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Enhancing Forensic Evidence Management in Pakistan's Criminal Justice System: A Criminological Analysis

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ABSTRACT

This study analyzes the use of forensic evidence in the criminal justice system of Pakistan to prepare legally informed system adjustments to evidence management, procedural guidance, and evidence alignment audit. For this study, a quantitative approach has been selected. Fifty respondents were surveyed from five groups, judges, lawyers, public prosecutors, healthcare professionals, and police officers. The results indicate a consensus within the groups, arguing that the management of forensic evidence has been primarily crucial to integrity and fairness to the trial. Maintaining the integrity of trial evidence and custodianship of forensic samples throughout the trial and its custodial process, preserved samples, and chain of custody were all highlighted. Within and across the groups, respondents raised the issue of the clarity of evidence custody, absence of evidence collecting procedures, and the training of healthcare evidence collectors as problematic. The study has also explored the forensic tools within legislative measures – Qanun-e-Shahadat Ordinance 1984, Criminal Procedure Code (Cr.P.C.) 1898, Punjab Forensic Science Agency Act 2007, and Prevention of Electronic Crimes Act (PECA) 2016 coupled with and within forensic legislation, noting width and depth of far-reaching legislation. Forensic training and evidence collecting procedures mentioned in the study have to be precision driven and integrated. Forensic evidence management system and infrastructure across Pakistan will form the spine of justice. Reliability and fairness of the criminal justice system will depend on the training and

infrastructure improvements.

Keywords: Forensic Evidence Management, Criminal Justice System, Chain of Custody, Evidence Integrity, Pakistan Legal Framework

INTRODUCTION

The word "forensic" comes from the Latin term forum, which described public places in Ancient Rome where, among other things, markets, debates, and legal discussions were held (Hussain et al., 2023). Originally, “forensic” signified active participation in public discourse and in debates in a court of law, where the arguments were advanced and subjected to thorough critique. Such forums enabled the examination and development of civil law. Thus, “forensic” encompassed the demonstration of articulate reasoning, grounded in facts, and thorough analysis that evidence the masterly of reasoning exercised in investigations in the Roman forensic institutes (Watson, 2020). Nowadays, however, “forensic” primarily relates to the scientific techniques employed in investigations hinged on criminal law and law-related evidence.

Before 2001, the integration of forensic science into the criminal justice system of Pakistan was inadequate. Due to the rise of terrorism, however, the development of forensic science facilities became a priority, and the National Forensic Science Agency (NFSA) was inaugurated in 2002 and focused on crime scene investigation, trace chemistry, questioned documents, and digital forensics. However, the country continues to lack an adequate number of forensic science laboratories and training facilities (Hussain et al., 2023).

The 1984 Qanun-e-Shahadat Ordinance also allows for the use of technology in the form of scientific proof during criminal court proceedings (Iqbal & Alharbi, 2020). Furthermore, 1898's Section 510 of the Criminal Procedure Code (Cr. P.C.) seems to claim that reports of summoned or court-appointed experts are to be treated as prima facie evidence, unless the court expresses otherwise (Asif & Qayum, 2023). Nevertheless, in criminal cases, Article 59 of the Qanun-e-Shahadat Ordinance requires that expert evidence be admissible for the purposes of cross-examination (Fatima et al., 2023).

Relating to and similarly crossing over to the legislation governing the acknowledged primary evidence and record keeping under the Evidence Act, the Investigations for Fair Trial Act recognises expert reports as primary evidence. Khan and Bhatti (2023) articulate that the Punjab Forensic Science Agency Act Article 2007 strengthens this alignment by equating Forensic Science Agency employees with those under 510 Cr. P.C. and those under Article 59 of the Qanun-e-Shahadat Ordinance. Attention is drawn to the 1934 Police Rules that speak to case preparation and investigation procedures, albeit those offered are relatively rudimentary as compared to the expectations PFSAA has with respect to the preservation of a crime scene and the forensic materials analysis. These provisions affirm the interrelationship between the Forensic Science Exploration Evidence and the Criminal Procedure Code, coupled with the provisions of the Police Act, with

proper alignment and burning of the core precepts of fair play. The provisions command passage of evidence, production, and evaluation by the experts, and level scrutiny professed by the law.

Furthermore, Pakistan emphasizes forensic science with the Prevention of Electronic Crimes Act (PECA) of 2016. Under Section 29 of PECA, the Federal Government must create or designate an investigative agency for the offenses under the Act. This agency must take the steps required by the Cr. P.C. unless they are contrary to PECA and must be able to do forensic examinations of data and information systems. Forensic examination reports are admissible in court, showing the law recognizes forensic reports and evidence (Rasool & Rasool, 2022). To enhance the value of electronic evidence in the court, Section 40 of PECA, also, mandates the court to obtain expert testimony from a forensic laboratory, thus further establishing the integrity of electronic evidence in the prosecution process.

Problem Statement

Despite the pivotal importance of forensic evidence in the criminal justice system in Pakistan, there are still significant implications arising from its management and incorporation into the justice system. Forensic science infrastructure commenced and expanded after 2001 with the establishment of the National Forensic Science Agency (NFSA) and the various legislative frameworks; however, there are still pressing issues pertaining to the management and training of personnel in the science and application of forensic evidence. In particular, the issues of evidence collection and the enforcement of the legal prerequisites of the chain of custody have been questioned. Such gaps erode the validity of forensic evidence, and ultimately, adversely affect trial justice and the justice system as a whole. In recognition of the issues above and in an attempt to improve the effectiveness and integrity of forensic evidence within the scope of Pakistan's criminal justice system, this paper seeks to examine the forensic evidence management systems in place and the legal and procedural frameworks surrounding them in order to identify potential areas for reform.

Significance of the Study

This study aims to combine two issues, one being the growing need for forensic evidence, and the other the ineffectual integration of forensic evidence in the legal system of Pakistan. The judicial process operates on the foundational assumption of the forensic evidence collected and managed to any given case. That said, this study examines the existing protocols for evidence collection and management to pinpoint systemic vulnerabilities (integrated weaknesses). The goal is to make suggestions for operationalizing forensic science in the law to preserve fairness.

This, in turn, will enhance the trustworthiness of forensic evidence and, consequently, the verdicts rendered in the judicial system of Pakistan. The results of this study will also be of interest to the policymakers, police and the forensic scientists, in the attempt to improve the criminal justice system transparency, accountability and overall effectiveness.

Objectives of the Study

1. This research intends to scrutinize the forensic evidence management system in Pakistan's criminal justice system. The main objectives are:
2. To evaluate the legal and procedural frameworks concerning forensic evidence management in Pakistan, including the Qanun-e-Shahadat Ordinance 1984, the Code of Criminal Procedure of 1898, and the Prevention of Electronic Crimes Act (PECA) 2016 and assess their current relevance.
3. To evaluate the forensic training and specialization in other relevant public sector departments and the healthcare system which possess the forensic materials and are responsible for their analysis.
4. To assess the adherence to the protocols of the chain of custody by the various interdisciplinary professionals in the justice system including judiciary, attorneys, prosecutors, healthcare workers, and police.
5. To investigate and assess the legal and operational shortcomings and systemic hurdles in forensic science, particularly the gaps in the collection, preservation, and processing of evidence at crime scenes.
6. To propose strategic and evidence-based initiatives that aim to improve the management of forensic evidence, modernize training, rationalize evidence collection, and strengthen the chain of custody in order to improve systemic forensic evidence processes.
7. To build a body of scholarship that will facilitate future research and support the creation of policies that will eliminate the barriers to forensic science and successfully integrate it into the practice of law.

LITERATURE REVIEW

Forensic science scholarship notes that forensic science encounters situations in which the evidence is disparate, lacking, and poorly configured. Practitioners need to create an organized story from very little information. The discipline functions under the belief that even the tiniest information is important to the investigation (Hussain et al., 2023).

The legal system interacts with the problems and the products of forensic science through evidence admissibility rules. This legal branch stipulates the conditions under which forensic evidence is presented in court and the evidence that meets certain conditions. These rules are under the normative legal principles of fairness, reliability, and scientific validity. Moreover, legal systems typically outline the qualifications and training that forensic practitioners need. In several legal systems, expert witnesses are required to have higher degrees and relevant professional experience in the field based on the idea that their opinion will have more probative value and credibility in the eyes of the court (Edmond et al., 2013).

Forensic evidence dependably conforms to procedure and depends on the particulars surrounding each situation. All legal participants--defendant, prosecution, judge, and jury--must understand the details surrounding evidence the minute evidence begins to come up, the collection and parsing of the evidence, so the

evidence can be subject to appropriate scrutiny and avoid the abuse of procedure. The linchpin to this procedure is the testifying expert. This expert must provide expert testimony that is reliable, appropriate, pertinent, and non-detrimental to the case (Edmond et al., 2013). Nevertheless, the expectations of such testimony must change. Continuous evolution of each discipline to incorporate the latest technologies, and new problems such as cognitive and other methodological biases, which are especially prominent in the sub-disciplines of forensic science that use advanced and intricate statistical calculations (Edmond et al, 2013). Continuous evolution of forensic science will ensure the delicate balance between the needs of the justice system and the need to protect the rights of the individual.

Regulatory frameworks guiding international law inform the admissibility of forensic evidence. In all criminal proceedings, the Universal Declaration of Human Rights (UDHR, 1948) requires that evidence be included in the context of a fair public trial and all evidence be included in the context of a fair trial. The International Covenant on Civil and Political Rights (ICCPR, 1966) further qualifies the right to a fair trial, that all legal protections right to a fair trial, and also includes protection against torture and arbitrary detention. The Convention against Torture and Other Cruel, Inhuman, or Degrading Treatment and Punishment (CAT, 1984) spells out the international prohibitions against torture and cruel treatment. The evidence applicable in these cases will be those severely handled or abused (Teleki, 2021).

The Rules for the Protection of Juveniles Deprived of their Liberty, or the Beijing Rules, provide a minimum standard for juvenile justice and the protection of children in conflict with the law. These rules, among other things, focus on reducing the harm that may be caused and guided the lack of legal participation (Teleki, 2021). These rules also limit the circumstances under which a child's testimony could be admitted.

The UN Convention against Transnational Organized Crime (UNTOC) hinders human trafficking and migrant smuggling and sets procedural standards regarding evidence handling for each case. Using this evidence, however, must conform to the principles laid out by the European Convention on Human Rights (ECHR). The European Court of Human Rights (ECtHR) checks the admissibility and use of forensic evidence against the standards of the right to a fair trial (Article 6), private life (Article 8), and the prohibition of torture (Article 3) (Sheasby, 2023). Hence, while procedural standards are laid down by UNTOC, ECHR ensures the standards are implemented fairly.

The Pakistan Supreme Court, in Criminal Petition No. 513/2020, highlights the importance of modern forensic evidence, particularly the use of DNA technology, which can legally and conclusively link an offender to a crime. The case also emphasized the legal framework for admissibility of DNA evidence which is scribed in Article 164 of the Qanun-e-Shahadat Ordinance 1984 (Hussain et al. 2023). This case also reviewed the evidence of a rape and murder case which was largely based on circumstantial evidence, witness testimonies, extra-judicial confessions, and DNA

analysis, where the appellant lost on a conviction appeal for the murder case to the Lahore High Court.

State v. Ahmad Omar Sheikh (2021 SCMR 873) exemplifies the significance of competent forensic evidence. In this instance, the prosecution could not establish the conspiracy surrounding the murder of a foreign journalist, leading the Supreme Court of Pakistan to dismiss the conviction. One of the decisive aspects of the ruling was the absence of any forensic evidence, particularly the digital evidence that could have linked the alleged perpetrator to the crime through a laptop used to send threatening emails. The ruling here demonstrates that a lack of strong forensic linkage can be prosecution evidence, and this lack can predominate the denial of an accused person's right to a fair trial.

The case Muhammad Bilal v. State (2021 SCMR 1039) also focused on forensic evidence. In particular, the case involved the defendant's forensic analysis, which focused on the murder case's DNA evidence on a knife. Ultimately, the conviction was due to gaps in the evidence chain which prompted the lack documentation on the evidence's knife handling and storage. Documenting the gaps in the chain of evidence prompted doubt on the evidence's value and the prosecution's case which is to prove the murder conviction beyond reasonable doubt. The case underscores the judicial conclusion that the procedural aspects of forensic evidence, along with the forensics analysis, are equally important.

METHODOLOGY

The researchers used a quantitative approach to measure scope and significance of forensic science evidence to form a complete analysis based on quantitative data. The data collection instrument used was a closed ended questionnaire, which allowed findings to be validated and cross checked against other data to improve reliability and robustness of the results. The study was based on a sample of 50 respondents comprising of diverse legally oriented and forensic science professionals - 15 judges, 10 lawyers, 10 public prosecutors, 10 healthcare professionals and 5 police officers, sampled from the Rawalpindi, Islamabad and Lahore region.

RESULTS AND DISCUSSION

Table 4.1: Demographics – Age Distribution

Age	Frequency	Percent	Valid Percent	Cumulative Percent
28-32	10	20.0	20.0	20.0
33-37	12	24.0	24.0	44.0
38-42	10	20.0	20.0	64.0
43-47	8	16.0	16.0	80.0
48-52	6	12.0	12.0	92.0
53-60	4	8.0	8.0	100.0

Age	Frequency	Percent	Valid Percent	Cumulative Percent
Total	50	100.0	100.0	

The age distribution of the 50 participants is as follows: the highest percentage (24%) is in the 33-37 age group, followed by the 28-32 and 38-42 age groups, each comprising 20%. A smaller proportion falls into the older age categories, with 16% between 43-47 years, 12% between 48-52 years, and 8% in the 53-60 category.

Figure 1: Age Distribution of Participants in the Study.

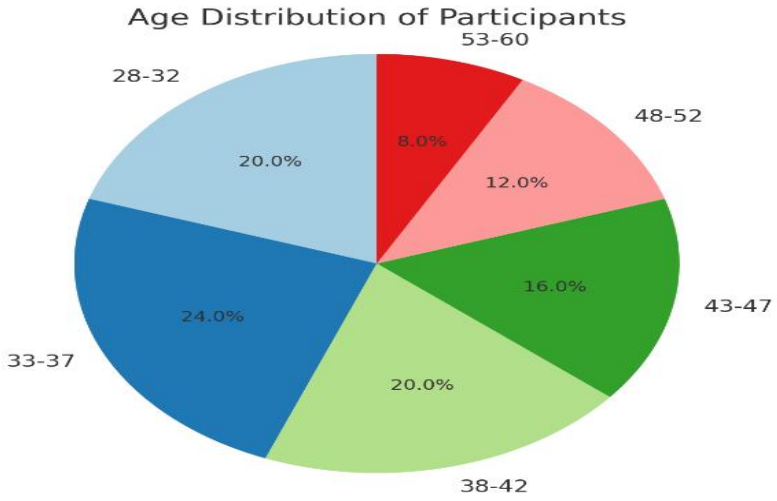


Table 4.2: Demographics – Gender Distribution

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Male	35	70.0	70.0	70.0
Female	15	30.0	30.0	100.0
Total	**50**	**100.0**	**100.0**	

The sample consists of a disproportionate number of males at 70%. In proportion to females at 30%, the results certainly indicate a considerable gender imbalance with a male to female ratio of more than two to one.

Figure 2: Gender Distribution of Participants.

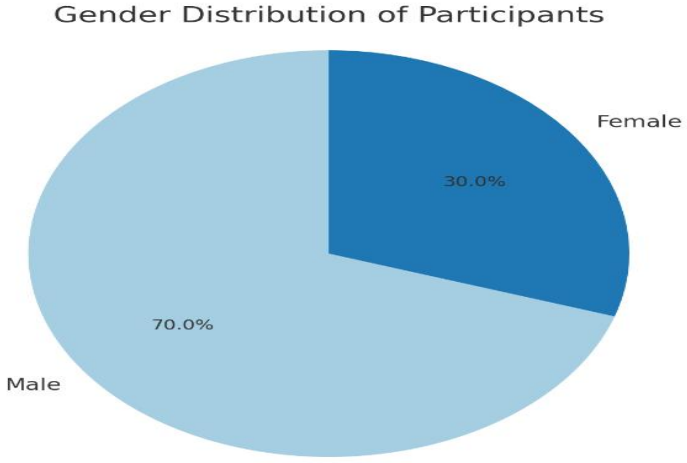


Table 4.3: Demographics – Work Experience

Years of Experience	Frequency	Percent	Valid Percent	Cumulative Percent
12	10	24.0	24.0	24.0
10	8	20.0	20.0	44.0
8	7	16.0	16.0	60.0
7	6	14.0	14.0	74.0
6	5	12.0	12.0	86.0
5	4	10.0	10.0	96.0
2	13	4.0	4.0	100.0
Total	**50**	**100.0**	**100.0**	

The majority of the participants (24%) have 12 years of work experience, followed by 20% with 10 years of experience. A smaller proportion has between 5 to 8 years of experience, while the smallest group consists of individuals with 2 years of experience.

Figure 3: Work Experience Distribution of Participants.

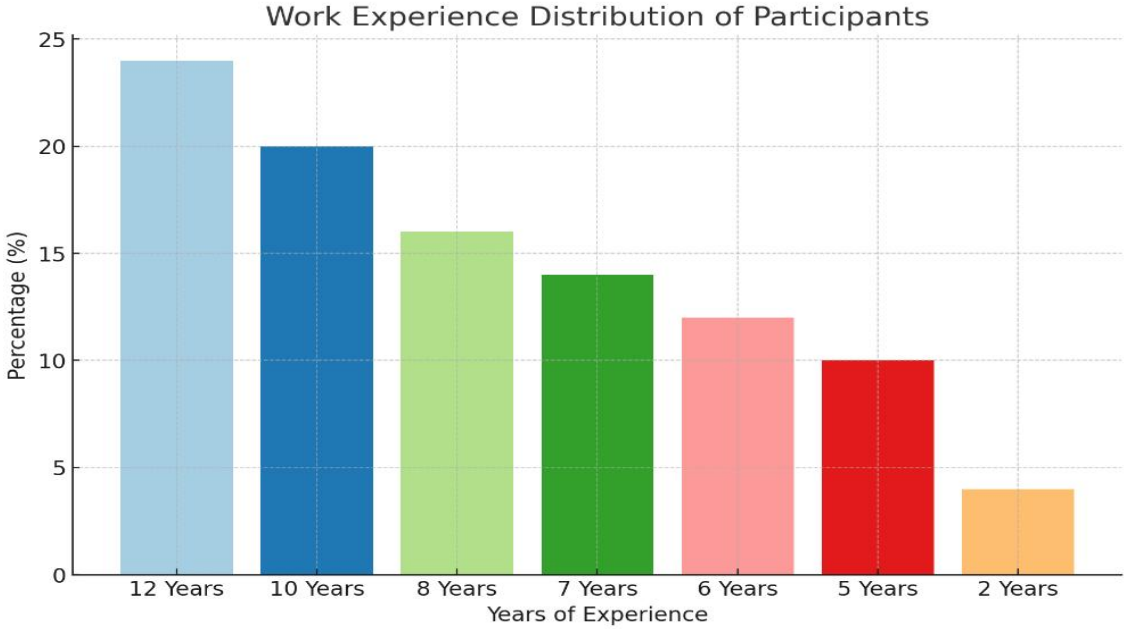
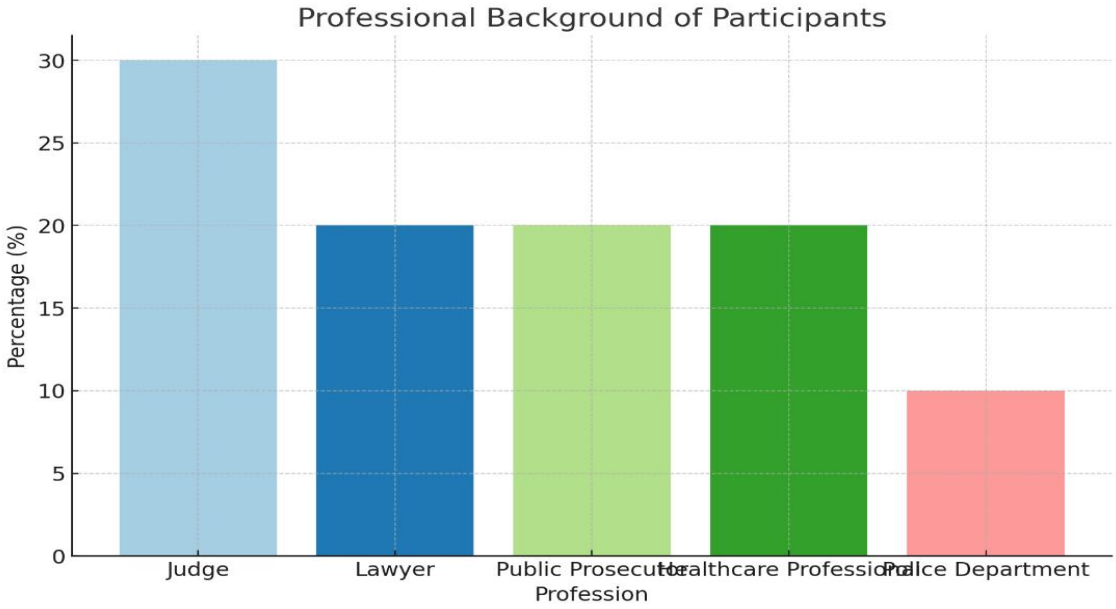


Table 4.4: Demographics – Professional Background

Profession	Frequency	Percent	Valid Percent	Cumulative Percent
Judge	15	30.0	30.0	30.0
Lawyer	10	20.0	20.0	50.0
Public Prosecutor	10	20.0	20.0	70.0
Healthcare Professional	10	20.0	20.0	90.0
Police Department	5	10.0	10.0	100.0
Total	**50**	**100.0**	**100.0**	

The professional distribution shows that judges make up the largest group (30%), followed by lawyers, public prosecutors, and healthcare professionals (20% each). The smallest group is from the police department, representing 10% of the sample.

Figure 4: Professional Distribution of Participants.



Chi-Square Test Results

i. The integrity of forensic evidence is maintained throughout the judicial process, from the commission of the offence to courtroom presentation.

Profession	Agree	Strongly Agree	Disagree	Strongly Disagree	Unable to Decide	Total
Judge	7	8	0	0	0	15
Lawyer	4	6	0	0	0	10
Public Prosecutor	3	7	0	0	0	10
Healthcare Professional	2	8	0	0	0	10
Police Department	2	3	0	0	0	5
Total	**18**	**32**	**0**	**0**	**0**	**50**

The results from this survey show a unanimous agreement among all professionals that the integrity of forensic evidence is maintained throughout the judicial process. No participants disagreed or expressed uncertainty, indicating a shared belief across all groups that forensic evidence is preserved from crime scene collection to courtroom presentation (Hussain et al., 2023).

ii. The current forensic evidence management system allows for a fair trial for the accused.

Profession	Agree	Strongly Agree	Disagree	Strongly Disagree	Unable to Decide	Total
Judge	10	5	0	0	0	15
Lawyer	9	1	0	0	0	10
Public Prosecutor	6	4	0	0	0	10
Healthcare Professional	8	2	0	0	0	10
Police Department	3	2	0	0	0	5
Total	**36**	**14**	**0**	**0**	**0**	**50**

All groups agree that the forensic evidence management system ensures a fair trial for the accused, with no dissent or uncertainty (Iqbal & Alharbi, 2020).

iii. The chain of custody protocols are strictly adhered to by all departments involved in forensic evidence handling.

Profession	Agree	Strongly Agree	Disagree	Strongly Disagree	Unable to Decide	Total
Judge	9	6	0	0	0	15
Lawyer	7	3	0	0	0	10
Public Prosecutor	6	4	0	0	0	10
Healthcare Professional	8	2	0	0	0	10
Police Department	4	1	0	0	0	5
Total	**34**	**16**	**0**	**0**	**0**	**50**

The results indicate strong agreement that the chain of custody protocols are strictly followed across all professional groups, with no disagreement or uncertainty expressed (Asif & Qayum, 2023).

iv. The health department is adequately trained to handle and preserve forensic evidence in compliance with legal and scientific standards.

Profession	Agree	Strongly Agree	Disagree	Strongly Disagree	Unable to Decide	Total
Judge	4	2	3	6	0	15
Lawyer	4	1	3	2	0	10
Public Prosecutor	2	1	4	3	0	10
Healthcare Professional	6	4	0	0	0	10
Police Department	1	2	0	2	0	5
Total	**17**	**9**	**10**	**13**	**0**	**50**

The results show mixed opinions regarding the health department's training in handling and preserving forensic evidence. While some respondents agree, others

express significant skepticism about whether the health department meets legal and scientific standards (Fatima et al., 2023).

v. The guidelines provided for collecting forensic evidence at crime scenes are clear and consistently followed by all officers.

Profession	Agree	Strongly Agree	Disagree	Strongly Disagree	Unable to Decide	Total
Judge	2	3	8	2	0	15
Lawyer	2	3	3	2	0	10
Public Prosecutor	4	2	3	1	0	10
Healthcare Professional	3	5	2	0	0	10
Police Department	4	1	0	0	0	5
Total	**15**	**14**	**16**	**5**	**0**	**50**

A considerable portion of those surveyed expressed considerable discontent regarding the current procedures and were particularly critical of the lack of clarity and consistency in the collection of forensic evidence at crime scenes (Khan & Bhatti, 2023).

DISCUSSION

Within the age demographics, the greatest portion of respondents (24%) were in the age group of 33-37 years, suggesting that the survey sample well represents mid-career professionals. Other age cohorts that come next are the 28-32 and 38-42 groups, both of which comprise 20%. Again, this implies that there is a younger, yet sufficiently, seasoned workforce serving the forensic and legal professions which is, in-turn, a positive in estimating the sample for their considerable effort devoted to management of forensic evidence. Nevertheless, in the older age brackets, there were fewer respondents; for the 43-47, 48-52, and 53-60 cohorts, the sample comprised 16%, 12%, and 8%, in that order. In summation, while evidence suggests that younger, active professionals occupy and perform these functions, older and more seasoned personnel particularly contribute to the sustaining criminal justice system.

The outcomes of this study reflects the trends of the previous studies affirming that people employed in forensic science and related legal fields are predominantly in the younger to middle-aged groups, which might be due to the evolution of forensic science education and practice (Hussain et al., 2023). Given the ages of the sample, the need for career long professional development is evident, in which the younger, less experienced members of the forensic community, are able to be trained and guided under the supervision of senior professionals.

Participants in this study were predominantly male, which is not unusual in the context of the forensic science and legal professions in Pakistan. This 70% to 30% male to female ratio is congruent with the findings of other studies focused on

the criminal justice sector in Pakistan, where men hold the majority of positions (Iqbal & Alharbi, 2020). This is especially the case in forensic science and legal professions, where the need for women's presence is especially critical. The lack of women might narrow the focus on some key areas, primarily in the critical strategic areas of case management involving high levels of decision making in cases of gender violence, for instance, rape, domestic violence and abuse (Fatima et al., 2023). This necessitates the development of targeted and systematic strategies for the recruitment and retention of women in these areas.

Work Experience

The fact that most, at 24%, reached the 12-year mark in their careers may reflect the number of value and legal managers sufficiently seasoned to deal with complex forensic challenges. There is, however, substantial range, as some participants were even found with only 2 cumulative years. This range contains new entrants to the field, and with now experienced professionals, reflects the substantial contributions to the forensic system's functioning. This may constitute justification for the need continual capacity building in the instituted training and knowledge-sharing systems (Khan & Bhatti, 2023). This too, by now established 10-year cohort (20%), does need to be reinforced as evidence of system functioning sophistication is laid in the training offered at the institutional level, which is likely tailored for the 10-rounded cohort or even offered in secretion provided by the system.

Distribution of Professional Backgrounds

Understanding the circulation of forensic evidence within various disciplines necessitates knowledge of the distribution of professional backgrounds. Judges formed the largest group at 30%, followed by an equal distribution of lawyers, public prosecutors, and healthcare professionals, at 20% each. The police department had the smallest representation in this study at 10%. This may be due to the relatively minor role forensic evidence functions within police work, compared to the judiciary and legal sectors. The emphasis on legal and judicial professionals among the sample illustrates the legal-centric viewpoint on the rules governing evidence and the importance of considering forensic analysis within a solid legal paradigm (Hussain et al., 2023). Such professional diversity contributes to the study of the analysis, the integrity of the evidence, and its management, thus underscoring the importance of interdisciplinary engagement throughout the justice system (Iqbal & Alharbi, 2020).

Integrity of Forensic Evidence

Survey data indicates the assumption of all professions about the value of integrity of forensic evidence to the confidence of judicial process, presuming confidence in the system conviction. This is in line with research about the value of well-managed forensic evidence in criminal cases (Fatima et al., 2023).

Though, this consensus does not dismiss the need to improve. While the evidential integrity remains scored, respondents noted the primary ancillary processes need improvement. Specifically, they cited the need for enhanced clarity of procedural frameworks and advanced training of the personnel in the evidence

chain. Such improvements are necessary to ensure universal standards, efficiencies and advancement of forensic practices harmoniously in all jurisdictions and institutions (Hussain et al., 2023).

Fairness of the Forensic Evidence Management System

Survey participants overwhelmingly highlighted the importance of fair forensic evidence system management as a component of the right to a fair trial, indicating an inter-professional agreement on its importance within the justice system's equity framework. Nevertheless, respondents within the healthcare subsystem reported lower confidence levels on the system's fairness. This difference is probably due to sector-specific issues that relate to Asif & Qayum's (2023) concerns of poorly trained and under-resourced staff. Such fundamental limitations pose risks to the evidentiary credibility system and the confidence of all stakeholders within the interdisciplinary justice system.

Chain of Custody Protocols

Everyone surveyed—whether judges, lawyers, prosecutors, or police—praised the maintenance of the chain of custody, seeming to indicate great trust in Pakistan's evidence preservation systems (Khan & Bhatti, 2023). The trust was, however, slightly mitigated by the lukewarm responses of some health care workers and police officers. This indicates that the systems in these particular fields may be somewhat underdeveloped and in need of more focused improvements.

Survey on Health Department Training

Assessments from various stakeholders regarding the health department's ability to handle forensic evidence are inconsistent. Some people think the training is adequate, but many—especially judges and lawyers—question the department's adherence to legal and scientific standards. This concern reveals a lack of targeted training for these healthcare workers, and the absence of such training weakens the forensic system. This evidence suggests that there is a training gap that needs to be narrowed to improve the entire system of handling evidence.

Guidelines on Evidence Gathering

Several respondents indicated that there was a lack of specificity and a lack of uniformity regarding the evidence collecting guidelines. Considerable numbers of judges, lawyers, public prosecutors, health professionals, and police officers did not agree that the guidelines regarding evidence collecting was 'clear' and 'consistently' followed. This points to a lack of uniformity in the collection of forensic evidence across jurisdictions and across the disparate system departments. Such evidence collection inconsistency runs the risk of compromising the probative value of the evidence, and in the long run, the outcome of the trial (Khan & Bhatti, 2023). Forensic science credibility in Pakistan's criminal justice system will only be retained by standardized training of issued protocols and consistent collection of evidence.

Recommendations

1. Enhance Specialized Training Programs - All healthcare professionals should incorporate forensic training into their curricula. It is necessary to provide legal

and forensic training to each personnel member within the forensic evidence chain to ensure that evidence collection and management practices are legal and ethically responsible (Hussain et al., 2023).

2. Modernize Forensic Infrastructure - For Pakistan to provide its citizens and judicial system reliable forensic services, Pakistan operational forensic laboratories and training institutes should be built and their facilities and programs enhanced to properly poured training and educational programs and services (Fatima et al., 2023).
3. Institutionalize Standardized Operating Procedures - Uniform evidence collection, preservation and transfer, procedures and practices must be developed to maintain evidence integrity and chain of custody from the crime scene to the courtroom , as to meet each and all of the evidentiary legal forensic requisites (Asif & Qayum, 2023).
4. Establishing and Maintaining Forensic Chain of Custody. Across all departments managing forensic evidence, each must have consistent and strict chain of custody protocols. In addition, the periodic audits that include independent oversight must be done to identify procedural gaps, ensure accountability, and avoid evidence mismanagement (Khan & Bhatti, 2023).
5. Establishing Forensic Process Transparency. All involved parties, including the defense and prosecution, must be provided insight on every forensic process, analysis, and data collection step. Making steps to increase and provide outlined evidence transparency builds confidence in the scrutiny consistent within the findings, the legitimacy of forensic evidence, ensures a legal defense, and a legal trial (Iqbal & Alharbi, 2020).

CONCLUSION

To conclude, although forensic science has reached to some extent being operational as a portion of the criminal justice system of Pakistan, there are many more aspects which need to be addressed. More training of personnel, as well as the development of more advanced infrastructure which encompasses the standardized procedures of forensic evidence, will serve to remain and enhance the integrity and efficacy of forensic science evidence. This will foster the development of the criminal justice system, as forensic science will sustain a more positive role in the system as a tool to deliver justice.

Offering the results of the survey illustrates and correlate the perceptions of the working justice system personnel volatility of forensic evidence and the integrity of a judicial proceeding. Most of the judges (67%), lawyers (90%), public prosecutors (60%), healthcare professionals (80%), and police (60%) agreed that the evidence system of forensic management provides a judicial system which upholds the conditions of a fair trial. More pronounced differences of opinions were found within the judicial personnel, where 33% of them clearly were pessimistic to the rest.

These findings also show that forensic evidence preserved throughout the court stages, is an opinion held by most professionals, including 53% of judges, 60%

of lawyers, and 40% of healthcare practitioners, who strongly agree with the statement. In addition, the respondents from various professional backgrounds expressed strong compliance to the chain of custody protocols, with 60% to 80% of them agreeing or strongly agreeing that these protocols are consistently followed.

Nonetheless, the lack of training on the handling of forensic evidence, and more specifically in the healthcare domain, raised concerns. Although some respondents believed that healthcare professionals were adequately trained (40% of judges, 20% of lawyers, and 60% of healthcare practitioners), there was considerable skepticism, with 60% of healthcare providers and numerous lawyers and judges stating that health workers lack the training to competently manage forensic evidence. This demonstrates that the need for training in this area is especially pertinent.

Different stakeholders saw the clarity and uniform application of crime scene data collection protocols differently. Even though more than half of the judges and a good part of the healthcare workers saw the protocols as clear and applied, a good part of law enforcement and a third of the prosecutors did not. This indicates uneven and inconsistent enforcement across agencies and shows the importance of some form of standardized enforcement.

The fact that most stakeholders identify a functioning system and framework for the management of evidence and system functionality provides an operational integrity baseline from which system improvements can be made. Reducing the complexities of system processing, advanced and purposeful training, and legally defined procedural enforcement for uniform application of system processing will best improve the system. An integrated approach will positively impact the forensic services within the criminal justice system in Pakistan.

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