

An Evaluation of Role of Police Forensic Science Laboratories in Countering Terrorism in Khyber Pakhtunkhwa, Pakistan

Farhat Ullah^{1*}, Mohammed Shafiq², and Asif Mahmood³

Abstract

Forensic Science is a powerful tool to counter terrorism both in pre-incidence deterrence as well post-incident deterrence. The present study explores out the effectiveness of police Forensic Science Laboratory (FSL) along with the significance and its role to counter terrorism in Khyber Pakhtunkhwa - Pakistan. Data were taken by using a Structured questionnaire from 217 respondents, including 99 legal practitioners (lawyers dealing criminal cases), 54 journalists (crime reporters from the different newspapers), and 64 police personnel (from the various ranks working in police department). A stratified proportionate random sampling technique as employed to find out the sample size for each stratum while a systematic sampling method was applied to select the respondents from the three chosen sample groups. A Chi-square and Gamma tests were employed to find out the relationship between independent and dependent variable. It was found that the forensic science laboratory has a significant relationship with countering terrorism including DNA tests, crime scene photography; and fingerprints are highly effective in criminal investigation. It was concluded from the study that capacities of forensic science laboratory needed to be enhanced to counter terrorism more efficiently. The study suggests that enhancing expertise in FSL on modern scientific grounds as framed to enhance the effectiveness of the use of facilities of FSL.

Keywords: Effectiveness; Police; Terrorism; Science; Forensic Science Laboratories.

1. Introduction

Policing is an extremely challenging and difficult profession because it requires continuous professional development, and structural professional improvements. Throughout the world; the effectiveness of modern policing depends upon the appropriate investigation skills and a modern well-equipped FSL so as to make policing the more scientific. To counter terrorism more effectively; the significance of forensic science laboratories has a great importance. Abbas (2011) argued that efficient, well trained, and scientifically sound police personnel are greatly important to counter terrorism, now and in the future as well. Since September 9, 2001, along with ordinary crimes, police are also dealing with the countering terrorism at the same time. Thus, keeping in view this condition; police personnel are required

¹ Department of Social Work & Sociology, KUST, Kohat Pakistan.

² Department of Islamic and Pakistan Studies, KUST, Kohat, Pakistan.

³ Department of Social Work and Sociology, KUST, Kohat, Pakistan.

*)Corresponding Author.

Email: mrlawyer002@yahoo.com

to be trained on the sound grounds for which necessary steps are needed to be taken to enhance their FSL competencies to disrupt the terrorist threats.

Forensic science is a significant scientific method to examine and gather information related to the past. Forensic is a term that means an analysis of a crime by using scientific means (Abbas, 2012). Fasihuddin (2012) stated that facilities like DNA tests, eye matching, fingerprints, examination of samples in the laboratories, cross-examination of the samples and so on. Hence, such are quite frequently employed the modern world for investigation processes, but quite an inadequately and rarely seen in Pakistan. In addition to this, no state of the art and well-equipped laboratories are available in Pakistan. Under the new police order 2002, (FSL was not modernized according to the new needs. However, the cost of investigation and lack of resources in the investigation management of the terrorism cases is also a serious problem as faced by the police personnel. The expenditures on investigation comprise the accused in daily traveling, food allowance, and communication (Abbas, 2011). No special fund or allowance is delivered to police in Pakistan for this purpose. According to Khan (2014), the more than 85% of the police budget is used for salaries, and merely less than 15% is spent on the qualitative expenditure, this is a very little amount of money for meeting rest of the expenditures well needed for provision of police services. In Pakistan, police heavily depend on local informers but in cases of terrorism, people avoid to be an informer (Fasihuddin, 2012).

2. Background and Rationale of the Study

Pakistan being a frontline state in the battle against terrorism whereas, the issue of countering terrorism remains one of the most critical issues after 9/11. The menace of terrorism creates the serious problems both at national and at a global level for Pakistan (Quraishi, 2002). Keeping in view the menace of terrorism and outdated policing system in Pakistan; scientific policing and an enhanced forensic science laboratory is one of the serious concerns. It has been observed that the effectiveness of forensic science laboratory is always questionable in the province of Khyber Pakhtunkhwa, and the same is the situation in the other provinces in Pakistan. Further, it can be witnessed that Pakistan went into a new era of battle against terrorism. In Khyber Pakhtunkhwa, police reportedly lack an effective forensic science laboratory and technical expertise relating to investigation, identification and location of the criminals on the scientific basis (Ullah, 2015).

Keeping in view; the perceived gap in the effectiveness of FSL to tackle terrorism in Pakistan, especially in the province of Khyber Pakhtunkhwa, this research is planned to find out all possible aspects of the forensic science laboratory and its impacts on their role to counter-terrorism. The study was conducted keeping in view the increasing threat of terrorism especially after 9/11. It is well established that forensic science is too much useful and instrumental in criminal justice system. With scientific principles in mind, forensic scientists look at the evidence for reaching the

criminals. Hence, forensic science also plays a major role in legal system. In forensic science laboratory, evidence is collected, reserved and examined through the course of an examination. Finger prints, forensic photography, cellular forensic, voice analysis and DNA analysis is the most prominent test in forensic science laboratories. The evidence as obtained through forensic science found the most helpful for police in investigation of crimes especially crimes of serious nature (Ullah, 2015).

3. Literature Review

The main obligation of the police is to keep and maintain law and order in the society. Lacking of modern techniques, unawareness and unavailability of forensic science tools and their utilization that greatly affect police effectiveness and became the difficult for them to respond to terrorism. In the criminal justice structure, the role of forensic science is considerably important by providing scientific evidences through analyzing the physical proofs. Abbas (2012) stated that “forensic is a term that means an analysis of a crime by using scientific means”. No state of the art and well-equipped laboratory are available in Pakistan (Fasihuddin, 2012).

In December 2017, The Inspector General of KP Police, Mr. Salahuddin Khan Mehsud inaugurated the first official website of KP FSL laboratory to streamline the forensic reports and forensic examinations (Frontier Post, 2017). According to the KP Police Act (2017), 25.13A, “there shall be an established and well maintained mobile forensic lab at each district level under the supervision of Superintendent of Police Investigation”. Accordingly, the mobile forensic laboratory will be the responsible for protection and gathering of proofs from the crime scene. Besides, there will be a Cellular Forensic Unit for forensic examination of mobile data. Ullah (2016), emphasized that the mobile unit working for FSL must be well-trained. Further, it is worth mentioning over here that courses including Cellular Forensic, Forensic Photography and Finger Print Courses are also taught to the trainees in the Police School of Investigation (established in 2014, in Hayatabad, Peshawar KP). Effective Forensic investigation includes Cellular Forensics, Crime-Map Analysis, Digital Photography, Comp-stat (Computer-Statistics), Voice Analysis, Cyberspace Monitoring which are few important initiatives and intensely followed in detecting the smart and hidden planners, operatives of militant organizations, financiers and terrorists (Fasihuddin, 2012).

For enhancing police investigation skills meanwhile, a police school of the investigation was established in KP province in June 2014, where core investigation skills are taught to the trainees (Ullah, 2015). The establishment of such a specialized school was not seen in the past anywhere in the country. The purpose of the establishment of this school was to train police force in analytical and scientific investigation practices. Currently, the several courses are being run in the Police school of Investigation for enhancing police personnel capacity in a general and particularly investigation staff (Imran &

Ullah, 2015). The courses consist of cellular forensic, criminal investigation and crime scene management, core investigation skills, DNA medico-legal reporting, IT-based skills and Hot Spot Policing; fingerprint sciences; Geo Tagging, case file management, and forensic photography.

Modern investigation toolkit includes: (a) smart Phones (b) all essential objects for cordoning/maintaining off the scene of the crime, (c) camera for digital photography, (d) materials for secured preservation of fingerprints, (e) equipment for gathering of these evidence like blood sample, hair, fibers for DNA testing, (f) online verification of CNIC and (g) interview recorder and so on, (KP Police Act, 2017).

Presently, Pakistan lacks a properly planned counterterrorism policy and effective FSL system. As we know, suicide terrorism is considered the worst form of terrorism among other forms of terrorism. It is a fact that the prevention of suicide attacks is quite a difficult than the prevention of other forms of terrorism (Hoffman, 2003). Prior to the US intervention in Afghanistan, police never experienced such the suicide attacks. The psychological and physical impacts of the suicide attacks are also extremely huge. The investigation of suicide attacks is quite a difficult for the police (Abbas, 2012). It is generally argued that the majority of suicide attacks have adverse effects on police personnel. Hence, it creates fear and demoralizes police and pulls down will to fight against the terrorists. Based on the literature review, it can be stated that police in Pakistan as needed effective and well-established Forensic Science Laboratories.

4. Research Objective

- To find out the relationship between forensic science laboratories and countering terrorism

5. The Study Methodology

A quantitative research method is used in the present study for data collection to quantify the responses of the respondents, and other defined variables to generalize the results from a larger sample population. Keeping in view the nature of the objective and research topic; the quantitative technique is employed for this study. Further, to find the relationship between independent and dependent variable a chi-square and Gamma (statistics) were applied in this respective

5.1 Participants

Trained police personnel in Peshawar city (SHOs, Inspectors and ASIs, N=64) Legal Practitioners (Criminal Lawyers/Advocates at Peshawar High Court, N=99) and Media Journalists (Members in Peshawar Press Club, N=54) were selected as the respondents for such the study. These are the people who have information regarding police reforms and Forensic Science. Proportionate stratified sample method was applied to find out the sample size from each stratum whereas a systematic sampling method was used to pick up the

samples from the three designated sample groups. A sample of 217, respondents was drawn from a total of 491, and covered through the formula suggested by Krejcie & Morgan (1970). Data was collected by using a structured questionnaire based on a Likert scale. Data as analyzed with the help of the SPSS (version 21), and the Chi-Square and Gamma tests were applied to find out the relationship and the strength and direction of relationship between the different aspects of FSL related factors and responding to terrorism. The formula suggested by Krejcie & Morgan (1970) is as follow i.e.

$$S = \frac{X^2 NP (1-P)}{d^2 (N-1) + X^2 P (1-P)}$$

Table 1: Association between Forensic Science Laboratory (FSL) and Countering Terrorism
Source: Field Survey, 2018

Forensic Science Laboratory	Response	Countering Terrorism			Total	Statistics
		Agree	Disagree	Not Sure		
DNA test is helpful in investigation	Agree	129 (81.6)	23 (60.5)	11 (52.4)	163 (75.1)	$\chi^2 = 14.53$
	Disagree	10 (6.3)	7 (18.4)	4 (19.0)	21 (9.7)	(P = .006)
	Not Sure	19 (12.0)	8 (21.1)	6 (28.6)	33 (15.2)	$\gamma = +.446$
There is need to establish a specialized school for police training in forensic science	Agree	129 (81.6)	34 (89.5)	15 (71.4)	178 (82.0)	$\chi^2 = 5.004$
	Disagree	10 (6.3)	3 (7.9)	3 (14.3)	16 (7.4)	(P = .287)
	Not Sure	19 (12.0)	1 (2.6)	3 (14.3)	23 (10.6)	$\gamma = -.018$
Finger print play a key role in modern policing	Agree	146 (92.4)	28 (73.7)	16 (76.2)	190 (87.6)	$\chi^2 = 14.49$
	Disagree	5 (3.2)	2 (5.3)	1 (4.8)	8 (3.7)	(P = .006)
	Not Sure	7 (4.4)	8 (21.1)	4 (19.0)	19 (8.8)	$\gamma = +.540$
Without forensic investigation, criminal identification is difficult.	Agree	119 (75.3)	18 (47.4)	10 (47.6)	147 (67.7)	$\chi^2 = 16.39$
	Disagree	25 (15.8)	15 (39.5)	7 (33.3)	47 (21.7)	(P = .003)
	Not Sure	14 (8.9)	5 (13.2)	4 (19.0)	23 (10.6)	$\gamma = +.437$
Police investigators are not properly trained in forensic science	Agree	111 (70.3)	20 (52.6)	9 (42.9)	140 (64.5)	$\chi^2 = 11.20$
	Disagree	32 (20.3)	10 (26.3)	6 (28.6)	48 (22.1)	(P = .024)
	Not Sure	15 (9.5)	8 (21.1)	6 (28.6)	29 (13.4)	$\gamma = +.384$
Crime scene photography in countering terrorism cases is helpful	Agree	132 (83.5)	27 (71.1)	14 (66.7)	173 (79.7)	$\chi^2 = 6.50$
	Disagree	7 (4.4%)	3 (7.9)	3 (14.3)	13 (6.0)	(P = .165)
	Not Sure	19 (12.0)	8 (21.1)	4 (19.0)	31 (14.3)	$\gamma = +.324$
DNA reports are more effective than eyewitness	Agree	122 (77.2)	22 (57.9)	12 (57.1)	156 (71.9)	$\chi^2 = 9.03$
	Disagree	12 (7.6)	7 (18.4)	4 (19.0)	23 (10.6)	(P = .018)
	Not Sure	24 (15.2)	9 (23.7)	5 (23.8)	38 (17.5)	$\gamma = +.336$
Most of the terrorism cases are not traced due to lack of technical expertise in the FSL	Agree	133 (84.2)	28 (73.7)	14 (66.7)	175 (80.6)	$\chi^2 = 7.69$
	Disagree	12 (7.6)	7 (18.4)	5 (23.8)	24 (11.1)	(P = .104)
	Not Sure	13 (8.2)	3 (7.9)	2 (9.5)	18 (8.3)	$\gamma = +.301$

Note* Values presented in the above table indicate frequencies, and Gamma values while value in the parenthesis represent percentage and Chi Square values.

6. Discussion and Analysis

The association between forensic science aspects and perception on countering terrorism is given on the table 1. According to the table a moderate affirmative ($\gamma = +.446$) and statistical significant ($P < .006$) correlation is originated between the statement that DNA test is helpful in investigation with countering terrorism. The association between independent and dependent variables is statistically significant. The findings of the study reflect that DNA evidence is helpful in investigation related to terrorism by comparing suspects DNA profiles with the likelihood of their involvement in the crime. DNA testing is a powerful tool for identification and it has many of practical applications in cases related to terrorism as well. Thus, the use of DNA evidence in investigation of situations related to terrorism has been grown in recent years. As clear from the literature that DNA is a powerful tool in criminal investigation. DNA analysis is greatly helpful in perpetrator identification of suicide bombing. Likewise, DNA verification has proved that several convicted people are actually not guilty as well. Forensic science has played an increasingly important role in combating the menace of terrorism. Such the findings of the present research are in consonance with the study carried out by Inman (1997); Sudoyo et al., (2008); Wilson et al., (2010) & Patel et al., (2013).

Similarly, a positive ($\gamma = +.018$) and non-significant ($P > .287$), relationship is extracted between the statement “there is need to establish a specialized school for police training in forensic science” and “countering terrorism”. The association between variables is statistically non-significant. But value of the Gamma statistics in the finding that indicates a positive association between the variables. The finding indicates the growing number of cases that needs forensic expertise but such expertise lack in our country. This indicates that the capacities of KP police in the area of forensic science are really poor and experts in the area are not existed. The findings support the views of Fasihuddin (2009); Crispino et al., (2014) and Ullah (2015). Thereby, the findings suggest for establishment of a specialized police training school of forensic science. Few developed countries are offering forensic science as a degree at graduate and undergraduate level as well. There is urgent need to establish a separate training college for police personnel in the area of forensic science. In Pakistan, none of the police training schools have even a forensic lab.

A moderate positive ($\gamma = +.540$) and significant ($P < .006$) relationship exists between finger print which play a key role in modern policing and countering terrorism. Therefore, the association between independent and dependent variables is statistically significant. The finding shows the effectiveness of finger prints in countering terrorism. The significance of finger prints in terrorism related cases cannot be overvalued. It can be further, stated that finger print being a forensic tool for criminal investigation that play a major role in analysis, and it successfully resolved the numerous complicated issues; it is quite reliable in identification of the suspected people.

These findings are in agreement with Boland et al., (1983), who discovers that the most regularly collected, submitted and inspected forms of proof from crime scene location of a bomb blast are finger prints, firearms and biological (blood and semen). The finding could be attributed to the views of Faithand Bekir (2015); who emphasized that a key part in modern criminal investigation is played by finger prints and DNA testing. Fingerprints play an important role in providing useful information and evidence in criminal identification. The finding is also supported by Bishop (2006); and Morakabati and Beavis (2017).

In contrast, a positive ($\gamma = +.437$) and significant ($P < .003$) relationship is explored between the statement i.e. “without forensic investigation; criminal identification is difficult” and “Countering terrorism”. Therefore, the association between independent and dependent variables is statistically significant. Forensic investigation has been considered as an important scientific support used during the process of investigation related to terrorist accidents. This finding could be attributed to the existing system of criminal identification that is almost outdated and has numerous deficiencies. Literature reveals that the location and identifying physical evidence at crime scenes of a bomb blast or any other occurrence of terror case, as well as potentially missing evidence identification, is much more difficult and very challenging. Proper forensic investigation is extremely essential for identification of potential offender. Such the result indicates that for combating terrorism, weakness of police forensic investigation which creates complexities for investigation staff. The finding shows the significance of forensic investigation and its effectiveness in combating terrorism. It can be further argued that forensic investigation that is helpful in identification of terrorists. The findings of the current study are in consonance with the study done by Ganor (2004); and Paul (2009). Johnson et al., (2015), suggested forensic risk assessments focus on attacker’s behavior, state of mind, and the prospect to carry out the attack.

A positive ($\gamma = +.384$) and significant ($P < .004$) relationship is observed between police investigators who are not properly trained in forensic science and countering terrorism. The association between independent and dependent variables is statistically significant because statistical value of the Gamma and “P” in the finding indicates a positive association between the variables. The finding of the study reflects that there should be a process of proper training of staff in the field of forensic science investigation because efficiently trained staff works more appropriately in the critical cases of terrorism. Likewise, poorly trained staff in the area of forensic science creating problems and the results of forensic laboratories are not appropriate to catch the militants. The finding also indicates that crime scene examiners lack the required expertise in the field of forensic science. It is revealed from the literature and respondent’s views that the investigation staff and experts working in forensic science laboratory lack expertise in the field of forensic science in Pakistan. The findings of the current research are in similarity with the study as carried out

by the Tilley and Ford (1995); McCulloch (1996); White (2004); Fasihuddin (2011); and Abbas (2012). The finding suggested that there is need to impart proper training to the staff working in the area of terrorism investigation in forensic science laboratories. Expertise in forensic science is inevitable for successful terrorism investigation.

Likewise, a positive ($\gamma = +.324$) and non-significant ($P > .165$) relationship is observed between the statement “crime scene photography in countering terrorism cases is helpful” and countering terrorism. The association between independent and dependent variables is statistically non-significant but the statistical value of the Gamma in the finding indicates a positive association between the variables. It can be argued based on the finding that police personnel must take proper photograph from the crime scene of a suicide accident that will be helpful later on in processing of case identification potential perpetrator(s). In contrast, Ullah (2016) was of the opinion that photographic equipment having been available for many years now but there is indication that police in Pakistan cannot use it properly in crime scene. This finding could be attributed to the views of Reno (1999), who reported that photographs as taken within the crime scene area by forensic practitioners have significant influence on the processes of criminal identification. Likewise, in order to combat terrorism more effectively, examining photographs of suspects and CCTV footage is also helpful in forensic investigation.

Thus, a positive ($\gamma = +.336$) and significant ($P < .018$) relationship is detected between “DNA reports are more effective than eyewitness” and “countering terrorism”. The association between independent and dependent variables is statistically significant because the statistical value of the Gamma and “P” indicates positive and significant relationship between the variables. The finding shows the relationship of countering terrorism and the importance of DNA reports in criminal investigation and providing it as a proof in the court of law. Result further shows that the investigators must provide DNA reports timely since it has more value to present it in the court of law as a proof against the terrorists. Relevant literature shows that there are cases in which DNA evidence is used to identify convicted person as much better than the evidence of an eye witness. The reason for this is that even the most authentic and unbiased people can make errors in reminding and interpreting a watched event; and this is also the nature of human memory as well. The finding of this analysis is in consonance with the views of Cutler (1995); and Reno (1999).

In this manner, a positive ($\gamma = +.301$) and non-significant ($P > .104$) relationship is found between “Most of the terrorism cases are not traced due to lack of technical expertise in the FSL” and “countering terrorism”. The association between independent and dependent variables is statistically non-significant, but the value of the Gamma indicates a positive association between the variables. The positive value of Gamma reflects the importance of expertise in the field of forensic science. It can be observed as based on study

findings that forensic science plays a vital role in the criminal justice system by proving information based on the analysis of physical evidence. As clear from the relevant literature that most of the experts working in forensic science laboratories are not appropriately trained. Because of this reason, most of the terrorism related cases remained unsolved due to technical expertise in forensic science. Literature further shows that in Pakistan, forensic science has been ignored for a long time. In Pakistan, DNA analysts are not updated with the current DNA research work in forensic the outcomes of such the study being in line with Etherick et al., (2009); Abbas (2011); and Ullah (2015).

7. Conclusions

The main objective of the current research study was to find out the relationship of forensic science laboratories and its efficacy to tackle terrorism and point out shortcomings (if any) and address it in the police reforms to tackle terrorism effectively. It is found that an effective forensic science laboratory is a major prerequisite for DNA profiling, forensic photography, fingerprints, and crime scene investigation scientifically. DNA testing and fingerprints are the most powerful evidence in criminal investigation and identification. Most of the terrorism cases are not traced due to a lack of technical expertise in the FSL. Thus, police in Pakistan also lacks relevant expertise in the area of forensic science and well-functioning DNA laboratories as well.

8. Recommendations

A specialized school for police training in forensic science and countering terrorism is required to be established to enhance police capacities in FSL. KP police capacities in the area of forensic science are really poor and experts in the area do not exist. Therefore, the growing number of cases of terrorism needs forensic expertise and for this purpose, police should hire experts in FSL from abroad. The government should increase the allocation of funds for improving the quality and infrastructure of forensic science laboratories.

References

- Abbas, H. (2011). Reforming Pakistan's Police and Law Enforcing Infrastructure. Retrieved May 20, 2014, from <http://www.usip.org/sites/default/files/resources/sr266.pdf>
- Abbas, H. (2012a). 'Effective Policing is key to fighting Terrorism in Pakistan'. Retrieved on June 18, 2014 from <http://asiasociety.org/effective-policing-key-fighting-terrorism-pakistan>
- Abbas, H. (2012a). *Stabilizing Pakistan through Police Reforms*. Newyork: The Asia Society. Retrieved from asiasociety.org/files/pdf/as_pakistan_police_reform.pdf
- Bishop, C. M. (2006). *Pattern Recognition and Machine Learning*. New York: Springer.

- Boland, B., Brady, E., Tyson, H. & Bassler, J. (1983). The prosecution of felony arrests, 1979. Washington, D.C.: Bureau of Justice Statistics.
- Crispino, F., Rossy Q., Ribaux O., and Roux C. (2014). Education and training in forensic intelligence: a new challenge. *Australian Journal of Forensic Sciences*. Retrieved from https://serval.unil.ch/resource/serval:BIB_8B166639BCAF.P001/REF
- Cutler, B. L., and S. D. Penrod (1995). *Mistaken Identification: The Eyewitness, Psychology, and the Law*. New York: Cambridge University Press
- Etherick, W., Turvey B. E, Ferguson C. E. (2009). *Forensic criminology*. Academic Press, Peace Kashmir Organization. Growing Terrorism in Pakistan. Retrieved from <http://www.peacekashmir.org/views-articles/2012/1216-growing-terrorism-in-pakistan.html>
- Faith, T., and Bekir C. (2015). Police use of technology to fight against crime. *European Scientific Journal*. 11(10). 286-296
- Fasihuddin. (2009). 'Police Education and Training in Pakistan'. In *Pakistan Journal of Criminology*. 1(2). P. 37 – 64
- Fasihuddin. (2012). 'Terrorism Investigation in Pakistan: Perceptions and Realities of Frontline Police'. In *Pakistan Journal of Criminology*. 3(2). P. 51 – 78.
- Ganor, B. (2004). Terrorism as a strategy of psychological warfare. *Journal of Aggression, Maltreatment & Trauma*, 9(1-2), 33-43.
- Hoffman, B. (2003). *The Logic of Suicide Terrorism. Terrorism and Counterterrorism: Understanding the New Security Environment*. Guilford: Connecticut; McGraw Hill Company. Retrieved from <http://www.newslinemagazine.com/2002/03/strategic-depth-reviewed/>
- Inman, Keith, and Norah R. (1997). *An Introduction to Forensic DNA Analysis*. Boca Raton, FL: CRC Press Inc.
- Johnson R., Ross B. D., Matteson R., Henry S., and Link M. (2015). A Forensic Psychological Assessment of Terrorists: An Anti-Terrorism Approach for Radicalized Westerners. Retrieved from https://nsuworks.nova.edu/cgi/viewcontent.cgi?article=1247&context=fse_facarticles/
- Khan, A. J. (2014, May 14). Khyber Pakhtunkhwa Police use modern technology. Retrieved from http://centralasiaonline.com/en_GB/pakistan-articles/caii/features/pakistan/main/2014/05/14/feature-01.
- Krejice, V. R and Morgan, W. D. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*. 30. 607-610
- McCulloch, H. (1996). *Police Use of Forensic Science*. Police Research Series Paper 19, London: Home Office Police Policy Directorate.
- Morakabati Y., and Beavis J. (2017). Do Terrorist Attacks Leave an Identifiable 'Fingerprint' on International Tourist Arrival Data?. *International Journal of Tourism Research*. 19(2). 179-190

- Patel, N., Gautaman, K. V., & Jangir N. N. (2013). The role of DNA in criminal investigation—admissibility in Indian legal system and future perspectives. *International Journal of Humanities and Social Science Invention*. 2(7). 15-21
- Paul, K. (2009). Crime scene and physical evidence awareness for non-forensic personnel. United Nations Publication, Retrieved from https://www.unodc.org/documents/scientific/Crime_scene_awareness__Ebook.pdf
- Quraishi, A. M. (2002). Strategic Depth Reviewed. *Newsline*.
- Reno, J., Fisher C. R., Robinson L., Brennan N., Travis J., (1999). Eyewitness Evidence: A guide for law enforcement. Retrieved from <https://www.ncjrs.gov/pdffiles1/nij/178240.pdf>
- Sajjid, A. I., and Ullah, F. (2015). ‘Policing with Passion: KP Police Initiatives’. *Pakistan Journal of Criminology*. 7(1). P. i – iii
- Sudoyo, H., Widodo P. T., Suryadi H., Lie Y. S., Safari D., Widjajanto A., Kadarmo D. A., Hidayat S., Marzuki S. (2008). DNA analysis in perpetrator identification of terrorism-related disaster: suicide bombing of the Australian Embassy in Jakarta 2004. *Forensic Science International Genetics*. 2(3). 231-237
- Tilley, N. and Ford, A. (1995). *Forensic science and crime investigation*, CPD paper in press, London: Home Office.
- Ullah, F. (2015). Intelligence Aspects in Police Basic Training and Countering Terrorism in Khyber Pakhtunkhwa, Pakistan. *Pakistan Journal of Criminology*. 7(1). P. 101 – 113
- Ullah, F., Hussain S., Alam H., Akhunzada U. Z. (2016). Factors Influencing Police Image in Public (A Study of University Students Perception in KPK Pakistan). *Pakistan Journal of Criminology*. 8(3). 134-148
- White, P. (2004) Crime scene to court: the essential of forensic science, 2nd ed. (ed.), The Royal Society of Chemistry, Cambridge.
- Wilson, B. D., McClure D., and Weisburd D. (2010). Does Forensic DNA Help to Solve Crime? The Benefit of Sophisticated Answers to Naive Questions. 26(4). Retrieved from <https://journals.sagepub.com/doi/10.1177/1043986210377231>