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Forensic Science in Court: Assessing the Legal Response to Emerging Reliability Concerns in Pakistan

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ABSTRACT
For decades, forensic science evidence has been perceived by courts in Pakistan as an infallible and objective arbiter of truth, often carrying a disproportionate weight in criminal adjudication. However, a global paradigm shift, spurred by influential reports from the United States National Academy of Sciences and the United Kingdom's House of Lords, has exposed significant reliability concerns within various forensic disciplines. These concerns pertain to issues of methodological rigour, subjective interpretation, contextual bias, and a lack of foundational validation. This article investigates the extent to which Pakistan's legal framework and judicial practice have responded to these emerging international concerns. Employing a qualitative doctrinal research methodology, this article analyses key legal provisions, including the Qanun-e-Shahadat Order, 1984, and a selection of seminal judgments from superior courts. The findings indicate that while there is a nascent and growing judicial awareness of the potential fallibility of forensic evidence, the legal response remains largely underdeveloped. The adversarial system struggles with a critical lack of prosecutorial and judicial scientific literacy, an under-resourced and fragmented forensic infrastructure, and an enduring cultural deference to expert testimony. The article concludes that without systemic reforms including the adoption of explicit reliability standards for the admissibility of expert evidence, enhanced funding and standardization for forensic laboratories, and specialized training for legal professionals the Pakistani justice system risks continued reliance on potentially unreliable scientific evidence, thereby compromising the integrity of its outcomes.

Keywords**: Forensic Science, Admissibility, Reliability, Expert Evidence, Qanun-E-Shahadat Order, Pakistan, Judicial Scrutiny, Daubert Standard, Frye Standard**.

Introduction

The portrayal of forensic science in popular media, often referred to as the "CSI effect," has cultivated a public and, at times, judicial perception of its infallibility (Schweitzer & Saks, 2007). In courtrooms across Pakistan, forensic reports—ranging from DNA analysis and toxicology to fingerprint matching and ballistic comparisons—are frequently tendered as conclusive proof of guilt or innocence. The aura of scientific certainty surrounding this evidence can be so compelling that it often short-circuits critical judicial scrutiny, becoming the central pillar upon which convictions are built. The traditional legal posture in Pakistan has been one of

considerable deference to the expert, rooted in the assumption that scientific methods are inherently valid and their application by state-appointed experts is objectively reliable.

This long-standing presumption of reliability has been fundamentally challenged on the international stage. The landmark 2009 report by the United States National Academy of Sciences (NAS), titled "Strengthening Forensic Science in the United States: A Path Forward," served as a seismic wake-up call. It concluded that, with the notable exception of nuclear DNA analysis, no forensic method had been rigorously shown to consistently and with a high degree of certainty demonstrate a connection between evidence and a specific individual or source (National Research Council, 2009). The report highlighted pervasive issues such as the lack of scientific foundation for many disciplines, the profound influence of cognitive bias, and the absence of standardized protocols and error rates. Similar critiques have emerged from other common law jurisdictions, prompting a fundamental re-evaluation of how forensic science is utilized within the legal process (Law Commission of England and Wales, 2011).

The central question for Pakistan's criminal justice system is whether it has absorbed the lessons from this global reckoning. This article posits that the legal response in Pakistan to these emerging reliability concerns has been fragmented, slow, and insufficient to safeguard against the admission of potentially misleading or erroneous scientific evidence. While the judiciary has occasionally expressed caution, the systemic structures—comprising the laws of evidence, the state of forensic facilities, and the scientific literacy of legal actors—remain inadequately equipped to perform the necessary gatekeeping function.

This article will proceed by first reviewing the relevant literature on the global crisis in forensic science and the nascent discourse within Pakistan. It will then outline the analytical framework for assessing forensic evidence admissibility, drawing from international standards. The methodology section will detail the qualitative doctrinal approach used. Subsequent sections will present findings on the current legal landscape in Pakistan, discuss the significant gaps between international best practices and local reality, and conclude with recommendations for essential systemic reforms.

Literature Review

The discourse on the reliability of forensic science is well-developed in international legal and scientific literature, but remains in its infancy within the specific context of Pakistan.

Global Reliability Concerns

The critique of forensic science is multifaceted. The 2009 NAS Report stands as the most comprehensive indictment. It distinguished between disciplines with a solid scientific foundation, such as DNA analysis, and those based more on experience and pattern recognition, such as bite mark analysis, firearm and toolmark examination, and hair microscopy. For the latter category, the report found a startling lack of empirical data establishing their fundamental validity and reliability (National Research Council, 2009). The problem is not merely a lack of research but also one of human subjectivity. Studies have demonstrated that forensic examiners can be influenced by "contextual bias," where their conclusions are swayed by extraneous information about the case, such as knowing that a suspect has confessed (Dror & Charlton, 2006; Kukucka et al., 2017). This challenges the core notion of forensic science as an objective enterprise.

In response, jurisdictions have grappled with refining their legal standards for admitting expert evidence. In the United States, the seminal case of *Daubert v. Merrell Dow Pharmaceuticals, Inc.* (1993) established a judge-led "gatekeeping" role, requiring courts to assess whether expert testimony rests on a reliable foundation and is relevant to the case.

The *Daubert* standard inquires into the testability of the theory, its peer-review status, its known or potential error rate, and its general acceptance within the relevant scientific community. This is a more rigorous approach than the older *Frye* standard, which focused solely on "general acceptance" (*Frye v. United States*, 1923). Other common law countries, like the United Kingdom, Canada, and Australia, have developed their own nuanced approaches, but all share a common trend towards requiring demonstrated reliability rather than mere acceptance (Edmond et al., 2016).

The Pakistani Context

Literature specifically addressing forensic science reform in Pakistan is sparse and primarily focuses on the technical and infrastructural challenges facing forensic laboratories. Scholars and practitioners have documented issues such as chronic underfunding, a lack of modern equipment, overwhelming caseloads, and insufficiently trained personnel (Chaudhry, 2018; Rehman, 2020). These operational deficiencies directly impact the quality and reliability of the evidence produced, creating a pre-admissibility problem of fundamental competence.

The legal scholarship on the *admissibility* and *evaluation* of this evidence is even more limited. Most Pakistani legal commentaries on the Qanun-e-Shahadat Order, 1984, provide a conventional exposition of the sections pertaining to expert testimony (Sections 45-51, 59) without a critical engagement with modern reliability concerns (Khan, 2022). The discourse rarely moves beyond the established principle that the opinion of an expert is relevant but not binding on the court, as affirmed in numerous judgments (e.g., *Muhammad Aslam v. The State*, 2011). There is a significant gap in the literature that systematically analyses Pakistani case law through the lens of the international reliability crisis. This article aims to fill this gap by examining whether Pakistani courts are evolving from a posture of deference to one of informed scrutiny, and by evaluating the legal framework's capacity to handle complex scientific evidence in an age of heightened skepticism.

Analytical Framework: Assessing Admissibility and Weight

To assess Pakistan's legal response, it is essential to establish a framework for how forensic evidence should be treated in a robust criminal justice system. This process can be broken down into two stages: admissibility and weight.

1. The Admissibility Stage: The Judge as Gatekeeper: Before scientific evidence is presented to a jury or considered by a judge in a bench trial, it must be deemed admissible. The core question at this stage is: "Is this evidence sufficiently reliable to be considered at all?" International best practices, as exemplified by *Daubert*, suggest that judges should perform a preliminary assessment of the proffered expert testimony. This involves evaluating:

- **Foundational Validity:** Does the scientific discipline itself have a reliable methodological basis? Has its core principle been empirically tested and validated?
- **Applied Validity:** Was the specific method applied correctly in this particular case? Were standardized protocols followed?
- **Error Rates:** Is there a known or potential rate of error associated with the technique?
- **Peer Review and Publication:** Has the methodology been subjected to peer review and publication?
- **General Acceptance:** While not the sole criterion, the level of acceptance within the relevant scientific community is a factor to consider.

The absence of a formal, judicially-led admissibility standard akin to *Daubert* in Pakistan's statutory law is a critical point of analysis.

2. The Weight Stage: The Trier of Fact as Evaluator: Once evidence is admitted, its "weight" or persuasive value is determined by the trier of fact (the judge or jury). This is where the

credibility of the expert, the clarity of their testimony, and the overall context of the case come into play. The key question is: "How much should I rely on this evidence in reaching my verdict?" Even if evidence is admissible, it may be assigned little weight if it is presented poorly, contradicted by other evidence, or shown to be potentially biased.

In Pakistan, the legal principle is that the opinion of an expert is not conclusive. However, in practice, without a robust admissibility filter, weak or unreliable evidence can enter the courtroom and exert a powerful, often undue, influence on the trier of fact, who may lack the scientific literacy to critically evaluate it. This framework will be used to analyse the Pakistani legal system's handling of forensic evidence in the subsequent sections.

Methodology

This article employs a qualitative doctrinal research design. Doctrinal research involves a systematic analysis of existing laws, legal principles, and case law to answer a specific research question (Hutchinson & Duncan, 2012). The primary sources of data for this study are:

1. **Primary Legal Sources:** The Qanun-e-Shahadat Order, 1984, which is the primary statute governing the admissibility of evidence in Pakistan, was analysed with a specific focus on Articles 45-51 and 59 concerning expert testimony.
2. **Case Law:** A purposive selection of judgments from the Supreme Court of Pakistan and various Provincial High Courts from approximately 2005 to 2023 was conducted. Cases were identified using legal databases (PLD, SCMR) and search terms such as "forensic evidence," "expert opinion," "DNA," "ballistic expert," and "Qanun-e-Shahadat Article 45." The selection aimed to include cases that prominently featured forensic evidence and where the court discussed its probative value.
3. **Secondary Sources:** Scholarly articles, books, and reports from international bodies (e.g., NAS, NIST) and Pakistani researchers were consulted to provide context, theoretical grounding, and comparative analysis.

The data analysis involved a two-step process. First, a content analysis of the legal provisions and case law was performed to identify recurring judicial attitudes, patterns of reasoning, and explicit or implicit standards applied to forensic evidence. Second, a critical comparative analysis was undertaken, measuring the identified Pakistani practices against the international analytical framework of admissibility and weight, as informed by the global literature on forensic science reliability.

Findings

The analysis of Pakistan's legal landscape reveals a complex picture characterized by a traditional stance of judicial deference, a nascent but inconsistent trend towards skepticism, and a regulatory environment ill-suited to addressing fundamental reliability concerns.

1. The Statutory Framework: The Qanun-e-Shahadat Order, 1984

The Qanun-e-Shahadat provides the foundational rules for expert evidence. Article 59 states that the opinions of experts are relevant facts. Articles 45 to 51 specifically detail the circumstances under which the opinions of third persons, including handwriting experts (Article 47) and others with specialized knowledge, are considered relevant.

The critical feature of this framework is what it *omits*. Unlike the U.S. Federal Rules of Evidence or the *Daubert* standard, the Qanun-e-Shahadat does not prescribe any specific test or criteria for a judge to use in determining the admissibility of expert testimony. There is no statutory requirement for the court to inquire into the reliability of the underlying scientific methodology, its error rate, or its peer-review status. The law is largely silent on the judge's role as a gatekeeper. The admission of forensic evidence is therefore predominantly a matter

of relevance and the expert's formal qualifications, not a deliberate assessment of scientific validity.

2. Judicial Attitudes: From Deference to Nascent Scrutiny

The case law analysis reveals two contrasting trends.

The Traditional Stance of Deference: A significant number of judgments reflect a deep-seated trust in state-sponsored forensic evidence. In many cases, particularly those involving medical evidence and ballistic analysis, courts have treated forensic reports as near-conclusive evidence. For instance, in *Muhammad Aslam v. The State* (2011), the Supreme Court of Pakistan upheld a conviction based primarily on ballistic evidence, stating that "the report of the ballistic expert is a scientific and expert opinion and cannot be lightly brushed aside." The burden of rebutting such evidence is placed heavily on the accused, who often lacks the resources to commission a competing expert analysis. This deference is rooted in the perceived impartiality and scientific authority of the state's experts.

The Emerging Trend of Critical Scrutiny: More recently, a growing number of judgments, particularly from the Supreme Court, have begun to articulate a more cautious approach. This is most evident in cases involving newer forms of evidence like DNA.

The landmark case of *Muhammad Imran Sadiq v. The State* (2021) is a prime example. The Supreme Court acquitted the accused, overturning a conviction based on DNA evidence. The court made several critical observations that resonate with international concerns. It noted that the prosecution had failed to establish the "safe and scientific custody" of the samples from the crime scene to the laboratory, creating the possibility of contamination or tampering—a key issue in the chain of custody. The judgment implicitly acknowledged the potential for error in scientific processes, moving away from the presumption of infallibility.

Similarly, in *Babar Khan v. The State* (2022), the Peshawar High Court, while acknowledging the value of forensic evidence, held that "the expert's opinion is only a piece of corroborative evidence and if the direct evidence is not trustworthy, the conviction cannot be solely based on the forensic report." This reinforces the principle that forensic evidence must be integrated into a coherent narrative of the case and cannot compensate for weak foundational testimony.

However, this critical scrutiny is not uniformly applied. It appears more frequently in DNA cases, perhaps due to the global discourse on its proper handling, and less so in traditional disciplines like fingerprint or toolmark analysis, where the "black box" of expert judgment remains largely unopened by the courts.

3. Systemic and Infrastructural Challenges

The findings further highlight that the problems with forensic science in Pakistan are not merely legal but deeply systemic.

- **Fragmented and Under-Resourced Laboratories:** Pakistan's forensic laboratories, such as those under the Punjab Forensic Science Agency (PFSA) and others in different provinces, operate with varying degrees of capacity. They suffer from high caseloads, outdated equipment, and a shortage of trained scientific staff (Rehman, 2020). This operational reality directly impacts the reliability of the evidence they generate, a factor courts are often ill-equipped to investigate.
- **Lack of Standardization and Proficiency Testing:** There is no national mandatory framework for standardizing protocols across all forensic disciplines or for implementing

regular proficiency testing of examiners. This lack of quality control makes it difficult to ascertain the competency of an expert or the reliability of a specific analysis.

- **The Adversarial Deficit:** The adversarial system relies on competing experts to test and challenge evidence. In Pakistan, the defence rarely has the financial means or state support to hire independent experts. This creates a profound imbalance, where the prosecution's expert testimony goes largely unchallenged on scientific grounds, reducing the trial to a cross-examination on procedural formalities rather than methodological soundness.

Discussion

The findings indicate that Pakistan's legal response to the global reliability crisis in forensic science is in a state of transition, but remains critically inadequate. The system is grappling with the tension between its historical culture of deference and the emerging, unsettling knowledge that not all that is presented as "science" is necessarily reliable.

The Gap in the Admissibility Framework

The most significant deficiency is the absence of a formal, judicially-managed admissibility standard in the Qanun-e-Shahadat. While courts pay lip service to the idea that expert opinion is not binding, the lack of a pre-emptive *Daubert*-like hearing means that evidence of questionable scientific validity routinely enters the courtroom. A judge, without specific training, is then placed in the difficult position of determining the "weight" of evidence whose fundamental reliability has never been contested. This puts the cart before the horse. By the time the evidence is admitted, its mere presence can create an aura of scientific certainty that is difficult to dispel, regardless of the judge's ultimate instructions to themselves.

The emerging critical scrutiny in cases like *Muhammad Imran Sadiq* (2021) is a positive development, but it is a post-hoc corrective measure. It occurs at the appellate level, after a trial may have been influenced by unreliable evidence. What is needed is a prophylactic rule that prevents such evidence from influencing the trier of fact in the first instance.

The Illusion of Objectivity and the Bias Blind Spot

Pakistani courts have yet to fully grapple with the issue of contextual bias, a central theme in the international critique. The assumption remains that a forensic expert, particularly one employed by the state, is an objective observer. The research of Dror and others (2006; 2017), however, demonstrates that examiners are susceptible to being influenced by their knowledge of the case details, such as being told the suspect has confessed. This "bias blind spot" is virtually never addressed in Pakistani trials. Cross-examination rarely, if ever, delves into the cognitive processes of the examiner or the laboratory procedures in place to minimize bias, such as sequential unmasking of evidence.

The Resource Disparity and the Right to a Fair Trial

The profound imbalance between the prosecution and the defence in accessing forensic expertise raises serious concerns under Article 10A of the Constitution of Pakistan, which guarantees the right to a fair trial. If the state can marshal the full force of its (however limited) forensic apparatus, and the accused cannot mount a meaningful scientific challenge, the adversarial process is compromised. The principle of equality of arms is undermined. There is no statutory provision in Pakistan for court-appointed, neutral experts or for state funding for defence experts, which is a common feature in other jurisdictions seeking to level the playing field.

The Path Forward: Integrating International Standards into the Local Context

Merely transplanting the *Daubert* standard into Pakistani law is not a panacea. The U.S. system has its own critics and challenges with its application (Mnookin, 2007). Furthermore, a stringent

admissibility standard could paralyze the criminal justice system in the short term, given the current state of forensic infrastructure. A more pragmatic, multi-pronged approach is required.

1. **Judicial Education and Reform of the Qanun-e-Shahadat:** The most immediate and feasible step is to enhance judicial capacity. The Judicial Academies of Pakistan should develop intensive, ongoing training programs for judges on the fundamentals of forensic science, its limitations, and key concepts like foundational validity, applied validity, and cognitive bias. Simultaneously, a long-term goal should be the legislative amendment of the Qanun-e-Shahadat to incorporate a reliability standard for expert evidence, drawing on the principles of *Daubert* but tailoring it to the Pakistani context.
2. **Strengthening Forensic Infrastructure and Governance:** The government must prioritize investment in forensic laboratories, ensuring they are adequately funded, equipped, and staffed. A national regulatory body should be established to set mandatory standards for all forensic disciplines, accredit laboratories, and implement mandatory proficiency testing for all examiners.
3. **Empowering the Defence:** To address the adversarial deficit, the law should be amended to provide for the right to state-funded independent expert assistance for indigent defendants in serious criminal cases where forensic evidence is pivotal. This is essential for a meaningful cross-examination and for upholding the right to a fair trial.
4. **Developing a Culture of Scientific Humility:** Ultimately, a cultural shift is needed within the legal community from the police investigator to the Supreme Court justice. This involves moving away from the perception of forensic science as magic and towards an understanding of it as a human endeavor, susceptible to error and bias, whose value is contingent on the rigour of its methods and the integrity of its practitioners.

Conclusion

The global paradigm shift regarding the reliability of forensic science has begun to send ripples through the Pakistani legal system, but a transformative wave has yet to arrive. This article has demonstrated that while the superior judiciary has shown flickers of awareness, as seen in its cautious approach to DNA evidence, the overall legal and institutional framework remains poorly calibrated to address the profound concerns raised by international science and jurisprudence.

The Qanun-e-Shahadat Order, 1984, provides no explicit guidance for judges to act as gatekeepers, resulting in the routine admission of evidence whose scientific foundations may be shaky. Judicial scrutiny, when it occurs, is often applied after the fact and inconsistently across different forensic disciplines. This is compounded by a crippling resource disparity between the prosecution and defence and by a forensic infrastructure that struggles with basic operational challenges.

The consequence of this inadequate response is a continued risk of miscarriages of justice. Individuals may be convicted based on evidence that appears scientific and certain but may, in reality, be subjective, biased, or methodologically flawed. For the Pakistani criminal justice system to uphold its commitment to fairness and accuracy, it must embark on a concerted program of reform. This requires empowering judges with the knowledge and legal tools to scrutinize the validity of expert evidence, strengthening the scientific infrastructure to produce more reliable results, and rebalancing the adversarial process to ensure a meaningful challenge to the state's scientific case. The journey from deference to discerning scrutiny is a difficult but necessary one for the integrity of justice in Pakistan.

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