

The Role of Forensic Science in Sindh's Criminal Investigations: Gaps, Barriers, and Solutions

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ABSTRACT

The utilization of forensic Science for prosecution is the norm for an able Felonious/criminal justice system(CJS) comprehensively. However the absence of measurable legends establishments prevents the felonious equity framework in Pakistan. It's accepted that the absence of limit and deficiently prepared policing force add to the low conviction rates in Pakistan. The main objective of this paper is to Investigate the role and significance of forensic evidence (FE) in criminal investigations by LEAs in Pakistan, by identification of limitations and challenges faced by them and to propose the reforms in application of forensic science in Sindh .The limit is characterized as the lack of ability of the LEAs to answer the situation of wrongdoing, FE Assortment, its safeguarding, storage facility, transportation, and understanding for the prescription of execution's case in the illumination of the transnational upscale practices. A mixed methodology was employed by using a structured questionnaire to collect data from investigating officers working at the police station level in two districts of Sindh Province, Pakistan and examining different research papers and Journals related to the field of Forensic. The data was assessed in comparison to international best practices outlined in the Crime Scene Investigation. The examination of the information is intriguing that there are serious limit issues in the Utilization of Scientific validation by Policing in Pakistan that bear healing way for upgrade. From early on, this study has given proposals on the foundation of the discoveries for upgrade. The paper fills in as a manual for the changes in regards to the utilization of FE by LEAs in Pakistan for a high level felonious equity framework.

Keywords: *Gaps in Application of Forensic, Challenges in application of FS, Use of Forensics in Criminal Investigation, Reforms to apply forensic in Sindh.*

INTRODUCTION

Forensic science agency has been assuming an incredible part in the criminal examination process. For the examination of proof, for example, opiates test, DNA test, unique mark test, blood, semen, soils, hair, hazardous materials, record assessment, biologic assessment, actual assessment, and recognizable proof. Prior to measurable science, criminal examination depended upon individuals' associations. When clinical science and sociology created in the world and innovation expanded. Individuals began to share their encounters. World become the worldwide town. Information on arithmetic, science,

science, and physical science helps the measurable science for the discovery of wrongdoing (Saferstein, 2020).

Over time and in contemporary law, forensic science has been seen as a crucial components in compiling a litigation against main accused. It entails the application of technology and cutting-edge scientific procedures to the investigation of crime, enabling detectives to unearth significant leads from a blank crime scene, especially in situations where offenders may have utilized atypical or antiquated methods (Inman & Rudin, 2022).

The application of the information and methods from several scientific arenas to legal challenges is the focus of forensic science (Houck & Siegel, 2015). It contains the use of a extensive range of disciplines, including software engineering, physical science, science, and science. The following are some forensic science subfields:

Forensic biology/ DNA: DNA profiling is the other frequently used legal approach in felonious examinations besides cutlet imprint analysis. Legal professionals can use DNA, which is as distinctive to an individual as fingerprints, to identify or confirm an unidentified person or to remove musketeers from a list of people who have been indicted.

The Sindh Scientific Science Organization Act was supported in the fiefdom of Sindh in August 2017, albeit no lab has been developed at this point. DNA testing establishment that offers scientific and investigation testing. Likewise, the Sindh government is attempting to deliver a measurable DNA testing lab at Karachi University.

A essential factor of the felonious justice system is forensic wisdom (Awan, 2018). To give unprejudiced suppositions can do help in the examination and trial of crime committers or guilty declared an acquitted person of dubitation, forensic geniuses check and estimate substantiation from crime scenes and other locales. The purpose of this exploration is to dissect about the significance of forensic wisdom in the felonious disquisition and its effectiveness. With increase in ultramodern technologies how this study helps Police and Prosecutors to investigates crimes more fluently as compared to the aged times when no similar installation was available (Chohan, 2020). Based on case analysis, expert interviews and legal evaluations, this study offers a comprehensive overview of the practical application of forensic science in Sindh and suggests strategic solutions to strengthen forensic investigation, enhance conviction rates and ensure a more effective legal system. In these findings, the study seeks to bridge the gap between forensic theory and its real-life application in criminal investigations in Sindh.

LITERATURE REVIEW

Forensic science in criminal investigations is an application of scientific techniques to analyze evidence and establish facts relevant to legal cases (Saferstein, 2020). Such fields include DNA analysis, fingerprinting, ballistics, and toxicology, and also digital forensics, which serve purposes of suspect identification, linking to the crime scene, and reenactment of crime commission events (Inman & Rudin, 2022). This method creates objective evidence that, unlike witness testimonies, can possibly support or contradict them. Thus, forensic evidence is positively correlated with better investigations in the area of crime (Houck & Siegel, 2015). Forensic science has gained a lot of attention in Pakistan over the last few years, but its use is still limited mainly due to the problems of lack of resources, absence of experts, and weak legal frameworks (Awan, 2018). Forensic science is still developing within Sindh, and police investigations generally depend more on traditional means, such as eye-witness accounts and confessions, rather than forensic evidence (Chohan, 2020). The reliance on non-scientific investigative methods has caused false convictions, delay in justice, and hurdles in fair trials (Hussain & Ahmed, 2021).

There are a lot of problems regarding forensic implementation in Sindh, although the importance of forensic science is recognized. One of the vital problems is lack of forensic infrastructure. There are very few proper forensic laboratories in the province, making it very difficult to conduct advanced forensic analyses (Chohan, 2020). Forensic reports also get delayed frequently due to backlog, untrained staff-in shortages, and poor processing systems (Hussain & Ahmed, 2021).

Training of law enforcement officers and judicial personnel is another major hurdle in Sindh's forensic science system (Jackson & Jackson, 2019). Some police officers and crime investigators do not receive training in the collection, preservation, and documentation of forensic evidence, which results in contamination of evidence and undermines the strength in court cases (Hussain & Ahmed, 2021). Most of these cases fail to provide forensic evidence in courts due to mishandling. Furthermore, many prosecutors and judges lack the mastering knowledge to interpret forensic reports; thus, they undervalue forensic evidence in trials (Saks & Koehler, 2005). This gap calls for adequately designed forensic training programs in an effort to improve the capacity of law officers and judicial practitioners to successfully deploy forensic science in the criminal justice system (Fisher, 2019).

The cybercrime and digital crimes have so increased to the extent that they demand forensic skills of a high-end nature. As for the digital forensics field, it remains largely underdeveloped, with fewer trained cyber forensics experts, and very limited modern forensic tools (Inman & Rudin, 2022). The absence of specialized digital forensic units thwarts chances available to law enforcement agencies investigating crimes, such as financial fraud, cyber terrorism, and electronic data manipulation (Hussain & Ahmed, 2021). It reflects the need to invest in digital forensic capacity building in training and infrastructure so that law enforcement agencies of Sindh could be equipped with the necessary tools to counter modern cyber threats.

Forensic science has potential to transform Sindh's criminal justice system: scientific, objective, and credible evidence enhances criminal investigations and increases conviction rates.

Research Gap

This research therefore brings a novel contribution by considering exclusively the Sindh forensic science system and fills up an important lacuna in available literature, as it discusses primarily the forensic science at the national or general level. Earlier research works have criticized Pakistan for not having adequate forensic infrastructure and training issues, but nothing is available concerning how forensic evidence is used or unused in Sindh's crime investigation. The current study has a unique feature of discussing real case applications of forensic science, offers firsthand perceptions from forensic experts, police officers, and legal professionals, identifies particular regional challenges, such as delays in DNA analysis, and forensic labs are inadequately developed, that is not reflected in previous research studies. It presents a bespoke framework for forensic training programs and policy recommendations to integrate forensic science into the Sindh legal system more effectively.

RESEARCH METHODOLOGY

This study uses a mixed method approach to examine the role of forensic science in criminal investigations in Sindh, Pakistan, combining practitioner findings and international standards to identify problems and propose customized solutions. Using a descriptive and exploratory approach, the aim of this study is to describe current forensic practice and explore its underlying limitations. Primary data were collected from 40 participants, including investigators, forensic scientists and lawyers, using a structured questionnaire covering key themes such as the importance of forensic evidence, challenges in evidence handling, adequacy of training, institutional delays and policy improvements. Secondary data were obtained from scientific literature, forensic manuals and international reports and used as comparative indicators. Data analysis included statistical evaluation of questionnaire responses, thematic analysis of qualitative data and benchmarking against global forensic standards. Ethical considerations were respected through informed consent, anonymity and objective presentation of data.

The study recognizes limitations such as focus on two districts and reliance on participant convenience. Despite these limitations, the mixed methods approach provides a comprehensive view of forensic science in Sindh through the integration of empirical data and contextualized narratives, and ultimately provides practical and actionable recommendations for improvement. This research employs a mixed-methods approach to investigate the role of forensic science in criminal investigations within Sindh, Pakistan. By combining direct input from practitioners with comparisons to international standards, the study identifies existing challenges and proposes actionable solutions tailored to the local context.

Challenges in Using Forensic Evidence in Sindh

In addition to more common crimes, Pakistan has formerly endured terrorist attacks and racial exertion. The police carried out the maturity of the examinations and analyses using conventional investigative ways. These processes constantly reacted in the destruction of priceless validation or, more constantly, the onus of the factual validation. The Pakistani judicial system requested a scientifically predicated study because the number of false claims made by spectators has increased. The conformation of forensic agencies in Pakistan is a result of the demand for contemporary investigative ways.

The major thing of the study is to understand the difficulties encountered by field police officers in forensic lawless exploration, from recovering the crime scene to putting together a case for the court, and to offer results predicated on disquisition to get around those difficulties. By addressing police enterprises in various areas, analogous as forensic training, contemporary investigative installations, and with reference to other actors in the exploration process, analogous as forensic wisdom laboratories, this study is important to police exploration officers. The study is salutary to forensic lab officers and lawless justice system practitioners because people who have been set up shamed of crimes predicated on physically vindicated validation that has endured scientific analysis are credible vouchers in court and will eventually meliorate the effectiveness of our legal system.

It's vital to note that forensic validation, including fingerprints, blood, semen, munitions, empty rounds, and others, is what drives forensic examinations. Forensic exploration is the process of gathering, conserving, and analysing validation in a lawless case. The exploration officers were questioned regarding the necessity and significance of forensic validation being properly collected, stored, and examined during the study's fieldwork. The question of whether inexperienced investigators tamper with the forensic validation at a crime scene was posed to the attesters in this terrain. Thirty of the forty attesters who responded to the question stated that it's true that inexperienced investigators are destroying forensic validation as they collect it from the crime scene. They were subsequently questioned regarding the progress of their original virgin course forensic training. 34 attesters said they had no forensic training during their original virgin course in answer to this. 27 attesters added that their police station demanded a crime scene forensics expert. The same number of attesters — 35 — did n't know that Jamshoro had any forensic training installations. Regarding attesters' opinions on the vacuity of packaging material for the collecting of forensic validation, 25 attesters reported entering the packing material, but the remaining attesters only entered a little amount of the material. When asked if they had gotten the necessary training to use and manage forensic validation, 32 attesters indicated that they were alive of how these tools should be used, but that they had not. This prevented them from using the tools effectively.

The forensic lab and DNA lab are essential to the assessment of physical validation that is applicable to the development of a lawless case in forensic exploration. In order to identify the suspect from DNA samples, a DNA lab is essential. The comparison of DNA samples to identify the offender in various lawless situations, particularly those involving child abuse, rape, and murder, is presently Pakistan's biggest challenge. In this study, attesters were questioned about the Forensic Science Laboratory's (FSL) response when reviewing cases that were appertained to them. In this regard, 28 attesters stated that the response of FSL is quick, and 28 attesters were satisfied from the position of cooperation of the FSL in forensic exploration. They claimed that the FSL's performance is effective in looking at physical validation. 28 attesters made the suggestion that there should be more forensic labs in order to lessen

the burden that the entire terrain places on The Sindh Forensic DNA and Serology laboratory Karachi. Unfortunately, Jamshoro does n't have a forensic laboratory. This was made in light of the significant part that the forensic lab plays in the examination of physical validation. Due to the inaccessibility of an installation of this nature in the Jamshoro region, the Sindh Forensic DNA and Serology laboratory in Karachi is where the Jamshoro Police shoot DNA samples for comparison.

In conclusion, it's reasonable to assert that the lawless investigative process in the maturity of lawless cases is shy without the operation of forensic wisdom. Forensic validation assists in the conviction of malefactors in the absence of an bystander. In order to establish data applicable to the case being heard in court, the exploration officers are continually collecting forensic validation, which might be physical or digital in character. Despite its significance, gathering, moving, and analysing forensic validation is n't a simple task. When conducting a forensic lawless exploration in the field, the exploration officers are over against a number of challenges. The main issues are undertrained investigators, tainted physical validation, shy forensic exploration training, a lack of instruments and outfit to handle physical validation, transportation of physical validation, a lack of a mobile van for crime scenes, etc. According to this study, there is no forensic lab in the Jamshoro region. The terrain suffers from a severe lack of forensic laboratories. The other state agencies do n't work on well with the police department. The police exploration officers' service delivery as exploration officers was ultimately impacted by their lack of professionalism and lack of professional qualifications.

Research Interviews

For data collection, a questionnaire is prepared for the study participants who are Examiner, expert, analyzer, doctors and Investigation Officers working for Police in Sindh Province of Pakistan. The questionnaire is divided into five parts. The first part comprises questions related to the important and role of forensic science, the second part is about Crime scene Processing: forensic evidence collection and contribution, followed by parts on track the use and attrition of forensic evidence, To ascertain cause of low progress in forensic science and analyzing the possible challenges that the forensic experts face in collecting and preserving the impressions. The questions included are related to standard operating procedures, training and skills, equipment and resources, and operational capacity.

Q:1. Why and to what extent the Forensic Science is important in the criminal justice system?

R/Dr 01: " Forensic wisdom is important in the felonious justice system because it provides scientific substantiation to prop in the disquisition and resolution of felonious cases. Forensic wisdom is a multidisciplinary field that includes DNA analysis, point examination, ballistics, toxicology and digital forensics, among others. These disciplines play a pivotal part in crime scene disquisition, substantiation collection, analysis, and donation in court. Forensic wisdom is important to the extent that it can make or break a case, as it provides objective substantiation that can help prove or falsify a suspect's guilt".

R/LS 01: Forensic wisdom's analysis of touch DNA is pivotal in felonious examinations, abetting in substantiation identification, crime scene reconstruction, and the resolution of cold cases. It plays a vital part in connecting individualities to crime scenes, supporting legal proceedings, and indeed exculpating the incorrectly indicted. Advancements in technology enhance the perceptivity of touch DNA analysis, making it a important tool in working crimes and icing justice.

R/SJ 01: The trial judge serves a part as the " doorkeeper " who determines whether expert evidence is considered estimable and applicable. also, the judge employs a Dubert test to corroborate whether the evidence of the expert is grounded on scientifically valid logic and whether it has been duly applied to the data of the issue. The procedure of scientific examination that fails to misbehave with the Daubert standard may affect in the rejection of any expert evidence in the court.

Q 02 :What are some of the challenges in collecting and conserving prints?

R/Dr 02: Collecting and conserving prints, similar as vestiges, tire tracks, or other types of prints, can be challenging due to several factors. Some of the challenges as under

1. Fragility.
2. Environmental factors.
3. impurity.
4. Limited time frame
5. Technical ways.
6. Storage and transportation
7. Chain of guardianship.
8. Limited moxie.
9. outfit and coffers.
10. Scene safety.

R/LS 02: Assessing the use and waste of forensic substantiation in the felonious justice system involves assessing the entire process, from crime scene collection to laboratory analysis and court donation. Then is a step- by- step approach to assess the use and waste of forensic substantiation

R/SJ 02: The use of forensic wisdom ways in behavioural wisdom aids us in furnishing a clear and terse overview of principles and styles that support legal decision- making in felonious examinations. This approach allows for an each- encompassing disquisition into crime scenes as well as the geste of perpetrators. The study provides sapience on the intricate intersectionality between justice, law, and forensic wisdom related to behavioural exploration- pressing their pivotal part in aiding presiding officers (similar as judges or adjudicators), attorneys, and police officers with reaching precise conclusions.

Q 3. What's the chain of Custody?

R/Dr 03: Chain of guardianship refers to the attestation and shadowing of the running, possession, and transfer of substantiation from the time it's collected until it's presented in court. It's a critical element of forensic wisdom and felonious examinations, icing the integrity and trustability of substantiation.

The chain of guardianship includes

1. Collection substantiation is collected at the crime scene or other locales.
2. Identification substantiation is linked and labeled.
3. Packaging substantiation is packaged and sealed.
4. Transportation substantiation is transported to a laboratory or storehouse installation.
5. Storage substantiation is stored in a secure installation.

6. Analysis substantiation is anatomized by forensic experts.
7. Reporting Results of analysis are proved and reported.
8. Testimony Expert evidence is handed in court.

What are the conditions for chain of guardianship?

The chain of guardianship requires

1. Attestation Each step is proved, including dates, times, and individualities involved.
2. Control substantiation is kept in a secure and controlled terrain.
3. Responsibility individualities handling substantiation are responsible for their conduct.

Which form of forensic substantiation contributes further successfully to the case?

The form of forensic substantiation that contributes most successfully to a case depends on the specific circumstances and the type of crime being delved . still, then are some of the most generally used and effective forms of forensic substantiation

1. DNA substantiation
2. Fingerprints
3. Footwear and tire track substantiation
4. Ballistic substantiation
5. Digital substantiation
6. videotape and audio substantiation
7. Forensic anthropology
8. Toxicology
9. Questioned documents
10. Bloodstain pattern analysis

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1. R/LS 03: Crime Scene Investigation
2. Substantiation running and storehouse
3. Laboratory Analysis
 - Estimate laboratory protocols and logical ways.
 - Assess the quality and trustability of test results.
 - Identify implicit sources of error or impurity.

4. Case Management and Prosecution

R/SJ 03: In utmost authorities, a conviction can be grounded on sole forensic substantiation, but it's subject to certain conditions and limitations. Then are some considerations

1. Quality and trustability The forensic substantiation must be of high quality and trustability, meeting scientific norms and protocols.
2. Expert evidence Expert evidence is pivotal to explain the forensic substantiation and its significance.
3. Chain of guardianship The integrity of the substantiation must be maintained through a secure chain of guardianship.
4. No disagreeing substantiation There should be no disagreeing substantiation that contradicts the forensic substantiation.
5. Corroboration not always necessary In some cases, forensic substantiation can be sufficient without substantiation, especially if it's strong and conclusive(e.g., DNA matching the suspect).
6. governance-specific laws Laws and regulations regarding forensic substantiation vary by governance; some may bear substantiation or have specific norms for forensic substantiation.
7. Judge or jury discretion Eventually, the judge or jury decides the weight and adequacy of the forensic substantiation in reaching a verdict.

It's important to note that counting solely on forensic substantiation can be parlous, as it may be subject to crimes, impurity, or misapprehension. Corroborating substantiation can strengthen the case and increase the liability of a conviction.

What are the causes of low progress in forensic wisdom in Sindh?

Principally Mirpurkhas is n't big megacity as compared to Karachi and Hyderabad,

substantially People confessed before judges and attorneys and also lack of advanced technology, confinement of justice, malpractice and quality of norms etc

How evidences attained with the help of forensic wisdom are helpful in working a riddle with regard to felonious offences?

Attestations attained with the help of forensic wisdom are pivotal in working felonious mystifications in several ways

1. Linking suspects to crime scenes Forensic substantiation like DNA, fingerprints, and vestiges can connect suspects to crime scenes, establishing their presence and involvement.
2. relating victims Forensic anthropology and DNA analysis can help identify human remains, working missing person cases and unidentified victim cases.
3. Reconstructing crime scenes Forensic experts use substantiation like bloodstain patterns, pellet circles, and glass fractions to reconstruct crime scenes, revealing the sequence of events.

4. Debunking defenses Forensic substantiation can falsify suspects' defenses, exposing their involvement in crimes.

The research interviews with forensic experts, law enforcement officers, and legal professionals in Sindh reveal that forensic science remains underutilized in criminal investigations due to limited resources, outdated techniques, and lack of trained personnel. Police investigations often rely more on eyewitness testimonies and confessions rather than scientific evidence like DNA analysis, fingerprinting, or ballistics. A major challenge highlighted is the lack of forensic infrastructure, with Sindh facing delays in forensic analysis due to poorly equipped laboratories and absence of automated databases. Additionally, law enforcement officers lack proper training in evidence collection and preservation, leading to evidence contamination and weak forensic integrity in trials. The judicial system also struggles with limited awareness of forensic science, making it difficult for courts to accept forensic reports as strong legal evidence. Moreover, legal barriers, including weak chain of custody procedures and outdated legal frameworks, further restrict the effective use of forensic evidence in trials. Interviewees emphasized the urgent need for government investment in forensic laboratories, structured training programs for police and judiciary, and policy reforms to integrate forensic science more effectively into the criminal justice system. Collaboration with international forensic institutions was also suggested to modernize forensic practices in Sindh. Overall, the interviews conclude that forensic science has the potential to transform Sindh's criminal justice system, but systematic reforms, legal recognition, and investment in forensic infrastructure are crucial for its effective implementation.

Comparison of Application of Sindh's Forensic Science with International Standards

The research compares Sindh's forensic science application with international standards, particularly in the USA, UK, and India, highlighting significant gaps and areas for improvement.

Table 1: Forensic Training And Expertise

Feature	Sindh Pakistan	International Standards (UK, India, USA)
Law enforcement training	Police and Investigation officers lack proper training.	Specialized forensic training is mandatory in UK and USA
Forensic Expert Availability	Number of forensic experts are very low that lead to backlog of cases	Each Investigating officer has access to certified experts and analysts.
Judicial Awareness	Judges and lawyers are not trained of forensic science, leading to misinformation of Evidence.	Judges and lawyers are given proper awareness on the use of forensic evidence

Table 2: Forensic Infrastructure and Laboratories

Feature	Sindh Pakistan	International Standards (UK, India, USA)
Forensic Laboratories	Limited Forensic Labs, mostly outdated, No dedicated DNA Lab.	Well Equipped Lab, proper advance Infrastructure, Advance DNA, ballistics, Toxicology Divisions.
Processing time	Always delay, takes months to years.	It is processed within hours to days due to proper funding system.
Equipment and Technology	Lack of Modern forensic tools like automatic finger print system or database forensic AI.	Advanced Forensic Technology such as AFIS(Automatic fingerprint Identification system) and rapid DNA identification .

Accreditation	No accredited International forensic Labs.	Labs accredited by FBI, ISO or UKAS ensuring high quality procedure.
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Table 3: Use of Digital Forensics and Cybercrime Investigation

Feature	Sindh Pakistan	International Standards (UK, India, USA)
Digital Forensic unit	Very Few Operational forensic labs, mostly in Karachi.	Well established forensic cyber crime divisions.
Cyber crime investigation	Investigation agencies lack expertise in digital forensics.	Trained forensic Experts on digital forensics.
Data Protection laws	No strictly followed data protection laws .	Strictly followed data protection laws.

This comparison shows that Sindh deviates significantly from international standards in forensic infrastructure, training, digital forensics, and legal admissibility. To strengthen forensic science in Sindh, the government must invest in modern forensic laboratories that meet international accreditation standards. Mandatory forensic training programs for police, investigators, and judges are in dire need of improvement to ensure better handling and admissibility of evidence in court. Stricter forensic laws and stricter chain of custody protocols need to be developed to ensure that forensic evidence is properly utilized in court proceedings. Finally, a digital forensics unit needs to be established and cyber laws need to be strengthened to meet the growing demands of cybercrime. Overall, the forensic system in Sindh needs significant reform to bring it in line with global forensic standards. By adopting best practices from developed countries, Pakistan will be able to strengthen criminal investigations, increase conviction rates, and strengthen its justice system.

CONCLUSION

The study illustrates the glaring importance of forensic sciences within the Sindhi criminal justice system while pointing to the real expertise deficits in that area. The inquiries discovered that forensic science is quite untimely in Sindh and is standing against underdeveloped infrastructure, understaffed trained personnel, anachronistic scientific work methodologies, and meager legal recognition of forensic evidence. While in relation to the global standards, Sindh’s forensic capabilities are lagging on several counts like laboratory facilities, digital forensic sophistication, and training for law enforcement and judicial. It would appear that forensic evidence is systematically neglected in criminal investigations, leading to weak prosecutions and poor crime conviction levels. With qualitative interviews, it was found that forensic specialists, police personnel, and the community of lawyers face issues, like contamination of evidence, delay in analysis, and scarcity of resources. This very study pursues and urges reforms to address these issues, for example, establishing regional forensic laboratories, establishing training programs looking at the applicability of forensic evidence under criminal law, and incorporating forensic science into cybercrime investigations. By adopting the best international practices and by infusing the forensic sector such an appointment in Sindh will be the way toward the betterment of forensic science and, consequently, effective criminal investigations and a more equitable criminal justice system.

RECOMMENDATIONS FOR REFORMS IN APPLICATION OF FORENSIC SCIENCE BY SINDH

Establish Specialized Forensic Training Programs:

It's essential to produce specialized, accredited forensic training programs for law enforcement officers, forensic judges, and other stakeholders involved in the felonious justice system. These programs should cover colorful aspects of forensic wisdom, including substantiation running, analysis ways, and legal norms for forensic substantiation admissibility.

Invest in Forensic:

Laboratory structure numerous forensic laboratories in Sindh warrant acceptable coffers, ultramodern outfit, and a sufficient pool to handle the volume of cases. Increased investment in forensic lab structure, including ultramodern technology and outfit similar as DNA sequencing machines, ballistic comparison tools, and digital forensics software, is pivotal to perfecting forensic analysis capabilities.

Establish Regional Forensic:

Centers Given the geographic size of Sindh, it's vital to establish indigenous forensic centers in different sections. This would reduce the logistical burden of transferring substantiation to distant laboratories, accelerate case processing times, and insure more effective forensic services throughout the fiefdom.

Apply National and Provincial DNA Databases:

A centralized DNA database for Pakistan, and indigenous DNA databases specifically for Sindh, would allow for faster identification of suspects, particularly in cases of periodical crimes. It would also help in linking DNA substantiation from colorful crime scenes, easing the identification of reprise malefactors and potentially working cold cases.

Develop a National Integrated:

Ballistic Information Network(NIBIN) A public or indigenous ballistic database can allow forensic experts in Sindh to compare arm- related substantiation more snappily and efficiently. By collecting ballistic substantiation similar as pellet striations and cartridge markings, investigators could match arms to crimes across multiple authorities.

Ameliorate substantiation running and Chain of Custody Protocols:

Strengthening the protocols for substantiation running, preservation, and attestation is essential to insure the integrity of forensic substantiation. Establishing clear chain- of guardianship procedures can help substantiation impurity, tampering, or loss, and eventually cover the credibility of forensic substantiation in court.

Enhance Public mindfulness about Forensic Science:

Public mindfulness juggernauts fastening on the significance of forensic wisdom and its part in the felonious justice system should be conducted. By educating the general public about the value of forensic substantiation, public confidence in the justice system can be increased, leading to stronger community cooperation with law enforcement.

Strengthen Collaboration Between Law Enforcement and Forensic Experts:

To maximize the effectiveness of forensic substantiation in felonious cases, there must be lesser collaboration between forensic scientists, law enforcement agencies, and prosecutors. Creating a more intertwined approach ensures that forensic substantiation is effectively collected, anatomized, and presented in court.

Address Political hindrance and Corruption:

Forensic substantiation can be compromised by political pressure or corruption. Strict anti-corruption measures and independent oversight bodies should be put in place to insure the equity of forensic examinations and guard the integrity of the felonious justice process.

Introduce Digital Forensics Training and Tools:

With the rise of cybercrime and digital substantiation, it's essential to invest in digital forensics training and technical tools for law enforcement officers. This would allow investigators to effectively dissect data from computers, mobile bias, and other electronic outfit involved in felonious conditioning.

Produce Multi-Disciplinary:

Forensic brigades Forensic examinations are frequently complex and bear moxie in colorful disciplines, similar as biology, chemistry, toxicology, and digital analysis. Forming multi-disciplinary brigades that combine experts in different fields of forensic wisdom can ameliorate the quality and delicacy of examinations.

Borrow International norms for Forensic Practice:

To insure that forensic substantiation is dependable and permissible in court, it's essential for forensic labs in Sindh to borrow transnational stylish practices and norms. This includes enforcing internationally honored protocols for forensic testing, quality control, and affect confirmation.

Establish a Forensic substantiation:

Tracking System Developing an automated shadowing system for forensic substantiation could enhance the effectiveness and translucency of forensic examinations. This system would track substantiation from collection through analysis and court donation, furnishing a transparent, secure, and fluently accessible record of all forensic conditioning related to a case.

Expand the Use of Forensic Psychology and Behavioral Profiling:

In cases involving serious crimes similar as periodical offenses, expanding the use of forensic psychology and behavioral profiling could help investigators more understand the provocations and patterns of malefactors. Collaboration between forensic psychologists and law enforcement agencies can lead to more accurate profiling and prophetic analysis, helping to break complex cases.

Increase Cooperation with International Forensic Networks:

Sindh's forensic wisdom community should unite further with transnational associations, similar as INTERPOL and UNODC(United Nations Office on medicines and Crime), to partake stylish practices, moxie, and coffers. Access to transnational forensic databases and networks can enhance the effectiveness of forensic examinations and help in working cross-border felonious cases.

Strengthen Post-Investigation Forensic checkups:

It's essential to establish mechanisms for post-investigation checkups to assess the delicacy and effectiveness of forensic procedures. This will help identify areas for enhancement in the forensic process, insure quality control, and give assignments for unborn cases.

Promote Public-Private hookups for Forensic:

Services To ameliorate the vacuity and quality of forensic services, public-private hookups could be encouraged. Collaborations between government agencies and private forensic providers can bring invention, better coffers, and technical moxie to forensic examinations.

Give Acceptable Backing for Forensic:

Research and Development Investment in exploration and development of new forensic technologies, methodologies, and tools is essential for keeping pace with advancements in felonious conditioning and investigative ways. The government and private sector should allocate backing to support the development of slice-edge forensic technologies that can enhance the delicacy and speed of felonious examinations.

Enhance Victim Support Programs Linked to Forensic Science:

In criminal cases, particularly those involving serious injury or death, victim support services play a critical part. Establishing victim support programs that work nearly with forensic brigades can help victims' families navigate the legal and emotional complications of felonious examinations while icing that the forensic process is handled with perceptivity and care.

Focus on Strengthening the Legal Framework for Forensic substantiation:

Eventually, there should be nonstop sweats to strengthen the legal frame governing the use of forensic substantiation in Sindh. This includes icing that forensic wisdom is honored as an essential tool in the felonious justice system and that laws governing the admissibility and norms of forensic substantiation are streamlined to reflect ultramodern technological advancements.

REFERENCES

- Awan, M. (2018). *Forensic Science and Its Role in Criminal Justice*. Lahore Law Review, 15(2), 45-67.
- Chohan, F. (2020). *Forensic Science in Pakistan: Challenges and Future Prospects*. Journal of Forensic Studies, 8(1), 23-40.
- Fisher, B. A. J. (2019). *Techniques of Crime Scene Investigation* (8th ed.). CRC Press.
- Houck, M. M., & Siegel, J. A. (2015). *Fundamentals of Forensic Science* (3rd ed.). Academic Press.
- Hussain, M., & Ahmed, S. (2021). *Legal Challenges in Admissibility of Forensic Evidence in Pakistan*. Pakistan Journal of Law and Society, 12(3), 78-95.
- Inman, K., & Rudin, N. (2022). *Principles and Practice of Criminalistics: The Profession of Forensic Science*. CRC Press.
- Jackson, A. R., & Jackson, J. M. (2019). *Forensic Science* (4th ed.). Pearson Education.

Saks, M. J., & Koehler, J. J. (2005). *The Coming Paradigm Shift in Forensic Identification Science*. *Science*, 309(5736), 892-895.

Saferstein, R. (2020). *Criminalistics: An Introduction to Forensic Science* (12th ed.). Pearson.