [6][17].

DNA Analysis and its Impact

"Dna analysis, otherwise termed 'dna fingerprinting', originated with the introduction by Alec Jeffreys, and dna has radically changed forensic and law enforcement by allowing human identification through genetic markers [18]. The analysis of dna from specified loci has become the default service for forensic investigations involving criminal cases, paternity applications, estimations of time of death, and identification of decedents in disaster and tragic accidents, owing to the ability for identification of one person from potentially hundreds, thousands or millions of people. [1]. Dna profiling has become standard practice in India for a great number of cases involving crime, and has provided excellent evidence either implicating a suspect in a crime scene determination, or clearing a suspect who was wrongly suspected as a crime perpetrator [6]. However, it may be possible that the use of dna evidence in India is not as optimized as other jurisdictions, related to procedures for standards in evidence collection protocols, testing in accredited laboratories, and training of personnel, which affects an ability of dna profiling to maintain its capacity for efficiency and have the ability to establish the credibility of, and admissibility in a court of law [19]. It must also be acknowledged that although there is considerable value to using dna analysis more broadly, new or investigational forensic techniques, and/or techniques in complex cases, could be second guessed by the courts with regard to the validity of a technique, since there is no precedent that can be referenced and applied [6].

Challenges with Traditional Forensic Techniques

While these traditional methods tend to be costly in time, labor, and resources, we should also consider how traditional modes of examination suffer from interpretational bias, no statistical foundation of reported matches, and human error, which may have an overall diminishing effect on their evidentiary value in court [1]. For example, the increasingly physical, labor-

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intensive tasks associated with traditional digital forensics cannot compete with the speed and complexity of change for digital data [20]. Newer emerging spaces of digital crime require more scientific, advanced, and automated ways to maintain the integrity and reliability of forensic outcomes [21].

Safeguarding Against Flawed Forensic Evidence

The persistent problem of forensic evidence being ruled inadmissible indicates a need for robust protections including serious quality assurance, practitioner quality oversight, and formal and ongoing education and training for forensic practitioners; along with independent oversight of forensic service providers. We need a better comprehensive approach to limit wrongful convictions caused by unreliable, suspect scientific evidence and reinforce a commitment to the most meaningful understanding of justice in the Indian legal system, which involves serious scrutiny of admission of forensic evidence under the new laws; especially as it relates to scientific claims to which scientific field, created and corroboration. Further, the problems in digital forensic science (e.g., chain of custody, assurance of evidence being evidence as a consideration of admission control) and the lack of standards or rules generationally or globally, raise larger issues of the consistency and admissibility of digital evidence, or evidence for that matter, in a criminal trial (12). Given the rapidly changing nature of the technology (e.g., limited by the number of digital devices and sophistication of perpetrators, cyber criminals) necessitates a better suite of tools and to develop an appropriate legal framework to not only assess and evaluate large volumes of digital evidence but also simply, to embed artificial intelligence and machine learning (21). Importantly, the serious review of the law and gaps in India's digital case law revealed many serious matters in urgent need of attention and reform (12). Specifically, there will need to be legislative clarity and ultimately cooperation at international levels to clarify legislative issues about data privacy, internationally, jurisdiction in the digital world, and fluidity to address the many complicated issues involved with developing, enabling and maintaining cyberspace quickly and easily, and as an international space if findings in digital forensics are to hold credibility and standing as evidence (12) (6). In addressing the gap in expertise and in this developing area of technology, we know that it has become critical that the evidence of digital forensic evidence be subject to scrutiny as evidence and realistically, and evaluated appropriately; this gap will require expert consultation and collaboration on the sharing of resources, and the formation of task forces to bring together legal experts with digital forensic science backgrounds (12). These processes will strengthen the criminal justice system to operate successfully in a legal and legal framework with the many challenges of the potential complexities related to the emerging issue with digital evidence, while assuring the admissibility and reliability of forensic evidence in a changing and dynamic world (12) (22).

CONCLUSION

This paper has examined specifically the dynamics of forensic science (specifically the Indian context and its role in post-conviction exoneration) and the status of the Indian criminal justice reforms to interrogate how the process of developing forensic science coupled with systemic issues, especially with evidence collection and evidence admissibility, limits the chances of moving forward to evidence-based justice and creating incremental shifts in the context of wrongful convictions. It has shown [albeit in a fragmented way] the optimistic possibilities of digital forensics in a legislative framework of which there are no standards of practice or national laboratories, and therefore a key obstacle for forensic practitioners to deploy in criminal matters, and which raises questions about the legislative and infrastructure requirement for a sound practice [12][19].While the potential for new technologies, like Artificial Intelligence and Machine Learning, to enhance the digital forensic investigations and analyze complex digital evidence present remarkable opportunities in establishing efficacy and accuracy, there are also new ethical and legal implications which must be understood and adhered to [23][21][24]. The nebulous legal landscape of India creates complexities in the issues and capabilities that inherently come with the use of AI, hence it is critical to immediate focus specifically on creating a formal regulatory framework [25].

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