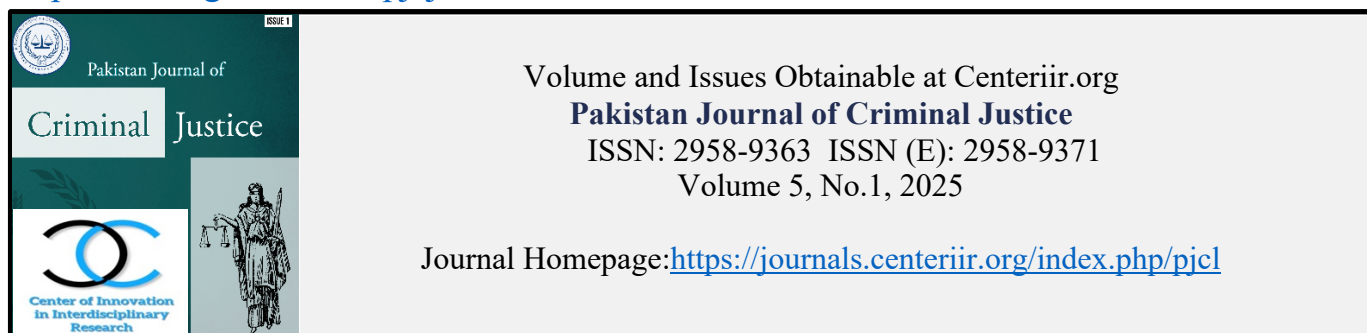




Forensic Fingerprints: An Evidential Clue for Police Officers in Forensic Investigation in Khyber Pakhtunkhwa, Pakistan

Syed Aizaz Ali Shah¹

¹ Faculty member; Department of Criminology, University of Peshawar, Peshawar-Pakistan. Email: syedaizazcrm840@gmail.com

ABSTRACT

Fingerprints being an individual trait make humans different from one another and perform an important role in criminal investigation. Within the broader field of forensic science; fingerprint is a specialized area and important biological evidence which is scientifically examined by fingerprint experts in the forensic lab in both criminal and civil cases to compare and match the disputed fingerprints with the suspected ones. This study was carried out to explore the value of forensic fingerprints as an evidential clue in criminal investigation. This qualitative research was carried out by using a sample size of 25 respondents from the Khyber Pakhtunkhwa Police Department in which 15 police investigation officers were selected through convenience sampling technique and 10 fingerprints experts belonging to Forensic Science Laboratory, (FSL) Peshawar and Regional FSL of Swat through simple random sampling technique. The primary data from all the respondents was collected through interviews. Research findings revealed that the Automated Fingerprint Identification System (AFIS) is not fully operational in the province due to the unavailability of advanced software; FSL Peshawar searcher hall contains more than five hundred thousand manual records of convicted criminals. The police department doesn't have direct access to NADRA fingerprint records in a criminal case. Lastly, experts in fingerprints sections of forensic labs are not academically sound which affects their service delivery in perusing the analysis of fingerprints in a criminal case.



© 2025 The Authors. Published by [Center of Innovation in Interdisciplinary Research \(CIIR\)](#).
This is an Open Access Article under the Creative Common Attribution Non-Commercial 4.0

Article History: Received: 11-01-2025

Accepted: 01-04-2025

Published: 30-06-2025

Keywords: Fingerprints, Forensic Lab, Forensic Experts, Biometric comparison, Criminal Investigation

Corresponding Author's Email: syedaizazcrm840@gmail.com



<https://doi.org/10.62585/pjcj.v4i2.100>

1. **Introduction**

Forensic science is a discipline that contributes to criminal investigation by applying scientific and chemical methods to forensic evidence to link it with crime and offender. Criminalistics is one of the branches of forensic science that specifically deals with the forensic lab to examine forensic evidence like fingerprints, firearms, blood, semen, etc that are directly connected to the criminal investigation. In Pakistan, every province has an institutional framework of forensic lab – a prominent pillar of the criminal justice system in the pursuance to perpetuate the chain of evidence in criminal investigation and forensic experts give testimony about the evidence before the court (James & Nordby, 2009). It has been observed in Pakistan that in most high-profile cases like murder, rape, child abuse etc., the culprits are detected through forensic science agencies in DNA profile comparison from semen or blood samples, handwriting comparison, and through other scientific techniques. Recently in Khyber Pakhtunkhwa Police reforms; it was planned to update and establish forensic and DNA labs in the province because of the emerging heinous offenses and the significant role of scientific investigation in solving the aforesaid cases (Forensic Science Laboratory [FSL], 2023).

The use of fingerprints as forensic evidence is not a new phenomenon. It has been found that fingerprints as forensic evidence have been used for over a hundred years for tracing the culprits from disputed finger impressions in different criminal justice systems around the globe (Ambadiyil et al., 2017). Fingerprinting is an individual characteristic of human identification that makes humans unique. This invariant feature has made fingerprints an important clue in criminal investigation to identify criminals. Besides, Kaushal & Kaushal (2011) argued that a fingerprint is a human's signature; no person has yet been identified with the same finger ridge impressions.

Daluz (2010) argued that the use of fingerprints as potential evidence is not new in the field of criminal investigation. It has replaced anthropometry – the biological measurement of the individual as a tool of criminal identification because fingerprints are a permanent and more reliable source of individuality. Fingerprints are the most important forensic evidence utilized as a biometric technique for the individual identification of criminals. To trace back the history; the FBI identification system came into being in 1924 to hold the recorded fingerprints of criminals for the Law Enforcement Agencies (LEAs) as it secured 810,880 records at that time. Fingerprint plays a crucial role as a lead in the investigation process and interestingly no one can deny their finger impressions as they are unique and act as an important clue in criminal investigation.

Shah & Hussain (2021) proposed different natures of hurdles confronted by police officers in criminal investigation with special reference to forensic science in Pakistan. There are few forensic labs in the country where there is a lack of credible forensic experts. Further, these labs can't confront the burden of criminal cases from across the country which results in pendency of cases and eventually hampers the criminal investigation process. Moreover, other issues in policing are the lack of crime scene mobile vans; lack of DNA labs; untrained police experts; and lack of coordination among law enforcement agencies. Moreover, crime scene forensic experts are not available at the station level which results in the contamination of physical evidence like firearms, blood, hairs, semen, fingerprints etc. The aforementioned evidence is a prominent clue for police officers in apprehending the culprit. There is therefore a dire need to streamline the significance of forensic science in criminal investigation.

2. Research Questions

- I.** Is the Automated Fingerprints Identification System operational in Khyber Pakhtunkhwa province?
- II.** What nature of difficulties square up to forensic science laboratories in the scientific analysis of fingerprints?
- III.** How does improper preservation of fingerprints on crime scenes hamper criminal investigation?

3. Rationale of Study

The nature and extent of crimes such as murder, rape, child sexual abuse, women abuse, etc. are steadily increasing in Pakistan which requires a more proactive scientific approach to investigate and punish the culprit. The use of scientific techniques such as cellular forensics, DNA profiling and comparison, etc. are the need of the day for the police investigation officers. In this respect, the identification of fingerprints of the culprit and its use in criminal investigations has gained much more importance these days. However, indigenous research on the need and importance of fingerprints in criminal investigations is very limited. This research aims to fill the gap in the theory and practice of using fingerprints due to the scarcity of indigenous research on the subject matter. Interestingly, the need and importance of forensic science are often debated in the electronic and print media, but no credible research has so far been published in Pakistan. Most importantly, this study is beneficial to the provincial biometric identification system to extract the loopholes in the digital records of criminals. This study recommends ways how to vitalize the biometric system to store, match, and compare the disputed fingerprints with the secured record of AFIS. The research work will also have an impact on the criminal justice system as it will eventually increase the capability of our legal system to prefer forensic evidence as circumstantial evidence in the courts.

4. Literature Review

Forensic science refers to the application of science in the criminal and civil law of the justice system. It aims to contribute services in the field of investigation by applying scientific methods to physical and biological evidence about an offense to determine the facts before the court (Howit, 2018). Forensic investigation on the other hand means the use of technologies and scientific tests for the analysis of forensic evidence by the forensic scientist to link the evidence with the accused of the case. It is basically, the scientific investigation of crime which starts after the registration of a case and proceeding to the crime scene to collect and transport the evidence to a forensic lab for further scientific analysis where forensic experts give their opinion about a legal case and give expert testimony to court (Kharal, 2015). Physical evidence and forensic evidence are the forms of circumstantial evidence which do not directly associate the culprit with the offense, but inferences need to be made which are examined by the expert or any other relevant authority and the court uses such forensic report as corroborative evidence to contradict or strengthen the forensic report with the other existed evidence of the case (National Police Bureau [NPB], 2021). Further, forensic evidence extracted from scientific devices is admissible in court under the legal framework of article 164 of Qanoon-e-Shahadat Order 1984, section 27-B of the Anti-Terrorism Act 1997 and section 510 of Code of Criminal Procedure, 1898. Saferstein (1977:21) argued that “as automobiles run on gasoline, crime laboratories “run” on physical evidence”. Physical evidence refers to any material with a physical structure that might exist at the crime scene, upon the victim or in the suspect’s possessions. Sharma (2010) mentioned some examples of forensic evidence which include fingerprints,

blood, semen, documents, drugs, firearms, hair, physiological fluids, wood and other matter with an objective existence.

According to Kaye (2003), fingerprint is the supreme evidence of forensic science and play a crucial role in both criminal and civil cases. Fingerprints are the impressions left upon any surface with which the finger comes in contact under pressure. Fingerprint is a unique, persistent and important source of personal identification and is used for the determination of two individuals. This is the reason that law enforcement agencies worldwide use different scientific means in forensic labs to examine fingerprints and to identify the culprits from disputed fingerprint traces on the crime scene. Reitnaner (2018) stated that there are three basic types of fingerprints. First, patent prints also refer as visible prints which can be seen with the naked eye on a crime scene. The second is latent print which refers to non-visible prints that become visible by applying chemicals and powders on the surface and are collected either by applying tape or through photography. Humans' skin has openings called pores that are the location of perspiration of sweat and body oils. When an individual makes contact with a surface body oils on fingers stick to a surface in the shape of fingerprints. Prints left with this technique at a crime scene are called latent prints. The third one is plastic print in which impressions are left on soft materials like putty, wax, soap etc and leave 3-dimensional marks.

O'Neil (1940) explained that fingerprint experts compare finger impressions of suspects with the impressions taken from the crime scene by observing similarities in the fingerprints referred to as "Minutiae Points" or points of identification i.e. pattern of finger impressions, position of delta and core, flow of ridges, shape of delta, ridge ending etc. There are more than a hundred individual ridge characteristics on the fingerprint. There is no set standard points of identification number required in the United States and England. However, in France, it requires 17 and in Germany, it requires 12 similar minutiae points, but still, this number is not as important as it is up to the competence and skill of the forensic expert to give an expert opinion.

Kiely (2006) explained that the Automated Fingerprints Identification System (AFIS) is a biometric digital platform for criminal identification. The computer stores and makes a fingerprint database of criminals. AFIS performs two basic functions. Firstly, it is utilized to know whether the arrestee has been previously convicted or not. Secondly, AFIS helps to compare the disputed fingerprint taken from the crime scene with the digitally recorded fingerprint of the suspects and criminals in AFIS which eventually helps in tracing the case. This system operates when scanned disputed fingerprints enter into the AFIS, the computer shows a list of recorded criminals whose fingerprints have similar identification points to the evidential fingerprint which is searched for detection. The system operator assesses the AFIS record list and compares the prints to determine if they match or not. This system can solve cold cases as well. This system is not new but traced back to the 1970s as the United States, France, Canada, Japan, and the UK established the computed system to store fingerprint records of criminals for identification in criminal cases.

No criminal justice system in the world can deny the importance of fingerprints as an important evidential clue in criminal cases, yet there are some hurdles in the processing of fingerprints in criminal investigations. Globally, latent fingerprints recognition is more challenging because latent finger impressions are taken from the surfaces of those items with which the person or culprit comes in contact unintentionally at the scene of occurrence. Most of the time latent prints are miry, obscure, shattered, and disfigured which makes the quality of forensic photography of latent prints poor and creates difficulty in the comparison of fingerprints for the experts (Guo & Tang, 2013).

The biometric process of AFIS can deform and blur the original disputed finger impressions and lead to misidentification. Therefore, the justice system primarily cannot rely on the digital systems and its replacement with the manual identification system. Both AFIS and manual identification supplement each other. Since it is very complicated to search and compare a large number of recorded fingerprints manually with the disputed ones AFIS generates a limited list of fingerprint records similar to the disputed fingerprints so that experts can easily compare it manually. Besides, manual records and classification of

fingerprints enhance the accuracy of AFIS and give support to the digital identification system (Gao & Pinto, 2016).

Forensic lab websites (as cited in Shah & Hussain, 2021) stated that in Pakistan, the institutional setups of forensic science laboratories are still in their infancy. In Punjab province, Punjab Forensic Science Agency was established in 2009 and it is the only lab in Pakistan that provides services of DNA in criminal cases. In Islamabad, a National Forensic Science Agency was established in 2015 under the Ministry of Interior, Sindh has a Criminalistics Division which is running under the administration of the Police Department. In Khyber Pakhtunkhwa, the main forensic lab is located in Peshawar under the administrative powers of police called Forensic Science Laboratory. This lab renders criminalistics services to the Khyber Pakhtunkhwa police and other LEAs within the province. All labs have fingerprint sections where fingerprint traces are examined scientifically and experts give testimony before a court of law.

Currently, crime prevention and proactive strategies are the key mandate of the modern police force. Contemporarily, law enforcement agencies worldwide widely endeavor to examine evidence through scientific means for rapid justice. Pakistan is also striving to utilize forensic means and to enhance its efficiency and admissibility in the court of law. In this regard, a scientific development about fingerprints has been initiated as an investigative tool in the apprehension of crime. The technique was adopted but escorted with many hurdles. Faridi (2021) summarized that the leading issue is the damage to the crime scene contaminated by the people before the arrival of the investigation officer. People or family members are curious and in trauma and they start to intervene in the crime scene as a result they damage the physical evidence present on the scene like cell phones, glass, blood samples, suspected fingerprints on the table etc. Due to lack of awareness most of the time people start to wash the crime scene and eventually wash out all the physical and biological evidence on the crime scene. Further, due to the lack of prominent fingerprint experts; they also damage the fingerprints due to lack of training and skills which hampers the criminal investigation process. Realistically, a prominent forensic expert cannot utilize fingerprints in a criminal case if contaminated already (Shah & Hussain, 2021).

Ayub (2012) proposed an issue of lack of coordination between the provincial Police departments and NADRA for getting access to fingerprint records. Police departments of different provinces have requested NADRA for a long time, but still, there is hesitation in providing access to fingerprint records. NADRA argues that their system contains civilian records of flat fingerprints while AFIS has rolling fingerprints of criminals. Further, there is a privacy issue as data of the civilians can get unsecured and vulnerable to getting leaked. However, NADRA usually gives information in those cases that are streamlined and grab political and departmental attention, but there are strong concerns about providing direct access to fingerprint records to the Police department. Modern Forensic Tools (2011) further described that in Pakistan there is a limited number of courses for police investigation regarding fingerprint collection, preservation, and sampling which ultimately leads to the contamination of fingerprints.

Ali (2014) concluded that crime became a multi-dimensional phenomenon as its pattern has changed with the emergence of technological revolutions like cyber blackmailing, harassment, data theft, etc. Similarly, techniques to tackle crimes shall also be modernized. Forensic labs play a pivotal role in the scientific examination of evidence. Regarding fingerprints, the Pakistan Automated Fingerprints Identification System (PAFIS) was initiated for the biometric identification of suspected fingerprints with the digital criminal record at the Federal Investigation Agency (FIA). It aimed to develop a centralized database and identification system of fingerprints for solving criminal cases; it has been initiated in 52 districts of the country covering all the provinces, but unfortunately currently out of service due to outdated software and needs funds for up-gradation.

Lastly, the Punjab Information Technology Board (PITB) established the Criminal Record Management System (CRMS) based on CNIC records. Complete criminal profiles are stored in the aforementioned digital-based system and can be readily retrieved with the use of biometric information. These profiles

contain photos, fingerprints, physical features, and convicted criminal information. Additionally, the manually entered fingerprint data has been successfully digitized and is available in the CRMS database, which provides an extensive profile of the convicts. The Criminal Record Identifier Programme in the CRMS uses fingerprints to identify criminals by comparing them to fingerprints recorded in the Megamatcher Fingerprints Matching Library and eventually due to this program, around 60 criminals are detected each day (NPB, 2021).

5. Theoretical Framework

5.1 Locard's Exchange Principle

Edmond Locard was a pioneering scientist in the field of forensic labs by establishing the first crime lab in Europe in 1910. Based on Edmond Locard's principle, "Every contact leaves a trace", this idea has grown to be fundamental and offers a theoretical foundation for comprehending how police officers can use fingerprints as an evidentiary hint in the context of forensic analysis. This theory is advancing how a criminal or his object comes in contact with the victim or crime scene and leaves a clue. Traces include fingerprints, foot marks, blood, hair, fiber, gunshot residue, DNA etc, and forensic experts after collection link the disputed traces with the suspects of the crime through scientific analysis (Chisum & Turvey, 2000).

In the context of fingerprints; the distinct patterns of ridges and valleys on human finger skin create finger impressions. A latent fingerprint is left on a surface by natural body oil and perspiration from a person's skin. As fingerprints are unique, transferred from the criminal to the surface or scene of occurrence, where they can subsequently be collected and used as evidence. Police investigation officers employ Locard's theory to direct the gathering and examination of fingerprints during a forensic investigation. The idea emphasizes the significance of gathering evidence methodically because even the smallest touch of a fingerprint might leave behind an important piece of evidence and help the police and forensic experts to trace the criminal.

5.2 Research Methodology

The approach adopted to conduct this research study is qualitative to explore the underlying themes within the data. The population of the study is male Police investigation officers and Forensic experts of the Khyber Pakhtunkhwa Police Department. The respondents were 25 in numbers and were selected by adopting two sampling techniques. A total of 15 police investigation officers from different police stations and other police institutions like the police school of investigation were interviewed and selected through convenience sampling technique. Besides, data was collected from 10 Forensic fingerprint experts belonging to the Fingerprint Unit of the Forensic Science Laboratory, Peshawar, and the Regional Forensic Lab of Swat through a simple random sampling technique. This technique was utilized as a total number of fingerprint experts were known in both the labs and to ensure an impartial selection of respondents. The lottery method was used to implement this technique, where each member of the population was assigned a unique indicator. These indicators were written on individual pieces of paper mixed, and then drawn at random to select the sample. The primary data from all respondents have been collected by using an interview schedule. Two different interview schedules were designed for the investigation officers and for fingerprint experts respectively to meet the research questions of the study. The interview duration lasts from 15 to 20 minutes. Interviews were taken in Pashto language because the majority of the participants were not comfortable with English and Urdu language. Later on, interviews were transcribed and translated into English. A total number of 70 codes have been derived and 7 recurring themes to gain deeper insights into the research questions. Further, the participants were assigned codes (IO) for Investigation Officers, (PFE) for Peshawar Forensic Experts, and (SFE) for Swat Forensic Experts.

5.3 Results and Analysis

In criminal investigation, forensic evidence plays a significant role as circumstantial evidence in the apprehension of the suspects. In the course of the investigation police officers proceed to the crime scene collect the evidence and transport it to the forensic lab for further scientific analysis by the scientists. The data was empirically analyzed and thematically highlighted the current status of fingerprints about the training of police officers, biometric comparison and other aspects that could lead to solving a criminal case or hampers the investigation process.

6. Theme 1: Un-Functional Automated Fingerprints Identification System

In the world of sophisticated crime; technological revolution has made investigation rapid and efficient. As different technologies in policing like Call Data recording and Geo-Fencing are used to apprehend the culprit, the same biometric fingerprint comparison of criminals can also be made via advanced technologies (Ali, 2014). In this regard, IO3 shed light on the current status of AFIS by saying that, *“The automated Fingerprint Identification System (AFIS) of Khyber Pakhtunkhwa police was initiated by the National Police Bureau in 2008. In Phase I, AFIS was implemented in 60 districts of Pakistan (including Khyber Pakhtunkhwa Province) and the remaining districts of the country would be established in Phase II which is still not implemented. Pakistan AFIS project will serve the whole country by linking FIA headquarters with provincial police headquarters and district police headquarters through the AFIS network for data sharing of criminal records in confronting different offenses especially transnational organized crime during investigation.”*

Further, IO1 stated that,

“AFIS will generate network connectivity to law enforcement department at district level for quick comparison and identification of criminals by generating the similarity points of the suspected fingerprints.”

However, PFE2 elaborated the facts on the current status by remarking

“The current state of connectivity of AFIS provincial and district police headquarters sites with Central Site is out of order. There are technical issues in the Pakistan AFIS at the national level and now the National Police Bureau intends to revive AFIS by launching Phase-II which includes the development and up gradation of new software for installation in all sites across the country.”

It was concluded from different views that presently AFIS acts as a database of criminal records; due to a lack of active and efficient software, neither it can search nor compare the disputed fingerprints with the criminal fingerprint record digitally.

7. Theme 2: Hurdles facing in Fingerprint preservation Training

Training is crucial for maintaining a proper chain of custody of evidence for the field investigation officers conducting an investigation. The principle of analysis is all about the proper preservation of evidence which will lead to authentic forensic reports (Shah & Hussain, 2021). In the context of training IO7 shares that.

“I received training, but the training lacked forensic-related modules and lacked a practical approach by the trainers. Exceptionally, I was taken forensic-related training like crime scene preservation and cellular forensics, but the training duration I attended was also short and it did not enable me to enhance my investigative skills.”

Further, IO2 and IO11 argued that,

“We just received fingerprint proficient training which is narrow in scope and duration. It just enables the investigators to know about the basic concepts of fingerprints and how to take fingerprints from convicted criminals. It did not enable us regarding the development and preservation of latent prints on crime scenes as well as the usage of fingerprint powder and chemicals for the enhancement of latent prints. The duration of fingerprint training was not up to the mark and was limited to one week, 14- days. Further, there is 6 6-month fingerprint expert course, but we have not received that course.”

It was further revealed by multiple respondents that

“We didn’t receive practical training with special reference to fingerprints in the initial recruit course after joining the police force; we just studied fingerprints as a topic in our syllabus which was not enough to enable us to do an investigation on crime scene about fingerprint evidence collection. Moreover, the training programs we have received at investigation schools were a traditional type of teaching; no practical training has been given to us about fingerprint collection, preservation, comparison, usage of powders and chemicals to develop the latent prints on the crime scene.”

In the context of training, the trainers just taught the theory that doesn’t vitalize the performance of practitioners on the field and that theory does not have applicability in the investigation process at the police level.

A participant expressed,

“There are no fingerprints crime scene experts at the police station level who usually undergo the course of 6-months, as a result, investigation officers sometimes contaminate the fingerprints and other evidence on the crime scene as they are not aware of crime scene protocols; however he mentioned that in heinous offenses fingerprint experts from forensic lab attends the crime scene for evidence collection, but due to untimely arrival, services of the expert went in vain.”

This data highlighted that training is essential for police investigation officers about crime scenes, evidence collection, development and preservation like fingerprints, blood, firearms, etc. and its proper transportation to forensic lab for scientific analysis. Training enhances the capacity and improves service delivery of the officers and can help a lot to prosecute the accused and provide justice.

8. Theme 3: Fingerprints Database of Criminals

A criminal database is the record of the previously arrested and convicted criminals by the justice system and such record is based on biological evidence like fingerprints, DNA, facial features, etc. Once a crime is committed and evidence like fingerprints from the crime scene is found it can be compared with the fingerprints in the database and helps in the apprehension (NPB, 2021). It was reported by PFE6 and SFE3 that

“More than 5 lacs manual criminal record of the convicted criminals based on fingerprints classified by Henry system of classification is stored in the fingerprints bureau of forensic science laboratory, Peshawar.”

Further, it was revealed by participants that,

“Fingerprints experts find out whether or not the suspect has a criminal history; the suspected fingerprints preserved from the scene of occurrence are sent to a lab for matching purposes by the fingerprint expert with the manual fingerprints records in the searcher hall of fingerprint bureau of the forensic lab at Peshawar.”

It is safe to argue that a fingerprint database is highly useful for comparing suspected fingerprints, but the process can be time-consuming and may disrupt the chain of custody in the case. The AFIS system needs to be operationalized as early as possible so it will become easy and efficient for the police department to identify and compare the suspected fingerprints with the disputed fingerprints digitally and will enhance the credibility of service delivery.

9. Theme 4: Challenges in Latent Prints Development

Latent fingerprints are important clues on crime scenes as it is not visible to the naked eye and require chemicals and powders to be developed and preserved. It was revealed by IO7 and IO8 that,

“Neither proper equipment, chemicals and powders to the investigation officers at police station level for processing and preservation of latent fingerprints are provided nor was forensic training for the development of latent prints provided to the police investigation officers.”

Further, it was told by one of the respondents that,

“Powder to develop latent print at the police station exists, but expired and not working efficiently, however, fingerprints sealing kits including packing material are available at the police station.”

Indeed, latent fingerprints are of great importance and shall not be ignored or contaminated by the investigation officers as they help in tracing the accused. There must be required tools and chemicals at police stations and expert-level training need to be given to the investigation officers to enable them to identify latent print and develop it appropriately and improve the chain of custody of the evidence.

10. Theme 5: Contamination of Fingerprints

In the investigation process, rapid transit of evidence plays a significant role in keeping the chain of evidence from the crime scene to the forensic lab. Saferstein (1977) concluded that the principle of progressive change encourages the quick transportation of evidence as some of the biological evidence is fragile and vulnerable to weather and can affect the proper analysis so quick transportation is an important element in forensic investigation. In this context, SFE7 encapsulates that,

“Almost in every case; the scene of occurrence is damaged and contaminated by the public. When the investigation officers reached the scene. Flimsy evidence especially fingerprints, footprints, hairs, and blood are usually displaced and vanish from the crime scene which reduces the clues in the investigation process.”

Besides, a participant from investigation officers revealed that,

“There is no vehicle or crime scene mobile vane present at the police station for investigation officers except a couple of police stations and police usually wait for operational police officers to use their vehicle to reach the crime spot and sometimes they use public transport which eventually takes a long time and make possibilities of crime scene contamination.”

It was elaborated by one of the investigation officers that,

“There is a lack of awareness among the families; especially in theft-related cases when investigation officers reach the spot; the family members have already touched and disturbed the disputed area which results in the contamination of the suspected fingerprints and eventually hinders the investigation process.”

It was concluded from the views of the respondents that awareness needs to be given to the general public so they shall not damage the evidence on the crime scene out of curiosity. Further police investigation officers shall be equipped with proper transportation so they can reach the spot rapidly and will enhance the efficiency of their service delivery.

11. Theme 6: No Access to NADRA Fingerprints Record

It is quite apparent that NADRA has computerized fingerprint records of all the citizens who have made their CNIC. NADRA can act as a key stakeholder in legal cases regarding fingerprint identification and comparison and it can identify the suspected prints from their record in the quickest possible time digitally. In this regard, SFE9 expressed that,

“Unfortunately neither police department has direct access to the NADRA database in a criminal case regarding fingerprints matching and comparison nor formal MOU between both the institutions which become a hurdle in the perusal of a case.”

In addition, it was revealed by a respondent that,

“There is a formal mechanism where the superintendent of police marked a request application to the director NADRA regarding tracing a case related to fingerprint evidence, but it is a complicated and time-consuming process and response from NADRA is also late and sometimes denies the request.”

Despite these, it was reported by IO3 that,

“NADRA officials’ behaviour is very harsh towards police investigation officers when approached about fingerprint-related cases in their office. Further, their report delivery is also very late which eventually results in police burnout and hampers the investigation process.”

It can be said that nowadays in a digital world, there must be a fingerprint database of criminals that police have easy access to for identification and comparison purposes. AFIS need to be operationalized and an MOU shall be signed with the NADRA to coordinate heinous and terrorism cases with the police department so it will increase the efficiency of police performance and justice delivery.

12. Theme 7: Situation of Forensic Science Labs in Khyber Pakhtunkhwa

Forensic lab is a key stakeholder of the criminal justice system in maintaining the chain of custody of forensic evidence. Labs receive evidence from the concerned police station or other law enforcement agencies for scientific examination and eventually, forensic experts provide opinion before the court under Article 59 of the law of evidence (NPB, 2021).

It was expressed by PFEs and SFEs that,

“There are two forensic labs in the Province; Forensic Science Laboratory, (FSL) Peshawar established in 1976 and Regional FSL Swat operationalized in 2020. The FSL Peshawar comprises different units including fingerprints, chemicals (serology, Semen, hair), firearms, Narcotics, questioned documents, and vehicle examination while in RFSL Swat chemical, fingerprints and firearms units are functional.”

Further, PFE1 sheds light on the criminal records that,

“Fingerprint bureau of FSL Peshawar consists of a searcher hall which holds manual criminal records of more than 5 lacs where experts compare the disputed fingerprints with the record manually to search the criminal history. There is a lab inside the fingerprint unit where experts do a scientific examination of fingerprints through advanced technologies like super glue fuming machines, comparators, lights and chemicals. Moreover, documentation work and writing of forensic reports take place at the workstation of the fingerprint section. The fingerprints section of FSL Peshawar consists of ten senior experts who can give expert testimony before the court.”

About Swat FSL, it was expressed by SFE8 that,

“Regional FSL Swat did not have recruited new forensic experts, however, experts from FSL Peshawar

have been transferred to operationalize the lab and cases of Swat region are dealt with by swat FSL.”

Further, all criminal and civil cases across Khyber Pakhtunkhwa are dealt with by FSL Peshawar in which the ratio of criminal cases is high. It was found that cases about fingerprints like disputed agreement papers, land papers containing fingerprints, Nika Nama, latent prints enhancement, fingerprints from the crime scene for comparison, and searching the criminal history of a suspect are dealt with by the fingerprint section of the forensic lab.

In addition, statistics were shared by PFE4 regarding fingerprint cases,

“Fingerprint unit of FSL Peshawar receive 6 hundred to 7 hundred cases containing fingerprints evidence annually and shared that experts scientifically examine 615 pieces of evidence from 307 cases in the year of 2023”

Further, issues were highlighted regarding the educational competence that,

“Forensic investigation requires technically and academically skilful personnel for accurate examination of evidence, but here in Khyber Pakhtunkhwa, the scenario is completely changed. Most of the fingerprint experts belong to Police departments of the rank of constables, Assistant sub-inspectors and sub-inspectors with a low level of academic qualification. They don’t have background knowledge and have received a few months of training from different labs in Pakistan and then they are directed to work in a Forensic lab, in Peshawar as forensic scientists. It was suggested that in future relevant and credible forensic researchers need to be hired which will enhance the service delivery and expert testimony.”

Further, PFE4 expressed that,

“There are some other services which are not offered by the respective forensic labs including Medico-legal cases and DNA cases where the police department of Khyber Pakhtunkhwa is dependent on Khyber Medical College for toxicology, autopsy and DNA cases and sometimes they refer more Complex DNA cases to Punjab Forensic Science Agency for comparison purposes.

Currently importance of digital forensics is at its peak and most of the cases are traced by the use of Call Data Records (CDR), CCTV footage etc, but it was stated by PFE2 that,

“Presently digital unit of the Peshawar forensic lab has been shut down due to lack of advanced equipment and maintenance charges of hard wares and software and cases are referred to the FIA cybercrime wing head office in Islamabad. Further, the CDR facility is also not available at the forensic lab. CDR facility is with the police department at Police lines under Child Kidnapping cell (CKC) where they attach CDR with the challan in the relevant case.”

In short, there is a need to revamp the structure of forensic labs in the province where there shall be components of biological evidence like serology, semen, DNA, autopsy, and toxicology along with other units of physical evidence in the forensic lab which will help in concluding the cases early and will improve the report delivery of the labs.

13. Conclusion

It can be argued from the findings of the study that fingerprints as circumstantial evidence perform an important role in tracing the accused. All forensic evidence present on the crime scene reveals some clues that help in identifying the culprit after scientific examination of the evidence in the forensic lab. In reflection of the objectives of the study it was found that the biometric fingerprint identification system based on a criminal record is not operational in the province due to the unavailability of advanced software’s as a result it cannot compare and match the disputed fingerprints of criminals digitally,

however, its work is just restricted to fingerprints database of convicted criminals. In addition, the FSL Peshawar searcher hall contains more than 5 lacs manual records of convicted criminals where experts search and compare the disputed fingerprints manually, but such a procedure is complicated and time-consuming. Further, the police department doesn't have direct access to NADRA fingerprints and civilian records in criminal cases, however, NADRA provides data in exceptional cases, but the procedure is quite complicated and late. Besides, there is a lack of proper training on forensic fingerprints at the police station level; contamination of fingerprints by the public and sometimes by untrained investigation officers; lack of chemicals and powders at the police station level to develop the latent prints, transportation of physical evidence etc are other issues about the forensic criminal investigation.

14. Recommendations

The following areas are suggested from the study to improve forensic Investigation by enabling the investigation officers and forensic experts to make the best use of circumstantial evidence like fingerprints to solve the cases amicably: -

AFIS: Equipping the AFIS by installing advanced software to operationalize it so disputed fingerprints with the reference ones would be digitally identified and compared without time-consuming.

Expert Level Training: Introducing a mechanism for the investigation officers at the police station level to provide an expert course of at least 6 months about crime scene processing and forensic fingerprinting to enhance their investigative skills.

MoU with NADRA: There shall be a MoU of the Khyber Pakhtunkhwa Police Department with the NADRA to coordinate criminal cases rapidly with special reference to fingerprints and facial identification.

Legal Reforms: There shall be legal reforms regarding the admissibility and strong acceptability of forensic reports in a court of law as the forensic report is still not considered direct evidence, but corroborative evidence.

Funding

This article was not supported by any funding from public, commercial, or not-for-profit sectors.

Conflict of Interest/ Disclosures

The authors have disclosed that there are no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

References

- Ambadiyil, S., Prakash, D., M.K, S., & Pillai, V.P.M. (2017). Secure storage and analysis of fingerprints for criminal investigation using holographic techniques. *Materials Today: Proceedings*, 4(2), 4389-4395. doi: 10.1016/j.matpr.2017.04.010
- Ayub, I. (2012, November 10). Police pressing Nadra for access to fingerprints data. *Dawn*. Retrieved from <https://www.dawn.com/news/763026/police-pressing-nadra-for-access-to-fingerprints-data>
- Ali, M.F. (2014, February 12). Inoperative fingerprints setup. *Dawn*. Retrieved from <https://www.dawn.com/news/1086434>
- Anti-Terrorism Act 1997* (PAK).
- Chisum, W. J., & Turvey, B. (2000). Evidence dynamics: Locard's exchange principle and crime reconstruction. *Journal of Behavioral Profiling*, 1(1). Retrieved from http://www.profiling.org/journal/vol1_no1/jbp_ed_january2000_1-1.html
- Code of Criminal Procedure, 1898* (PAK)
- Daluz, H.M. (2010). *Fundamentals of fingerprints analysis* (2nd ed.). Boca Raton, FL: CRC Press, LLC.
- Faridi, T. (2021, January 15). Fingerprint no longer safe from data theft. *The Express Tribune*. Retrieved from <https://tribune.com.pk/story/2280017/fingerprint-no-longer-safe-from-data-theft>
- Forensic Science Laboratory. (2023.). *Forensic services*. Retrieved from <http://www.kpfsl.gov.pk>
- Guo, W., & Tang, Y. (2013). Latent fingerprint recognition: Challenges and advances. Retrieved from https://link.springer.com/chapter/10.1007/978-3-319-02961-0_26
- Gao, Q., & Pinto, D. (2016). Some challenges in forensic fingerprint classification and

interpretation. Retrieved from
https://www.researchgate.net/publication/304189718_Some_challenges_in_forensic_fingerprint_classification_and_interpretation

Howit, D. (2018). *Introduction to forensic and criminal psychology* (6thed.). Harlow: Pearson Educational Limited.

Houck, M.M., & Siegal, J.A. (2010). *Fundamentals of forensic science* (2nd ed.). Burlington: Academic Press.

James, S.H., & Nordby, J.J. (2009). *Forensic science: An introduction to scientific and investigative techniques* (3rd ed.). Boca Raton, FL: CRC Press, LLC.

Kaye, D.H. (2003). Questioning a courtroom proof of the uniqueness of fingerprints. *International Statistical Review*, 71(3), 521-533.

Kaushal, N., & Kaushal, P. (2011). Human identification and fingerprints: A review. *Journal of Biometrics & Biostatistics*, 2(4), 123-127. doi: 10.4172/2155-6180.1000123

Kharal, S. (2015). *Forensic investigation handbook* (1sted.). Karachi: Paramount Books (PVT) Ltd.

Kiely, T.F. (2006). *Forensic evidence: Science and the criminal law* (2nded.). Boca Raton, FL: CRC Press, LLC.

Mateen, R.M., Tariq, A., & Rasool, N. (2018). Forensic science in Pakistan: Present and future. *Egyptian Journal of Forensic Science*, (8), 45. doi: org/10.1186/s41935-018-0077-3

Modern forensic tools. (2011, March 07). Dawn. Retrieved from
<https://www.dawn.com/news/1086434>

Nabar, B.S. (2015). *Forensic science: In crime investigation* (3rded.). Hyderabad: S.P. Gogia (H.U.F).

National Police Bureau. (2021). *Handbook of criminal investigation in Pakistan*. Pakistan: Research Society of International Law.

O'Neill, M.E. (1940). Fingerprints in criminal investigation. *Journal of Criminal Law and Criminology*, 30(6), 929-940. [doi: org/10.2307/1137319](https://doi.org/10.2307/1137319)

Qanoon-e-Shahadar order 1984 (PAK).

Reitnaner, A.R. (2018). Latent print examination. In A. Barbaro (Ed.), *Manual of forensic science: An international survey* (pp. 59-78). Boca Raton, FL: CRC Press, LLC.

Shah, S.A.A, & Hussain, B. (2021). Challenges faced by Police officers in forensic criminal investigation in district Peshawar, Pakistan. *Pakistan Journal of Criminology*, 13(4), 51-65.

Saferstein, R. (1977). *Criminalistics: An introduction to forensic science*. Englewood Cliffs, NJ: Prentice-Hall.

Saferstein, R. (1998). *Criminalistics: An introduction to forensic science* (6thed.). Upper Saddle River, NJ: Prentice-Hall.

Sharma, B.R. (2010). *Scientific criminal investigation* (Rev. 3rded.). Lahore: Fine Law Publisher.