

Forensic Science in the Ethiopian Federal Criminal Justice Process: Appraisal of its Utilization.

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Abstract

This article explores the utilization and impact of forensic evidence within the federal criminal justice process of Ethiopia. It aims to investigate the current state of forensic science in the country's federal criminal justice process, examining its application, challenges, and potential for improvement. The research employed, as major research tools, comprehensive literature review, analysis of relevant legal frameworks, and interviews with key informants. Findings of the study revealed that there is an insufficient legal framework in place to govern the utilization of forensic evidence in criminal cases. In addition, inconsistencies were observed in the utilization of forensic evidence by law enforcement agencies, posing challenges to its effective utilization. Furthermore, variations were identified in how courts interpret and apply forensic evidence, highlighting the need for standardization and clearer guidelines. The findings also indicate the importance of adequate training and resources for forensic experts to ensure accurate analysis and presentation of evidence.

Keywords: Forensic Science; Forensic Evidence; Criminal Justice Process; Ethiopia.

Introduction

Crime has existed as long as humanity and it is changing its form from time to time based on the changing circumstances in human lives. Technological

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advancements have brought forth new forms of criminal activity, leading to an increasingly complex investigation that requires a higher level of expertise and the application of scientific knowledge. Further, the complex nature of the crimes committed often complicates criminal investigations.¹

In response to such dynamics, the field of criminal investigation has undergone multiple stages of development over time, advancing new methods and techniques in criminal investigation practice. Particularly the integration of forensic science into criminal investigation has taken the advances to a significantly higher level.² The continuous advancement of technology has led to major improvements in forensic science, and presently, modern criminal investigation is closely intertwined with the application of forensic science.³

As its course of development shows, forensic science is largely a practical science, drawing theoretical and empirical insights across spheres of scientific disciplines for practical applications. As such it is composed of different professions and referred to as “mixed science” that seeks to utilize science to benefit the ends of legal systems.⁴ In the modern criminal justice system, the application of forensic science assists courts in resolving criminal, civil, and administrative cases though it is predominantly applicable in criminal cases.⁵

¹ Segni Nemomsa et al, ‘Forensic Science Trend, Current Challenges in Ethiopia: A Narrative Review Evidence from Recent Literature and Policies’ *Journal of Forensic Research*, [2023] 14(3), pp. 2-3.

² Max H. Houck and Jay A. Siegel, *Fundamentals of Forensic Science*, Second Edition, Elsevier, (2010), p.3.

³ Id.

⁴ Barry A.J. Fisher et al, *Introduction to Criminalistics: The Foundation of Forensic Science*, First Edition, Elsevier, (2009), p.3.

⁵ Id.

The application of forensic science with a particular focus in criminal matters is termed as “criminalistics.”⁶

Practically speaking, the utilization of forensic science means the examination of physical evidence,⁷ which includes murder weapon, hairs, fibers, fingerprints, DNA,⁸ biological materials, and so on.⁹ The history of the application of forensic evidence goes back thousands of years to ancient China.¹⁰ The story goes as follows: A farmer was found murdered in a rice farm. The head of the village gathered the farmers who were working in the fields closest to the crime scene. As all of them denied the criminal act, he had them lay their sickles on the ground. After some time, while the interrogation was conducted, flies gathered around one of the sickles. Though it was cleaned and no visible blood on it, the flies were attracted by microscopic blood remains on the sickle, and ultimately the killer was identified.

The insight underlying the story is still used in modern forensic practice.¹¹ Forensic evidence, if utilized properly, may be used as the best available evidence.¹² Presently, advances in forensic science have progressed to the extent of reliably revealing some form of evidence a suspect inevitably leaves

⁶ Richard Saferstein, *Criminalistics: An Introduction to Forensic Science*, Tenth Edition, Pearson Education Inc., (2022), p.6.

⁷ *Id.*

⁸ While DNA is not tangible, the physical evidence that contains DNA, such as bodily fluids, skin cells, and blood, can be physically collected and preserved. In a word, these materials are tangible and contain DNA. Hence, DNA is a physical evidence.

⁹ Houck and Siegel, *supra* note 2, p.3.

¹⁰ Deepak Rawtani and Chaudhery Mustansar Hussain, *History of Forensic Science*, First Edition, Wiley-Vch Gmbh Publisher, (2020), p. 7-8.

¹¹ *Id.*

¹² Ross M. Gardner, *Practical Aspects of Criminal and Forensic Investigations*, 2nd. Ed., Tailor & Francis Group, (2012), p.7.

behind due to his unavoidable contact with a crime scene during the perpetration of a crime.¹³

The utilization forensic science operates based on the principle that states where there is contact between two items, there will be an exchange of microscopic material—which is widely referred to as Locard’s Exchange Principle.¹⁴ Underlying the principle is that forensic science plays a vital role in the criminal justice process by providing scientific expertise and analysis such as DNA analysis, fingerprinting, ballistics, toxicology, and more. The expert evidences from such endeavor help to identify suspects, to establish timelines, and to reconstruct events surrounding a crime. By utilizing forensic science, investigators can link individuals to criminal activities, corroborate witness testimonies, and provide objective evidence in courts of law.¹⁵ The application of forensic science ensures that the criminal justice system operates on a solid foundation of scientific principles, enhancing the accuracy, reliability, and fairness of criminal investigations and trials. It serves as a powerful tool in uncovering the truth, protecting the innocent, and bringing the guilty to justice, ultimately contributing to the safety and well-being of society as a whole.¹⁶

This article explores various types of forensic evidence commonly used in criminal investigation, prosecution, and adjudication processes in Ethiopia at

¹³ Houck and Siegel, *supra* note 2, p.3.

¹⁴ Locard's Exchange Principle states that a person who commits a crime will carry something to the crime scene and take something away from it. In other words, any criminal leaves behind a trace when committing a crime due to his contact with the crime scene and it is the investigator's duty to find this trace evidence and reconstruct the events of the crime.

¹⁵ Tae Myung Choo and Young-Shik Choi, 'Defining and Explaining Serial Murders in the United States', *Korean Journal of Legal Medicine*, [2010] 44 (1), p. 6.

¹⁶ Everett Baxter, *Complete Crime Scene Investigation Handbook* (First Edition, Taylor & Francis Group 2015), p. 126.

the federal level. The study particularly aims to explore whether forensic science is utilized in the Ethiopian federal criminal justice process. It specifically aims to identify the common and major kinds of forensic evidence to be used in criminal cases, the gaps in the practice, and to suggest ways to better utilize forensic science.

The study employed qualitative research method. Both primary and secondary data sources such as Ethiopian federal court records and insights from federal forensic experts (primary sources), as well as information from books, journals, and academic research (secondary sources) are utilized. The data in the investigation were generated through legal text analysis, document reviews, interviews with key informants, case analysis, and scholarly literature reviews.

Police officers, public prosecutors, judges, and public defenders were taken as sources of data to gain perspectives on the challenges and opportunities related to the use of forensic science in Ethiopia's criminal justice system. The study specifically examined the operations of the Federal Court at Lideta Bench, which is known for handling a significant number of cases, including those of a complex and high-profile nature.¹⁷

The research is organized in four sections. The first section, following this preliminary backdrop, highlights fundamental concepts in forensic science. The second section provides a brief account of Ethiopian forensic practice in criminal legal systems. In the third section, the article defines and extensively elaborates the technical operations of forensic tools instrumental in criminal investigation. Also, this section assesses the Ethiopian practice in terms of the use and the capacity of institutions in their use of these tools. As an extension

¹⁷ Tadesse Biru Kassie and Mohammed Seid, *The Challenges of the Judiciary System in Ethiopia: The Case of the Federal Supreme Court and the Federal High Court*, *Journal of Law and Society*, Vol. 9, No. 2, (2018), p.54.

of such issues, the fourth section unravels the major constraining issues in using forensic science across Ethiopian criminal investigation practice. Finally, the article makes concluding remarks by reemphasizing the place of forensic science in the pursuit of attaining the ends of criminal justice, and by recapping on the institutional and individual capacities in using forensic tools in the Ethiopian legal systems. Based on the findings, the part suggests possible policy and legislative actions to fill the gap in the use of forensic tools in the country's criminal justice system.

1. Basic concepts associated with forensic evidence

1.1. Crime Scenes

A crime scene is a place where a crime is committed. It may be a street corner, a business place, or a residence. Crime scenes can also be categorized as indoor or outdoor.¹⁸ The size and complexity of crime scenes vary depending on the type of crime committed.¹⁹ Multiple crime scenes may occur. For instance, if a victim is killed in his home and his body is discovered dumped elsewhere, his home becomes the primary crime scene, and the dumping site becomes the secondary crime scene.²⁰ A crime scene provides the investigator with a starting point to gather information about the victim and the suspect. Besides, it helps to reconstruct the crime.²¹

¹⁸ Gardner, *supra* note 12.

¹⁹ *Id.*

²⁰ Peter White, *Crime Scene To Court: Essentials of Forensic Science*, Second Edition, RS.C.(2004), p. 21-23, [hereinafter Peter, *Crime Scene To Court: Essentials of Forensic Science*]; Interview with Tewodros Taye, Forensic Evidence Collection Unit Head and Forensic Expert in Arson and Explosion at the Federal Forensic Investigation Department (Addis Ababa, 24 May 2023).

²¹ *Id.*

Crime scenes are processed by forensic experts and investigators to gather evidence, identify suspects, and build cases. This process involves taking photographs of the scene and collecting DNA samples and fingerprints. Forensic experts may also collect physical evidence such as clothing, weapons, and other objects. The proper processing of the scene determines the degree of success for the entire criminal investigation.²²

Crime scene investigator needs to have the knowledge and skills to preserve the evidence related to the crime committed. He should, in other words, be capable of recognizing, identifying, preserving, and gathering physical evidences. He must also be equipped with knowledge of both the legal and the scientific standards for gathering such evidences.²³ One of the most important aspects of crime scene investigation is the establishment of a chain of custody, which refers to the process from evidence collection to delivery to a court of law. Chain of custody shall be maintained to ensure validity of the evidence.²⁴

Crime scenes are also important in identifying trends and patterns in criminal behavior. By studying the commission of the crime and the evidence gathered from crime scenes, it is possible to develop profiles of offenders and determine any similarities in the way they commit crimes. This can help the police to narrow the suspects' list, to stop crimes in progress and prevent similar crimes in the future.²⁵

1.2. Forensic Toxicology

²² Jacqueline T. Fish and Jonathon Fish, *Crime Scene Investigation Case Studies*, First Edition, Elsevier, (2014), pp. 10-14.

²³ Id.

²⁴ Id.

²⁵ Terrence F. Kiely, *Forensic Evidence: Science and the Criminal Law*, First Edition, CRC Press LLC, (2001), p.262.

Toxicology is the scientific study of the impact of chemicals and toxins on living organisms. Toxicology frequently involves the examination of biological samples such as blood, urine, and hair to determine whether an individual has come into contact with dangerous substances.²⁶ It plays a crucial role, especially in cases involving drug-related offenses, poisoning, and homicide.²⁷ To this end, samples are analyzed in a laboratory to identify the presence and quantities of toxic substances.²⁸ Forensic toxicology can also be used to determine whether alcohol played a role in a crime. Analysis of a suspect's blood alcohol level at the time of their arrest can provide evidence in cases such as drunk driving accidents, assault, and homicide.²⁹ Further, toxicology can provide information about the victim's behavior and actions leading to a crime.³⁰

1.3. Crime Laboratories

Crime laboratories are where forensic evidence is processed and analyzed.³¹ They are run by experts from various fields, including, Physics, Geology, Botany, Biology, Photography, Computer Science, and more.³² The ballistics department also examines and processes any firearms, bullets, or other firearm parts discovered on or near the crime scene or inside the victim's

²⁶ K.S. Narayan Reddy, *The Essentials of Forensic Medicine and Toxicology*, 33rd Ed., *The Health Sciences Publisher*, (2014), pp.498-499.

²⁷ *Id.*

²⁸ Fisher et al, *supra* note 4, p.80.

²⁹ *Id.*

³⁰ William G. Eckert, *Introduction to Forensic Sciences*, 2nd. Ed., CRC Press Inc. (1997), p. 2.

³¹ Ayn Embar-Seddon and Allan D. Pass, *Forensic Science*, Salem Press, Inc., (2009), pp. 301- 303.

³² Gardner, *supra* note 12.

body.³³ Moreover, a crime laboratory may contain crucial units like the toxicology unit, fingerprint unit, voiceprint analysis unit, and others.³⁴

2. Forensic Evidence in Ethiopia – a Brief Account

Currently, forensic evidence holds immense significance as a tool in criminal investigation. In several countries, its advanced utilization has led to the successful resolution of numerous criminal cases that would have otherwise remained unsolved through conventional investigation methods. Scholarly literature on the utilization of forensic evidence in Ethiopia is insufficient. While there are varying reasons for this, it is largely attributed to the complexities and daunting circumstances surrounding Ethiopian criminal justice practice. These variables are presumed to have hindered scholars from adequately exploring the subject.³⁵

Before the introduction of modern investigation techniques, criminal investigation in Ethiopia used to employ traditional methods that took various forms throughout different periods. Practices such as *Leba shay* and *Afersata/Awechachign*³⁶ were employed to identify perpetrators. However,

³³ Interview with Seada Abdela, Head of Physical Forensic Evidence Unit at the Federal Forensic Investigation Department (Addis Ababa, 24 May 2023).

³⁴ Saferstein, supra note 6.

³⁵ Assefa Mulugeta Asfaw, Development And Competence of Forensic Examination in the Protection of Rights of the Accused in the Criminal Justice of Ethiopia: Prospects and Challenges, the Case of Homicide in Addis Ababa, Ma Thesis, Addis Ababa University, (2016), p. 5.

³⁶ The phrase *leba shay* or *leba sha* is Amharic and literally means searching thief. It was a technique of thief-searching that was practiced in Ethiopia. An individual who was stolen (or allegedly stolen) reported to the person who was in charge of *leba shay*, known as *leba shay at'ech'i*- the one who administers the *leba shay*. An adolescent boy would be made to drink a drug. Reportedly, the drug he drank was a mixture of tobacco and an herb-the latter unidentified by the common people. After taking the drug, the boy became intoxicated and entered into a trance as if under hypnosis. Accompanied by a follower, *leba shay teketa*y, the boy went to house looking for the thief. The owner of the house before which the boy fell down was considered to have stolen the property. The accused person would be taken to a judge

despite their long-standing use, these methods had numerous drawbacks. Lacking scientific basis, they often led to misleading outcomes and consequences. Consequently, these traditional investigation practices were entirely abolished.

The first step in establishing modern criminal investigation in Ethiopia began during the time of Emperor Haile Selassie I in 1946, and the first forensic science laboratory was established. Since its establishment, the Abadina Police College, currently renamed as the Ethiopian Police University College, has been providing a range of forensic-related courses, including fingerprint and document analysis, crime scene photography analysis, and more.³⁷ It is now more than half a century since the college started delivering forensic science services, and until recently, it was the only institution that provides training related to forensic science and forensic evidence at a national level.³⁸

As far as legal framework is concerned, forensic science and evidence are not given due emphasis in the Ethiopian criminal justice system. There is no comprehensive legal regime governing evidence in general and forensic evidence in particular. Even the recent criminal justice policy--the 2011 FDRE criminal justice policy--hasn't incorporated forensic evidence as one of

known as the leba shay dannya (judge). See Alexander Naty, The Thief-Searching (Leba Shay) Institution in Aariland, Southwest Ethiopia, <https://www.jstor.org/stable/pdf/3774010.pdf?refreqid=fastly>. Affersata, also known as awuchachign, is communal inquiry into crime to discover a criminal's identity. The technique used was to summon all inhabitants of the neighborhood where the crime was committed, and to sequester them until they named the criminal. The gathering would be called by a local official such as the district governor, either upon request of the injured party, or, in cases of serious public disturbance, on government initiative. See Stanley Z. Fisher, *Traditional Criminal Procedure in Ethiopia*, 1971.

³⁷ Kibrom Desta, *Fingerprint Identification and Verification using Minutiae Extraction for Crime Investigation* (MSC Thesis, St. Mary's University 2018) 4.

³⁸ Id.

the major kinds of evidence to be utilized. There are some provisions implicitly related to digital forensics dealing with computer crimes,³⁹ but forensic evidence as a contemporary form of evidence is not properly set out in a separate section in the policy. Neither does the judicial practice provide guiding cases. The federal Supreme Court's cassation division has published 25 volumes of decisions, and in none of those cases was forensic evidence used to resolve a criminal matter.⁴⁰

Moreover, there are some provisions in different legislations that allow the use of forensic evidence in criminal cases. For example, some provisions under the Anti-terrorism Proclamation No. 652/2009⁴¹ allows interception of individual's phone, correspondence, and e-mails. Similarly, proclamation no. 434/2005⁴²—revised anti-corruption special procedure and rules of evidence proclamation – permits the use of evidences produced by a computer, interception of correspondence & letters, and voice recordings.

Yet the problem here is that though there are provisions in other legislations allowing the use of forensic evidence in criminal and other cases, there is no detailed procedure that govern the use of such evidences. This most probably results in inconsistent utilization of forensic evidences in different benches within the same court as judges and prosecutors are not obliged to adhere to a defined criteria and procedure to use them. Generally speaking, in the context

³⁹ Federal Democratic Republic of Ethiopia, *Criminal Justice Policy* (Ministry of Justice 2011), pp. 44-45.

⁴⁰ Federal Supreme Court, Cassation Division Decisions, Volume 1-25.

⁴¹ Federal Democratic Republic of Ethiopia, Anti-terrorism Proclamation No. 652/2009, Federal Negarit Gazette, (2009), Article 2(8), Article 14 and article 29.

⁴² Federal Democratic Republic of Ethiopia, Revised Anti- Corruption Special Procedure, Proclamation No. 434/2005, Federal Negarit Gazette, (2005), Articles 45-47.

of Ethiopia's criminal justice process, forensic evidence rules has not been put in place in a way to meet the demands of the criminal justice system.⁴³

3. Major Kinds of Forensic Evidence and Their Utilization in Ethiopian Federal Criminal Justice Process

3.1. Fingerprint

Fingerprints are one of the most crucial pieces of forensic evidence that play a significant role in identifying and convicting criminals. Human fingerprints are unique, and the pattern formed by the ridges (the raised lines that form unique patterns on the tips of human fingers and thumbs) and minutiae (the unique characteristics or features that are present in the ridge patterns of a fingerprint) is what makes fingerprints unique. Minutiae can include ridge endings, bifurcations, dots, and other unique details.⁴⁴ Fingerprints are different for every person. Even identical twins have different fingerprints though they have the same DNA.⁴⁵

Fingerprints are common at crime scenes and can be gathered through various mechanisms such as ink, dust, or chemicals. Once secured, the print is photographed or scanned to produce a digital image.⁴⁶ These images are then scrutinized to match with the identity of a known suspect or to someone

⁴³ Nemomsa *et al*, supra note 1; Behaylu Girma, Forensic Science Evidence under Ethiopian Criminal Justice System; the Case of Homicide in Addis Ababa, LLM Thesis, Bahir Dar University, (2014), p.3.

⁴⁴ Gardner, supra note 12.

⁴⁵ Id.

⁴⁶ Baxter, supra note 16; Interview with Behailu Mengistu, Head of Prints and Criminal Records Unit at the Federal Forensic Investigation Department. (Addis Ababa, 24 May 2023).

else.⁴⁷ Fingerprints can be lifted from various materials such as plastic, metal, and glass, and can also be employed to recognize victims.⁴⁸

Image 1. Ridges of fingerprints⁴⁹

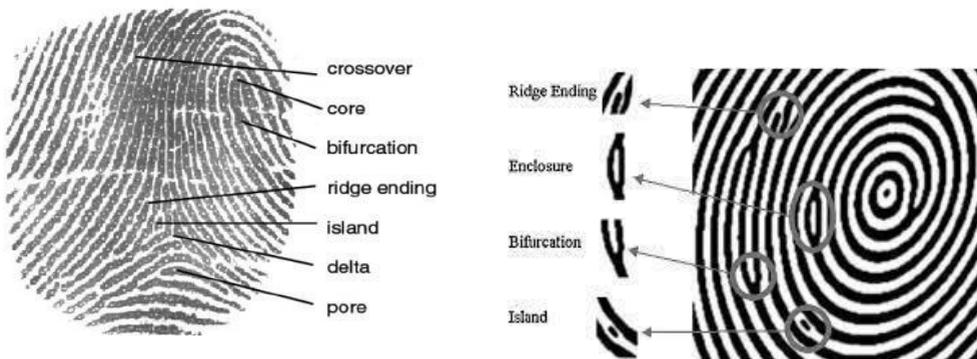
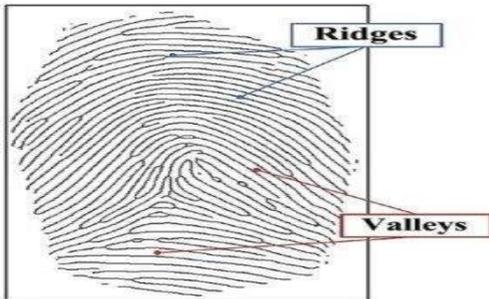


Image 2. Minutiae of Fingerprints⁵⁰

⁴⁷ Id.

⁴⁸ Gardner, supra note 12, 28-30.

⁴⁹ Ridges Characteristics of fingerprints, available at <<https://www.google.com/search?q=Images+of+ridges+characteristics+of+fingerprint>> last accessed on 6 June 2023.

Fingerprints at a crime scene can appear in three primary forms. Latent prints are typically invisible and left behind by bodily secretions. Patent prints are visible to the naked eye and result from contaminants like blood or grease. Plastic prints are created when an impression is made on a malleable surfaces, such as wax.⁵¹ Identifying the surfaces to examine for fingerprints at a crime scene is crucial in the effort to locate and recover them.⁵² Perpetrators may deliberately obliterate fingerprints, making it challenging for investigators to discover any trace of them. This act of perpetrators is referred to as a *forensic countermeasure*.⁵³ In such instances, investigators may opt not to process the scene due to the possibility of negative outcomes.⁵⁴

Fingerprint can help identify the gender of the offender. Accordingly, women have significantly higher ridge density than men. It is likely that the fingerprints have a male origin with a ridge density of 11 ridges/25 mm² or less. Similarly, a fingerprint having a ridge density of 12 ridges/25mm² or greater is likely to be of female origin.⁵⁵ Additionally, fingerprints can assist in estimating the age group of the culprit. The trend is that as individuals get older, the ridges of their fingerprints become more worn and scattered than before. The skin's pores also experience a reduction in lubrication, which affects the texture of the fingertips.⁵⁶

⁵⁰Minutiae of fingerprints, available at <https://www.google.com/search?q=Images+of+Minutiae+of+fingerprints> last accessed on 6 June, 2023.

⁵¹ Baxter, supra note 16; Tewodros, supra note 20.

⁵² Id.

⁵³ Baxter, supra note 16.

⁵⁴ Gardner, supra note 12, pp.28-30.

⁵⁵ P. Gnanasivam and R. Vijayarajan, Gender Classification from Fingerprint Ridge Count and Fingertip Size Using Optimal Score Assignment, Springer, (2019), pp. 344-346.

⁵⁶ Id.

Though there is no law that governs the application of fingerprint, it is being utilized in the Ethiopian criminal justice process. To this end, the federal forensic investigation department is employing its own manual to collect, preserve, and presents it as evidence in court of law.⁵⁷ According to the respondent, the manual is prepared as per the standards of best international practices.⁵⁸ Despite the use of such manual, practitioners still notice practical problems in securing crime scenes by first responders as there is a possibility of tampering with fingerprints.⁵⁹ According to one of the respondents to is the study, this problem may be due lack of knowledge of forensic evidence and sometimes because of negligence.⁶⁰

In one illustrating criminal case,⁶¹ a man was murdered in his residence and locked inside and the neighbors notified the police about the incident. Unfortunately, the police were negligent and mishandled the crime scene. They failed to collect any fingerprints from the doorknob and also neglected to collect fingerprints from a stone discovered at the scene promptly. As a result, the case failed despite the presence of circumstantial evidences suggesting the suspect's involvement in the crime.⁶² On the flip side, there are cases where fingerprint analysis was made by the federal police forensics department and the court considered it admissible. In a case involving two defendants accused of aggravated theft, one of the defendants had a

⁵⁷ Seada, *supra* note 33.

⁵⁸ *Id.*

⁵⁹ Interview with Chief Inspector Bikila Tadesse, Head of Corruption Crimes against Government Institutions, Federal Police Criminal Investigation Department (Addis Ababa, 30 May 2023).

⁶⁰ Interview with Chief Sergeant Kebe Adinew, Detective at Addis Ababa Police Homicide Division (Addis Ababa, 30 June 2023).

⁶¹ Interview with Adanech Gezahegn, Homicide Division Coordinator and Prosecutor at Ministry of Justice, Lideta Bench (Addis Ababa, 22 May 2023).

⁶² Kebe, *supra* note 60.

fingerprint that matched the one found at the crime scene. The court relied on the forensic report and convicted the defendant.⁶³

In another case⁶⁴, fingerprint evidence, though both possible and necessary to use, was not utilized. In the case of *Federal Prosecutor v. Hiwot Mekonin*, the defendant was charged with strangling and killing two children using a knife. Nevertheless, despite the identification of a murder weapon with a possible fingerprint on it, no forensic evidence was provided to conclusively prove that the defendant's fingerprint was present on the weapon. As a result, the defendant's conviction relied solely on her confession without the support of forensic evidence.⁶⁵

Relying solely on the defendant's confession not only creates potential grounds for the defendant's acquittal but also hinders judges from reaching an informed decision. Even when a defendant confesses, it is crucial for the prosecution to collect and present forensic evidence like a fingerprint. By doing so, if the confession is deemed invalid for any reason, the integrity of the case would not be compromised. In addition,⁶⁶ witness testimony, in many similar cases, is relied on more frequently than fingerprint and other forensic evidence in securing a conviction. This also has the potential to compromise cases of the prosecution in present and future cases.

Fingerprints prove most valuable when they can be matched with previously recorded prints. However, without a database to facilitate matching a suspect's

⁶³ Simeneh Kiros and Cherinet Hordofa, When the Expert Turns into a Witch: Use of Expert opinion Evidence in the Ethiopian Justice System, *Journal of Ethiopian Law*, Vol. 27, No. 1, (2015), p.104-105.

⁶⁴ Interview with Mihiret Eshete, Coordinator and Prosecutor of Crimes against Women and Children Division, Lideta Bench (Addis Ababa, 24 May 2023).

⁶⁵ Federal Prosecutor v. Hiwot Mekonin, Federal High Court, Lideta Criminal Bench, File No. 298113, (5 December 2022).

⁶⁶ Mihiret, supra note 64.

fingerprint with existing records, certain investigations may fail even when a fingerprint is obtained from a crime scene or another relevant location within the investigation.⁶⁷ The police usually retains fingerprints of recidivists; however, this practice falls short as the number of records is severely limited.⁶⁸

3.2. Document Analysis

Document analysis is employed to scrutinize various forms of paper-based evidence, including handwritten notes, typed or printed documents, and even digital images.⁶⁹ Document analysis is employed for similar purpose in the Ethiopian federal criminal justice process.⁷⁰

Document analysis begins with a preliminary visual examination of the document in question to ascertain its origin, age, and authenticity. The analyst examines the paper used, watermarks, ink, strokes, and letter formation, to determine its source.⁷¹ Handwriting analysis involves evaluating the handwriting's overall appearance, including features such as letter spacing, slant, slope, size, alignment, and pressure patterns to create a writer's profile. By comparing this profile to reference documents, the examiner can determine if the questioned writing was written by the same person.⁷²

Another critical aspect of document analysis is typewritten and printed documents. In the case of typewriting, the typeface, typewriter, ribbon, and formatting elements are analyzed for similarities and differences compared

⁶⁷ Behailu, *supra* note 48.

⁶⁸ Interview with Deputy Inspector Binyam Berihun, Team Leader at Addis Ababa Police Homicide Division (Addis Ababa, 30 June 2023).

⁶⁹ Fisher et al, *supra* note 4, p.80.

⁷⁰ *Id.*; Interview with Zelalem Fikadu, Deputy Director General of Corruption Crimes at Ministry of Justice, Lideta Office (Addis Ababa, 20 June 2023).

⁷¹ Saferstein, *supra* note 6, p.12.

⁷² *Id.*

with any known reference documents. The same methods are used in the analysis of printed documents with particular attention given to identifying the type of printer used.⁷³

As far as photocopied documents are concerned, in Ethiopia, document forensic analysis encounters a limitation wherein photocopied documents cannot be thoroughly examined by forensic experts. This problem arises due to the absence of advanced technology and trained experts in the field.⁷⁴ However, in other jurisdictions, particularly in developed countries, forensic analysis of photocopied documents is feasible.⁷⁵ Yet in Ethiopia, public prosecutors⁷⁶ and public defenders⁷⁷ face challenges as they are unable to utilize photocopied documents to substantiate charges or defend their clients. According to a respondent,⁷⁸ certain individuals are aware that photocopied documents are not susceptible to forensic scrutiny under existing criminal investigation techniques and resort to measures to eliminate original documents when apprehended in the act. For instance, they may opt to chew and swallow the original document, such as a cheque, in an attempt to destroy the incriminating evidence.

The application of documentary evidence as a form of forensic evidence is incorporated in pertinent laws. For example, Articles 45 and 46 of proclamation No. 434/2005, revised anti-corruption special procedure and rules of evidence proclamation, set out the application of documentary evidence in various forms such as one obtained from a computer and written

⁷³ Fisher et al, *supra* note 4.

⁷⁴ Seada, *supra* note 33.

⁷⁵ Anil Kumar, 'A Review on Analysis of Photocopied Documents', *International Journal of Information and Computer Science*, [2018] 5(7), p. 1.

⁷⁶ Adanech, *supra* note 61.

⁷⁷ Interview with Ayalew Masresha, Federal Public Defender (Addis Ababa, 14 June 2023).

⁷⁸ Zelalem, *supra* note 70.

letters. In white-collar crimes, documentary evidence is one of the most common forms of evidences presented by disputing parties in the Ethiopian federal criminal justice process.⁷⁹ The prevalence of forged, falsified, and other fraudulent documents in criminal cases are a primary factor contributing to the utilization of document analysis within the Ethiopian criminal justice process. These cases encompass various forms of deception, such as counterfeit currency, fake identity documents, fraudulent contracts, and forged documents from government institutions.⁸⁰

3.3. Ballistics Evidence

A forensic investigation related to ballistics evidence is about an examination of the trajectory and behavior of projectiles, such as bullets, and ballistics as a way to establish connections between a specific weapon and a crime scene.⁸¹ Ballistics experts gather and scrutinize evidence, including firearms, spent cartridges, bullets, casings, and other pertinent materials, and finally carry out tests to determine the type of weapon employed. The process mostly involves meticulous inspection of the bullet or casing's size, shape, and markings, assessment of any scratches or imperfections present on the surface, and measuring the distance it traveled.⁸² Ballistics analysis can also help to identify the type of injury sustained by a victim. Particularly, a bullet wound's size, shape, and trajectory can give investigators insight into the nature of the

⁷⁹ Seada, *supra* note 33; Zelalem, *supra* note 70.

⁸⁰ *Id.*

⁸¹ Philip P. Massaro, *Big Book of Ballistics*, First Edition, Gun Digest, (2017), p.11-14; Seada, *supra* note 33.

⁸² Brian J. Heard, *Firearms and Ballistics*, Second Edition, Wiley-Blackwell, (2008), pp. 43-48; Seada, *supra* note 33.

crime, and help determine if the shooter was stationary or moving and other related details.⁸³

In certain instances, ballistics analysis may be employed to link a particular suspect to a weapon. When investigators seize a firearm, ballistics analysis may be used to ascertain whether it was used in a specific crime. If the bullet or casing's markings correspond to those on a suspect's weapon, it can provide convincing evidence that the suspect was implicated in the crime.⁸⁴ As one of the respondent pointed out in the interview over the subject,⁸⁵ ballistics evidence is used in crimes involving firearms such as terrorism, robbery in Ethiopia, and to this effect, firearms, bullet barrels, gunpowder, and others are analyzed to understand the commission of the crime.

While the practice on the ground widely involves such professional activities to day, there is no law that *per se* regulates the utilization of ballistics evidence.⁸⁶ According to respondents in the study, the federal forensic investigation department used its own manuals to collect, preserve, and utilizes ballistics evidence in court of law.⁸⁷ Yet it is important to note that despite the limited utilization of ballistics forensic investigation in relation to the current demand for criminal investigation, there are notable cases that show potential for the utilization of ballistics forensic evidence in the Ethiopian federal criminal justice process. One prominent case is the

⁸³ Gerald Burrard, *The Identification of Firearms and Forensic Ballistics*, First Edition, A.S. Barnes and Co., (1934), p.26-29.

⁸⁴ Fisher et al, *supra* note 4, pp. 31-33.

⁸⁵ Interview with Tadele Bereded, Coordinator of Terrorism, Conflicts, and Hate Speech Crimes at Ministry of Justice, Lideta Office (Addis Ababa, 5 June 2023); Interview with Abriham Getaneh, Federal Prosecutor and Coordinator of Organized and Transboundary Crimes at Ministry of Justice, Lideta Office (Addis Ababa, 14 June 2023).

⁸⁶ *Id.*

⁸⁷ Tewodros, *supra* note 20.

assassination of the late General Seare Mekonin, a former General of the Ethiopian Defense Force, and General Gezai Abera, another former military official.⁸⁸

The ballistics investigation report examined multiple elements including bullets, bullet casings, and the firearms associated with the shooting incident. Through such analyses, it was determined that the bullets recovered from the victims' bodies and the bullet box discovered at the crime scene were linked to the firearm confiscated from the defendant, providing evidence of his involvement in the assassination.⁸⁹ By examining the markings on the bullets found at the crime scene and comparing them with those created by the firing mechanism of the gun, as well as matching the bullets with the markings on the bullet box, the ballistics investigation concluded that the firearm confiscated from the defendant was the weapon used to kill the two victims.⁹⁰

Another respondent⁹¹ shared experiences related to exhibit handling. He stated that some cases fail because prosecutors fail to see the actual existence and details of exhibits. In one case, a suspect was captured while possessing a firearm believed to be illegal, leading to charges filed by the prosecutor. However, the accused denied the allegations and requested the court to order an examination of the firearm seized from them. Subsequently, a ballistics report demonstrated that the supposed firearm was not an actual gun but rather an Olympic Fire gun.

⁸⁸ Federal Prosecutor v. Mesafint Tigabu, Lideta High Court Criminal Bench, File No. 248873, (28 June, 2021).

⁸⁹ Id.

⁹⁰ Id.

⁹¹ Interview with Seid Kemal, Prosecutor of Terrorism Cases at Ministry of Justice, Lideta Bench (Addis Ababa, 3 July 2023).

In *Federal Prosecutor v. Michael Tadesse*,⁹² a third case relevant to the subject, the accused faced charges of possessing an illegal firearm, and the police exhibited a gun allegedly connected to the crime. The prosecution relied on this gun as evidence to strengthen the grounds for conviction. However, the accused requested the court to order a ballistics examination to determine if the gun was functional or not. When the court issued the order, it was determined that the police no longer had the gun in their possession. As a result, the accused was exonerated. Thus, exhibit mishandling may seriously affect the validity of the evidence and the outcome of the case as it is part of the chain of custody.⁹³

A significant issue within the Ballistics unit of the federal police forensic investigation department is the absence of stored data for future cases. This lack of data storage becomes problematic when, for instance, the same firearm is used in multiple crimes across different times and locations. As a result, investigations are prolonged as there is no database available to cross-reference a recovered gun with past records.⁹⁴

3.4. Cyber Forensics

Cyber forensics, also referred to as *digital forensics*, is the process of examining digital evidence to discover, assess, safeguard, and present data for legal purposes. It is a crucial element in contemporary criminal investigation, particularly in cases where criminals utilize technology to perpetrate crimes like hacking, identity theft, and cyber stalking.⁹⁵ Investigators collect

⁹² Federal Prosecutor v. Michael Tadesse, Federal High Court, Lideta Criminal Bench, File No. 227352, (3 May 2023).

⁹³ Interview with Tewodros, supra note 20.

⁹⁴ Seada, supra note 33

⁹⁵ EC-Council, Computer Forensics: Investigating Network Intrusions & Cyber Crime, EC-Council Press, (2010), p.1-3; Interview with Inspector Bedilu Yohhannis, Head

electronic evidence from sources such as computers, cell phones, and other digital devices. The evidence collected could be anything from deleted files to internet browsing history, social media communications, and even emails.⁹⁶ Cyber experts analyze the data collected in cybercrimes and provide reports to be used in court. With the rise in cybercrimes, it is important to collect all relevant digital evidence like logs of IP addresses, timestamps, and access records because digital evidence is often the most crucial evidence in establishing the motive and identifying the perpetrator.⁹⁷

When it comes to the Ethiopian practice, though limited, there are some legal provisions that govern the utilization of cyber forensic evidence. For instance,⁹⁸ Anti-terrorism proclamation No. 652/2009 Article 2(8), Article 14, and Article 29 allow interception of individual's phone, and e-mail. Besides, Articles 45-47 of proclamation No. 434/2005, revised anti-corruption special procedure and rules of evidence proclamation, set out rules on evidences produced by a computer, and voice recordings.

Yet the major problem with the practice in the Ethiopian context is that the cybercrimes unit faces limitations in conducting independent cyber forensics investigation. This challenge particularly visible in cases involving serious and complex crimes, and the police have to rely on assistance from government institutions such as INSA (The Information Network Security Administration) and NISS (The National Intelligence and Security Service).⁹⁹ In practice, institutions like INSA may be unwilling to present certain evidence in its original form. For example, telephone recordings may be presented in a script form, and the original recordings may be withheld on the

of Cyber Crimes Division at Federal Police Criminal Investigation Unit (Addis Ababa, 2 June 2023).

⁹⁶ Embar-Seddon and Pass, *supra* note 31.

⁹⁷ EC-Council, *supra* note 95; Bedilu, *supra* note 95.

⁹⁸ Anti-terrorism Proclamation No. 652/2009, *supra* note 41.

⁹⁹ Bedilu, *supra* note 95.

grounds of national security concerns. As a result, courts may disregard such evidence due to its altered presentation and the refusal to provide the original recording.¹⁰⁰

Nevertheless, in some cases courts accept the script forms of evidence, even in the face of objections from Public Defenders or the accused. According to the respondents,¹⁰¹ it appears that courts occasionally show a bias towards the prosecution. Despite this, judges justify admissibility of such evidence and a respondent explained that such evidence is admissible as circumstantial evidence.¹⁰² There is an example of cyber forensic investigation (currently ongoing court case). According to a respondent,¹⁰³ during a ceremony to distribute condominium apartments in Addis Ababa, suspicions arose that the selection system had been manipulated to favor a specific list of winners. As a result, a computer forensic investigation was conducted, which provided evidence of a cybercrime committed with the intention of benefiting certain individuals in the process. The individuals involved in the crime, many of whom are computer and ICT experts, are now facing prosecution. The respondent explained that¹⁰⁴ according to the findings of cyber forensics, the software application system was deliberately tampered with to introduce vulnerabilities that allowed remote manipulation of the input data and subsequent outcomes.

¹⁰⁰ Interview with Abriham Getaneh, Federal Prosecutor and Coordinator of Organized and Transboundary Crimes at Ministry of Justice, Lideta Office (Addis Ababa, 14 June 2023); Bedilu, *supra* note 95; Interview with Mignot Denekew, Federal Prosecutor of Financial Crimes at Ministry of Justice, Lideta Office (Addis Ababa, 14 June 2023).

¹⁰¹ Interview with Abu Mamo and Tilanesh Asmare, Federal Public Defenders (Addis Ababa, 16 June 2023).

¹⁰² Interview with Feyisa Bedada, Federal High Court Criminal Cases Judge, Lideta Bench (Addis Ababa, 15 May 2023).

¹⁰³ Bedilu, *supra* note 95.

¹⁰⁴ Interview with Idris Selman, Federal Prosecutor of Corruption Crimes at Ministry of Justice, Lideta Office (Addis Ababa, 20 June 2023).

The respondent¹⁰⁵ further explained that to prevent intrusion and remote manipulation, the system was intended to operate solely within a local area network, i.e., limited to specific computers and inaccessible online. However, it was deliberately designed to be connected to the internet network, enabling easy manipulation from any location. As a result, although the system appeared to function fairly and transparently during the ceremony, it was actually manipulated to generate predetermined names as winners of the opportunity

3.5. Forensic Pathology

Forensic pathology deals with the study of postmortem (after-death) examination of dead bodies to determine the cause and manner of death.¹⁰⁶ Forensic pathologists perform examinations of the body, which involve examining injuries, establishing the time of death, and collecting biological samples for further investigation. They employ various techniques to examine the body and obtain evidence, such as X-rays, CT scans, and microscopic analysis of tissue samples.¹⁰⁷ Sometimes, the dead person may be a Jane Doe (unknown corps of a female) or a John Doe (unknown corps of a male). In such instances, a forensic pathology may include DNA and fingerprint tests to identify the victim.¹⁰⁸

In Ethiopia, there are a few medical institutions like Menelik II Referral Hospital where most forensic pathology examination is made.¹⁰⁹ According to respondents, though there is no law that governs the application of forensic pathology report as a forensic evidence, the federal forensic investigation

¹⁰⁵ Id.

¹⁰⁶ Eckert, *supra* note 30.

¹⁰⁷ Id.

¹⁰⁸ Pekka Saukko and Bernard Knight, *Knight's Forensic Pathology*, Third Edition, Arnold Publisher, (2004), p. 98-106.

¹⁰⁹ Simeneh and Cherinet, *supra* note 63.

department employs its own manual prepared based on best international practices.¹¹⁰ Though it is not used in all cases,¹¹¹ there are promising experiences in federal courts. A couple of stories that illustrate the experiences were reported by respondents. In one of such cases, a man was admitted to a hospital after sustaining injury from an alleged human attack.¹¹² Unfortunately, the victim passed away while receiving treatment, leading to the accused being charged with homicide. However, the forensic pathology report revealed that the victim's death was not a result of the accused's actions but rather due to a viral infection contracted during his hospital stay. As a result, the accused was cleared of homicide.

A respondent,¹¹³ in another instance,¹¹⁴ reported that the accused hit the victim in the face, leading to the victim's admission to a hospital and eventual death. Nonetheless, a forensic pathology report revealed that the cause of death was internal brain bleeding, which could potentially stem from natural causes rather than solely being attributed to the accused's punch. Despite this evidence, the defendant was still deemed guilty. However, the court's decision was reached by a majority vote. Even if the accused was ultimately convicted, the forensic pathology report resulted in a dissenting opinion. The problem here is that in the current practice, forensic pathology reports in the Ethiopian federal criminal justice process do not incorporate a toxicology examination in cases where the cause of death may be linked to toxic substances, rather

¹¹⁰ Interview with Chief Inspector Wondimagegn Tsegaye, DNA Examination Expert and Head of Forensic Biology Unit (Addis Ababa, 24 May 2023).

¹¹¹ Kebe, *supra* note 60.

¹¹² Interview with Temesgen Zelalem, Nina Taye, and Abdulkarim Shehibo, Federal High Court Criminal Cases Judges, Lideta Bench (Addis Ababa, 12 May 2023).

¹¹³ Kebe, *supra* note 60.

¹¹⁴ Federal Prosecutor v. Solomon Kefene, Federal High Court, Lideta Criminal Bench, File No. 292825, (22 June 2023).

than solely relying on observable internal and external injuries of the victim. This omission has the potential to lead to unjust decisions.¹¹⁵

Still in another case with some similarity with first case in this category,¹¹⁶ a woman stabbed a man, causing him to be hospitalized. Unfortunately, the man passed away leading to the accused being charged with homicide. However, the forensic pathology report determined that the victim's death resulted from an infection he acquired while in the hospital. Consequently, the accused was charged with the lesser offense of inflicting bodily injury on others.¹¹⁷

Two well-known cases that serve as most illustrative in the utilization of forensic pathology in Ethiopia's federal criminal justice process are the assassinations of two former high-ranking military officials, General Seare Mekonin and General Gezai Abera¹¹⁸ and the singer Hachalu Hundessa.¹¹⁹ The forensic pathology reports demonstrated that the recovered bullets from the crime scenes were the cause of death. The reports provide detailed explanations of how the bullets inflicted injuries and impacted the internal organs of the victims, ultimately leading to death.¹²⁰

3.6. DNA (Deoxyribonucleic Acid)

DNA is unique to every individual, except those individuals who are identical twins or triplets. DNA is known as the "blueprint of life" as the genome

¹¹⁵ Interview with Melkamu Debie, Federal Public Defender (Addis Ababa. 15 June 2023).

¹¹⁶ *Id.*

¹¹⁷ Federal Prosecutor v. Samrawit Tizazu, Federal High Court, Lideta Criminal Bench, File No. 279648, (12 March 2023).

¹¹⁸ Federal Prosecutor v. Mesafint Tigabu, *supra* note 85.

¹¹⁹ Federal Prosecutor v. Tilahun Yami & 4 others, Lideta High Court Criminal Bench, File No. 260483, (24 December 2021).

¹²⁰ *Id.*

(genetic information) of an individual is entirely contained within their DNA, making it the most unique and reliable form of identifying an individual.¹²¹ DNA can be found in a wide range of sources, such as hair, skin cells, blood, semen, and saliva. By analyzing these samples, forensic specialists can establish a connection between an individual and a crime.¹²²

The DNA analysis unit is a recent phenomenon in the Ethiopian criminal justice process. The unit was established on July 9, 2022, for the first time in the country.¹²³ Though there is no law that governs the application of DNA as a form of forensic evidence, the federal forensic investigation department carries out DNA test for various purposes one of which is its utilization in court of law to assist criminal cases. As such it is utilized as per the internal manual prepared by the department.¹²⁴

Turning to the role of the outcomes, DNA analysis can almost always confirm or exclude a suspect's involvement in a crime. DNA evidence is incredibly enduring and samples can last for centuries or longer, making DNA a reliable form of evidence.¹²⁵ In the Ethiopian context, certain limitations can potentially impact the accuracy of DNA testing. One such limitation is the scarcity of chemicals required for the testing process. Additionally, the lack of financial resources to acquire expensive and state-of-the-art devices is another constraint that may affect the accuracy of results.¹²⁶

However, despite its many advantages, application of DNA evidence has its limits in the Ethiopian federal criminal justice process. Forensic experts have

¹²¹ William et al, *An Introduction to Forensic Genetics*. 2nd.ed., John Wiley & Sons, Ltd, (2007), p.7.

¹²² FBI Handbook of Crime Scene Forensics, Skyhorse Publishing Inc., (2008), p.24.

¹²³ Wondimagegn, *supra* note 110.

¹²⁴ *Id.*

¹²⁵ William et al, *supra* note 121.

¹²⁶ Wondimagegn, *supra* note 110.

to take due care when collecting, analyzing, and interpreting DNA samples to keep their validity. In addition, DNA samples can be contaminated which can make it difficult to establish a reliable chain of custody.¹²⁷ There are instances where police officers have tampered with crucial sources of DNA evidence. In one case, a woman was raped and murdered in a motel, with semen present around her genitalia. However, first responders (police officers) compromised the evidence by cleaning the semen and disposing of it.¹²⁸ In the case of homicide, it is primarily investigated by the Addis Ababa Police, with a few exceptions involving federal officials and foreigners falling under the jurisdiction of the Ethiopian Federal Police.¹²⁹ According to respondents,¹³⁰ the utilization of forensic evidence by the prosecution is not adequate. However, other respondents acknowledged that there are instances where DNA is employed in criminal cases.¹³¹

In another illustrative case,¹³² a woman faced charges of killing her baby, and the prosecution presented eyewitness testimonies and circumstantial evidence, such as the woman found with blood on her hands and clothes. However, the woman denied any involvement in the crime. During the court's evaluation of the prosecution's evidence, it was revealed that there was no conclusive evidence establishing that the baby belonged to her. Additionally, the prosecution lacked evidence to substantiate that the blood discovered on the defendant's hands and clothing is of the deceased baby. To ascertain whether the woman had indeed committed the crime or not, the court ordered a DNA examination. The results of the examination confirmed the blood was from

¹²⁷ Jacqueline and Jonathon, *Crime Scene Investigation Case Studies*, supra note 33.

¹²⁸ Interview with Aboma Legese, Coordinator and Prosecutor of Various Crimes Division, Lideta Bench (Addis Ababa, 26 May 2023).

¹²⁹ Binyam, supra note 68.

¹³⁰ Interview with Asahib Bizuneh and Aynalem Dereje, Criminal Cases Judges at Federal First Instance Court, Lideta Bench (Addis Ababa, 11 May 2023).

¹³¹ Supra note 112.

¹³² Id.

the baby and that the baby was indeed biologically connected to the defendant, leading to her conviction.¹³³

Interview reports from respondents of the study also show that¹³⁴ the prosecution, in most cases, doesn't utilize forensic evidence and this results in detrimental effects on the desired outcome. The respondents specifically highlighted instances where the cases of prosecution become weak and unreliable due to non-utilization of forensic evidence effectively. In one case,¹³⁵ a person was charged with statutory rape, which resulted in her giving birth to a child. The prosecution had only the testimony of the victim. The defendant denied the rape allegations and also disputed the paternity of the child. Subsequently, the court directed the prosecution to present DNA results to establish whether the defendant was the biological father of the child. However, by the time the court issued the order, the child had already passed away, and performing a DNA test on the decomposed body was not feasible due to lack of technological tools and experts in the field.

Despite the aforementioned shortcomings, the defendant was convicted based on the victim's testimony and compelling circumstantial evidence. The respondent counter argued that the prosecution was not sufficiently diligent in gathering forensic evidence to support its case, highlighting the potential for the court to have exonerated the defendant. Additionally, he stated that if the prosecution had collected DNA evidence before the child's death, the defendant would have had less room to deny the charges, and the court could have reached a more certain decision.¹³⁶ The same respondent stated that¹³⁷

¹³³ Id.

¹³⁴ Interview with Temesgen Shiferaw, Criminal Cases Judge at Federal First Instance court, Lideta Bench (Addis Ababa, 12 May 2023).

¹³⁵ Federal Prosecutor v. Girma Abebe, Federal First Instance Court, Lideta Criminal Bench, File No.302906, (24 May 2023).

¹³⁶ Id.

there are instances where the prosecution relies on forensic evidence to support its case.

There are, in fact, instances of reports where DNA analysis pay off in the practice. For example, in one particular case,¹³⁸ a man was accused of raping a woman with intellectual disabilities. By the time the defendant was charged, the fetus resulting from the rape had already been aborted. However, the prosecution presented compelling forensic DNA evidence, which demonstrated the similarity between the accused's DNA and that of the aborted fetus. As a result, the defendant was ultimately found guilty and sentenced, as he was unable to refute the incriminating evidence.

To add a more illustrative case, a woman was killed in a strangle, the crime scene yielded crucial evidence in the form of a string and a fingerprint. However, despite the potential to extract forensic evidence from the string and the victim's nails for DNA analysis, as well as the presence of a clear fingerprint on the wall, the police failed to conduct a timely forensic examination of the crime scene. Consequently, the opportunity to gather valuable evidence was lost, and the evidence dissipated leading to the suspect's acquittal without consequences.¹³⁹

Respondents in the study also reflected on their experiences as prosecutors. A respondent¹⁴⁰ in this instance stated that the police focus on gathering evidence such as the suspect's blood and clothing from the crime scene. However, other potential forensic evidences such as hair and other remnants found at the scene are often overlooked. Nevertheless, there are instances where DNA testing is conducted to further analyze the evidence. In one

¹³⁷ Id.

¹³⁸ Federal Prosecutor v. Ketema Begashaw, Federal First Instance Court, Lideta Criminal Bench File No. 302775, (26 April 2023).

¹³⁹ Tariku Abate (Federal Police File No. 044/12).

¹⁴⁰ Mihiret, supra note 64.

case,¹⁴¹ a woman was subjected to sexual assault and subsequently became pregnant. After some time, she filed accusation against the suspect. The pregnancy was terminated through an abortion. Meanwhile, seeking retribution for the accusation made against him, the suspect killed the woman and was subsequently apprehended. To establish a connection between the suspect and the crime, a DNA test was conducted, comparing the blood found at the crime scene, the victim's blood, and the blood discovered on the suspect's clothing at his residence. Furthermore, a DNA test was carried out to determine if there was a match between the DNA of the aborted fetus and that of the accused.. The result of these findings confirmed the match and revealed the rape act as a result of which the perpetrator was convicted.

The experience of Public Defenders also revealed that there are promising practices related to DNA. In one of such cases,¹⁴² a woman was raped and subsequently gave birth to a child. Consequently, the accused faced charges of rape. DNA testing conclusively established that the accused is the biological father of the baby. With no viable defense, the accused was pronounced guilty of rape.¹⁴³

Though DNA test is available in Ethiopia, it is not usually utilized by law enforcement institutions and individuals. Apart from a lack of awareness as to its significance, the cost is a pushing factor not to utilize it. According to a respondent,¹⁴⁴ the cost of conducting a DNA test for paternity is relatively lower compared to testing samples from a crime scene. Currently, the maximum subsidized cost of a paternity test is approximately 8,600 Ethiopian

¹⁴¹ Federal Prosecutor v. Michael Shimelis, (Federal High Court, Lideta Bench, File No. 301860).

¹⁴² Federal Prosecutor v. Kedir Shemelo, Federal First Instance Court Lideta Criminal Bench, File No.294490, (17 March 2023).

¹⁴³ Mihiret, *supra* note 64.

¹⁴⁴ Wondimagegn, *supra* note 110.

Birr. On the other hand, testing samples from a crime scene can be quite expensive. This is primarily due to the need for a series of tests and the use of various chemicals in the process. According to a respondent,¹⁴⁵ in a specific instance, the expense associated with a DNA test amounted to 45,000.00 (forty five thousand) Ethiopian Birr. Here it is possible to see that the cost of DNA tests particularly of evidence obtained from a crime scene is not easily affordable, which may be a pushing factor for its application in criminal cases.

An issue concerning the Biology unit of the federal forensic investigation department is the lack of a structured database to store DNA information from individuals who have undergone DNA testing during criminal investigation. Additionally, there are limitations in data sharing practices with federal and regional law enforcement agencies due to the absence of an established system for such exchanges.¹⁴⁶

3.7. Voice Print

Voice print analysis is one aspect of forensic evidence. Recorded conversations are one of the admissible evidence in court during criminal proceedings. The recording may be intercepted or direct recording. The voice of each individual is different (based on frequency, wavelength, and other differences) and a voice related to a crime can be identified.¹⁴⁷

Under Ethiopian context, there are limited laws that relate to utilization of voice print as a form of forensic evidence. For instance,¹⁴⁸ Anti-terrorism proclamation No. 652/2009 Article 2(8), Article 14, and Article 29 allow

¹⁴⁵ Kebe, supra note 60.

¹⁴⁶ Wondimagegn, supra note 110

¹⁴⁷ James M. Ulam, the Hearsay Rule: Are Telephone Calls Intercepted by Police Admissible to Prove the Truth of Matters Impliedly Asserted, *Mississippi College of Law Review*, Vol. 113, No.5 (1991), p.351.

¹⁴⁸ Proclamation No. 652/2009, Supra note 41; Proclamation No. 434/2005, supra note 42.

interception of individual's phone to extract voice evidence from the phone communication. Besides, Articles 45-47 of proclamation No. 434/2005, revised anti-corruption special procedure and rules of evidence proclamation, deal with evidences obtained from voice recordings as a form of voice forensic evidence.

In Ethiopia, however, it is a problem where the voice recording cannot be presented or the prosecution is not willing to present it in its original form, but in a script form. In such cases, the accused objects to other forms claiming his constitutional right to confront all the evidence presented against him.¹⁴⁹ Accordingly, the defendant claims the production of the original recording to contest or otherwise admit the contents. This is because the voice recording may not be credible due to various constraints in it such as noise, number of people, and others.¹⁵⁰ As a general principle, before accepting the voice recording as evidence, the court shall decide whether the evidence is relevant to the case at hand. Besides, if the court is convinced that the evidence is relevant, it has to decide in what form the evidence shall be admissible.¹⁵¹

Voice evidence that is not presented in its original form may also face potential dismissal by prosecutors. This is due to the concern that such evidence may not be deemed admissible in court. In a specific case involving defendants accused of conspiring to commit terrorism, one of the pieces of

¹⁴⁹ Feyisa, *supra* note 102; Interview with Mihretab Bayu, Federal High Court, Criminal Cases Judge, Addis Ababa, Lideta Bench, (17 May 2023).

¹⁵⁰ Clifford S. Fishman, *Recordings, Transcripts, and Translations as Evidence*, the Catholic University of America, (2006), p. 5; Feyisa, *supra* note 102; Mihretab, *supra* note 149.

¹⁵¹ Peter Ashford, *the Admissibility of Illegally Obtained Evidence*, Chartered Institute of Arbitrators, (2019), p.377-381, [hereinafter Peter, *the Admissibility of Illegally Obtained Evidence*]; James W. Jennings, *Preserving the Right to Confrontation: A New Approach to Hearsay Evidence in Criminal Trials*, University of Pennsylvania Law Review, Vol. 113. No.5, (2002), p. 742.

evidence presented was a telephone conversation recorded by INSA (Information Network Security Agency). However, the evidence was provided to the police in written form and the Prosecutor chose to close the case due to insufficient evidence to continue with the criminal charges.¹⁵²

There are similar examples in this regard.¹⁵³ In this context, it is essential for prosecutors not only to verify the authenticity of the evidence obtained from institutions such as INSA but also to obtain additional evidence that validates the identification of the suspects' voices. This includes verifying that the voice recordings were cross-checked and confirmed to be genuinely belonging to the suspects.

According to a respondent,¹⁵⁴ Similar to the Biology unit, the Prints and Criminal Records unit lacks a database for cross-referencing an individual's voice in ongoing criminal investigations with previously stored voice prints. Additionally, the department lacks the necessary technology and expertise to conduct voice recognition tests to support criminal investigations and court proceedings. Moreover, the unit does not collaborate with institutions such as INSA and NISS, which possess the essential resources for voice analysis, to enhance its capabilities. Instead, the unit heavily relies on these institutions to carry out investigations related to voice recognition.

3.8. Forensic Toxicology

As noted in section one, toxicology is the scientific study of the impact of chemicals and toxins on living organisms in which biological samples such as

¹⁵² Bontu Fikadu and Urge Wakene, Lideta Office, Prosecution File No. 216/15 & Police File No.761/14.

¹⁵³ Gebre-Silassie and 6 others, Lideta Office, Prosecution File No. 585/15 & Police File No. 365/15; Mebru and 14 others, Lideta Office, Prosecution File No. 376/15; Tsehay and 7 others, Lideta Office, Prosecution File No. 757/15.

¹⁵⁴ Behailu, supra note 48.

blood, urine, and hair are examined to determine whether an individual has come in contact with dangerous substances.¹⁵⁵ Samples are analyzed in a laboratory to identify the presence and quantities of toxic substances.¹⁵⁶ Forensic toxicology can also be used to ascertain whether alcohol play a role in a crime. Analysis of a suspect's blood alcohol level at the time of their arrest can provide evidence in cases such as drunk driving accidents, assault, and homicide.¹⁵⁷ Further, toxicology can provide information about the victim's behavior and actions leading to a crime.¹⁵⁸

In the Ethiopian federal criminal justice process, the practice of forensic toxicology is not applicable and there is not case that utilized toxicology report as an evidence. According to a representative from the forensic department of the federal police, this is primarily attributed to a lack of technology and trained professionals in the field.¹⁵⁹ As a result, many criminal cases remained unsolved. Another respondent reported an instance¹⁶⁰ where a woman tragically passed away while seeking medical assistance. It was difficult to determine the cause of her death. The family alleged professional fault and requested a criminal investigation. The police initiated a criminal investigation, but due to the unavailability of a toxicology examination and report, it was challenging to determine the cause of death. Consequently, the prosecution closed the case due to insufficient evidence to file a criminal charge.¹⁶¹

¹⁵⁵ Reddy, *supra* note 26.

¹⁵⁶ Fisher et al, *supra* note 4.

¹⁵⁷ *Id.*

¹⁵⁸ William, *supra* note 30.

¹⁵⁹ Wondimagegn, *supra* note 110.

¹⁶⁰ Adanech, *supra* note 61.

¹⁶¹ Melaku Mekonin, Federal Police File No. 1411/11.

4. Arson and Criminal Profiling- issues of special significance in connection with forensic evidence

An essential topic concerning forensic evidence is the matter of arson. This form of crime necessitates the presentation of forensic evidence to support a criminal charge. Given that arson is among the most challenging crimes to investigate, it demands a distinct set of skills and expertise. Investigators need to have a deep understanding of the legal and regulatory requirements associated with arson investigation.¹⁶² Further, arson investigation requires a deep understanding of fire dynamics, the behavior of different materials when exposed to fire, and the techniques used to start fires.¹⁶³ Experts utilize specialized software to scrutinize fire patterns and anticipate fire behavior. They also collaborate closely with other professionals, such as forensic chemists and electrical engineers to comprehend the source and beginning of the fire.¹⁶⁴

Arsonists often use accelerants such as gasoline or kerosene to start fire, which can complicate the investigation process.¹⁶⁵ Detecting and identifying accelerants requires specialized training and equipment, and the analysis of evidence from the scene of the fire can be complex and time-consuming.¹⁶⁶ Another unique aspect of arson forensic investigation is the need to work closely with other professionals like firefighters, and law enforcement officials like the police. Firefighters are often the first responders to a fire, and they play a critical role in preserving evidence and documenting the scene of

¹⁶² John E. Douglas et al, *Crime Classification Manual*, Second Edition, Jossey-Bass Publisher, (2006), p. 261.

¹⁶³ Id.

¹⁶⁴ Douglas H. Ubelaker, *Forensic Science: Current Issues and Future Directions*, Wiley-Blackwell (2012), p. 43-46.

¹⁶⁵ Douglas et al, *supra* note 162.

¹⁶⁶ Id.

the fire.¹⁶⁷ Forensic analysts will also examine the burn patterns at the scene of the fire. An intentionally set fire will typically have a pattern of burn marks that follow the path of the accelerant, while an accidental fire will produce a different pattern of burn marks.¹⁶⁸ The analysis of burn patterns and the behavior of the fire can provide critical information about how the fire started and can help reduce list of suspects and identify the offender.¹⁶⁹

As far as Ethiopian context is concerned, arson is a crime punishable up to 15 years of rigorous imprisonment and it is defined as :

*whosoever maliciously or with the intention of causing danger of collective injury to persons or property, sets fire to his own property or to that of another whether it be building or structures of any kind, crops or agricultural products, forests, timber or any other object.*¹⁷⁰

However, there is no specific rule to enable the use of forensic evidence in crime of arson. The federal forensic investigation department uses its own manual how to collect, preserve, and present evidence in court of law.¹⁷¹ In practical cases of arson, the crime is treated with provisions related to crimes against property as there is no specific law that governs cases related to arson.¹⁷²

The forensics unit within the Ethiopian federal police department is in its early stages of development, particularly concerning the requirements for

¹⁶⁷ Mukesh Sharma and Ajay Sharma, Forensic Investigation in Fire & Arson Cases, Rajasthan (2020), p.2.

¹⁶⁸ Paul Bieber, Folklore and Forensics: The Challenges of Arson Investigation and Innocence Claims, West Virginia University, (2016), p.558.

¹⁶⁹ Id.

¹⁷⁰ Criminal Code of Federal Democratic Republic of Ethiopia, Proclamation No. 414/2004, Federal Negarit Gazette, (2005), Article 494.

¹⁷¹ Tewodros, supra note 20.

¹⁷² Mihretab, supra note 149.

forensic investigation of arson cases. In essence, the unit lacks proper organization to effectively integrate experts and technologies necessary for handling complex cases that require advanced technological applications. This limitation can be attributed to scarce resources in terms of manpower, technology, and budget.¹⁷³

In terms of court proceedings in the Ethiopian federal criminal justice process, arson cases are typically supported by eyewitness testimonies and circumstantial evidence. However, there are instances where forensic evidence is utilized to establish the occurrence of arson as a criminal act. In one case,¹⁷⁴ a fire erupted in a government office, resulting in the destruction of materials housed within. Given that there were no signs of an accidental fire, suspicion fell on an employee who worked there. Through a forensic investigation, it was determined that the accused intentionally started the fire. The underlying narrative revealed that the accused had embezzled public funds stored in the office and set the fire in an attempt to make it appear as though the money had been lost in an accidental fire.

Another essential topic regarding forensic science and evidence is criminal profiling, a method used to identify forensic evidence linked to perpetrators. Criminal profiling is a technique that originates from the discipline of forensic psychology and it is considered a forensic tool in criminal investigation.¹⁷⁵ It is a unique method that enables investigators to construct a profile of an offender not solely based on witness accounts, but rather on behaviors exhibited during the commission of a crime. It can be described as the procedure of identifying an offender's personality traits, behavioral inclinations, geographic locations, and demographic or biological attributes

¹⁷³ Tewodros, *supra* note 20.

¹⁷⁴ Mihretab, *supra* note 149.

¹⁷⁵ Richard N. Kocsis, *Criminal Profiling: Principles and Practice*, First Edition, Humana Press Inc., (2006), p.20.

based on the characteristics of the crime.¹⁷⁶ In a nutshell, profiling is the application of psychology to find offenders. Data utilized to generate profiles may be taken from clues found at the crime scene, as well as from information about the victim, forensics reports, and witness statements.¹⁷⁷

Criminal profiling is used in a proactive context during an ongoing criminal investigation.¹⁷⁸ It is also referred to as psychological profiling, offender profiling, criminal investigative analysis, and criminal personality profiling.¹⁷⁹ Profiling proves to be a valuable technique as it helps to comprehend the psychological state of the perpetrator, thereby narrowing down the list of potential suspects.¹⁸⁰ In this regard, it helps the investigator to decide the direction of the investigation and this minimizes the time to be taken to find the perpetrator and windup the investigation.¹⁸¹

There are arguments about whether criminal profiling is a science that accurately identifies the identity of the offender. On the other hand, some argue that though it seems to be scientific, it cannot correctly predict the identity of the offender. As a result, it is labelled as a *Pseudo-Science*.¹⁸² There is also a widely accepted view that criminal profiling is more of an art than a science while others argue that criminal profiling is a science as it uses

¹⁷⁶ Joseph T. McCann, Criminal Personality Profiling in the Investigation of Violent Crime: Recent Advances and Future Directions, *Behavioral Science and the Law*, Vol.10, No.4, (1992), p.475.

¹⁷⁷ Grover M. Godwin, Criminal Psychology and Forensic Technology: A Collaborative Approach to Effective Profiling, CRC Press, (2001), p. 6.

¹⁷⁸ Id.

¹⁷⁹ Id.

¹⁸⁰ McCann, supra note 176.

¹⁸¹ Colin Wilson, Criminal Profilers and Their Search for the World's Most Wanted Serial Killers, First Edition, Skyhorse Publishing, (2007), p.18, [hereinafter Colin, Criminal Profilers and Their Search for the World's Most Wanted Serial Killers].

¹⁸² Godwin, supra note 177.

scientific facts for its effective findings.¹⁸³ Though criminal profiling plays a significant role in finding the perpetrator, it may in some cases turn out to be entirely wrong resulting in unfavorable outcomes.¹⁸⁴ Further, not all arson crime scenes are amenable to criminal profiling. Typically, crime scenes that are most conducive to criminal profiling are those where there are indications of psychopathology or mental disorder exhibited by the perpetrator. Examples of appropriate instances where criminal profiling is most effective include crime scenes revealing evidence of sadistic torture, ritualistic behavior, evisceration (body organs removal), posturing of the body (abnormal positioning of a body), and others.¹⁸⁵ Cases involving destruction of property, assault, or murder during the commission of a robbery are generally unsuitable for criminal profiling since the personality of the criminal is not generally revealed in such crime scenes. Similarly, drug-induced crimes are not well-suited for criminal profiling as the true personality of the perpetrator is often distorted or altered as a result.¹⁸⁶

Presently, criminal profiling has gained widespread recognition as an essential method of crime investigation, and it continues to be employed in the United States, Europe, and various other countries to this day.¹⁸⁷ The concept of criminal profiling is unfamiliar within the Ethiopian federal criminal justice process. Detectives, forensic experts, prosecutors, judges, and defense attorneys are not acquainted with the term "profiling." Hence, there is no practice as far as criminal profiling is concerned. However, it is hoped that criminal profiling will eventually be utilized to assist Ethiopia's criminal justice system. This section incorporated the topic to provide readers an

¹⁸³ Kocsis, *supra* note 175.

¹⁸⁴ Godwin, 177.

¹⁸⁵ Embar-Seddon and Pass, *supra* note 31.

¹⁸⁶ McCann, *supra* note 176.

¹⁸⁷ *Id.*

insight into the term and how it is employed in other jurisdictions to assist their criminal justice systems.

5. Challenges in the utilization of Forensic Evidence in Ethiopian Federal Criminal Justice Process

Forensic science plays a critical role in resolving criminal cases and delivering justice. However, in Ethiopia, forensic science faces numerous challenges that hinder its effectiveness. These challenges range from inadequate funding and insufficient training of forensic practitioners to the lack of advanced forensic technology in the country.¹⁸⁸ Furthermore, the absence of consistent utilization of forensic evidence in courts and prosecutions poses a significant challenge. Additionally, there is a noticeable lack of awareness among police officers regarding the importance and practical application of forensic evidence.¹⁸⁹

One of the primary challenges facing forensic science in the federal criminal justice process of Ethiopia is inadequate funding. The government allocates a meager budget to forensic science, which limits the sector's ability to invest in modern technology and advanced training.¹⁹⁰ This forces forensic experts to rely on outdated techniques and equipment, limiting their ability to analyze evidence accurately.¹⁹¹ As the investigators lack the necessary resources to conduct forensic investigation to the desired standard,¹⁹² they rely on eyewitness testimonies, which are not always reliable and are susceptible to

¹⁸⁸ Tewodros, *supra* note 20; Wondimagegn, *supra* note 110.

¹⁸⁹ Sisay Goa, Deputy Head of Various Crimes Division at Ministry of Justice, Lideta Bench (Addis Ababa, 26 May 2023); Aboma, *supra* note 128.

¹⁹⁰ Behailu, *supra* note 48; Seada, *supra* note 33; Tewodros, *supra* note 20; Wondimagegn, *supra* note 110.

¹⁹¹ *Id.*

manipulation. This limitation may result in disparities in the gathered evidence, ultimately affecting the administration of justice.¹⁹³

Another challenge is the lack of sufficient and continuous training opportunities for forensic experts and other law enforcement officials.¹⁹⁴ Regarding forensic experts, there is a scarcity of qualified forensic scientists in the country, and a majority of them have insufficient formal training. This scarcity is influenced by the limited availability of institutions offering courses in forensic science and evidence, such as Arba Minch University.¹⁹⁵

The county's legal framework is also a source of challenge impeding the effectiveness of forensic science. No standardized protocols and procedures are guiding forensic evidence collection, processing, and its admissibility in court in this country.¹⁹⁶ Consequently, inconsistencies arise in the application of forensic evidence within the judicial system, as legal practitioners demonstrate variations in their comprehension and familiarity with forensic science. Likewise, prosecutors lack specific guidelines to determine which types of forensic evidence should be included in a legal charge.¹⁹⁷ This situation can result in discrepancies when incorporating forensic evidence into criminal charges, as there is no mandatory procedure in place to assess and determine the inclusion of specific types of forensic evidence.¹⁹⁸

Another aspect of concern is the matter of financial resources. The forensic department of the Ethiopian federal police has been unable to hire sufficient number of forensic experts or provide sufficient funding for the procurement

¹⁹³ Tewodros, *supra* note 20; Wondimagegn, *supra* note 110.

¹⁹⁴ *Id.*

¹⁹⁵ Seada, *supra* note 33; Wondimagegn, *supra* note 110.

¹⁹⁶ Temesgen, *supra* note 134.

¹⁹⁷ Sisay Goa, Deputy Head of Various Crimes Division at Ministry of Justice, Lideta Bench (Addis Ababa, 26 May 2023); Mihret, *supra* note 64.

¹⁹⁸ Wondimagegn, *supra* note 110.

of essential forensic equipment due to the scarcity of financial resources.¹⁹⁹ In addition, the lack of technical expertise and modern forensic equipment means that analyses are of a lower standard. This lack of capacity affects the outcome of many crimes.²⁰⁰

Limited access to essential equipment and tools can hinder forensic investigators in collecting sufficient evidence, potentially resulting in delays or incomplete investigations.²⁰¹ This limitation may compromise the accuracy of forensic results, as investigators might struggle to detect trace evidence without access to state-of-the-art laboratory equipment, leading to inconclusive findings. Consequently, the lack of equipment and tools can slow down forensic investigations, delaying justice and adversely affecting the individuals involved in a case. Moreover, inadequate resources increase the likelihood of errors, raising the risk of wrongful convictions and impeding the investigative process. Insufficient access to necessary equipment and tools can also impact the training of forensic experts, leaving them ill-prepared to fulfill their duties effectively. This, ultimately, means that many crimes may go unsolved, and the perpetrators go unpunished.

Concluding remarks

Forensic science can transform the way criminal cases are investigated, prosecuted, and adjudicated in Ethiopia. By employing various scientific techniques, investigators can uncover new information that can lead to successful criminal investigation, even in cases that would otherwise remain unsolved. The use of forensic science has helped to reduce the number of unsolved cases in the Ethiopian federal criminal justice process. However,

¹⁹⁹ Behailu, *supra* note 48; Seada, *supra* note 33; Tewodros, *supra* note 20; Wondimagegn, *supra* note 110.

²⁰⁰ *Id.*

²⁰¹ *Id.*

there are still several issues that need to be addressed to make the application of forensic analysis more effective.

Forensic evidence, its application, and significance is not well-understood by a significant number of Police officers. This poses one of the challenges in effectively securing crime scenes to preserve crucial evidence that requires investigation and analysis by forensic experts. Yet, the utilization of forensic science within the federal criminal justice process of Ethiopia is still in its early stages, leading to inadequate utilization of forensic evidence. Furthermore, in the current federal criminal justice process of Ethiopia, forensic evidence is predominantly employed as circumstantial evidence rather than conclusive evidence.

The absence of sufficient documentation system poses difficulties in accessing closed cases for research purposes. Likewise, an inadequate database system hampers investigation and limits the availability of closed cases for research purposes. The lack of a comprehensive legal framework for the use of forensic evidence in the Ethiopian criminal justice process poses significant challenges. To address these issues, it is crucial for Ethiopia to develop a unified and comprehensive legislation specifically dedicated to forensic evidence. This framework should provide detailed guidelines, procedures, and standards for the collection, analysis, admissibility, and evaluation of forensic evidence. By doing so, Ethiopia can ensure fairness, accuracy, and effectiveness in its criminal justice system, promoting public trust and confidence in the administration of justice. Moreover, among the 25 volumes of cassation decisions from the Federal Supreme Court of Ethiopia, there is a notable absence of decisions related to forensic evidence in criminal cases. This may suggest that forensic evidence is poorly utilized or not used at all.

The following measures are specifically suggested to address the issues pertaining to the application of forensic science within the Ethiopian criminal justice system. First, given the importance of forensic evidence in criminal investigation, universities should consider providing courses related to forensic science such as law, medicine, biology, chemistry, and computer science. These courses can provide students with a solid foundation in the scientific principles and techniques used in forensic investigation.

Second, legal frameworks that will guarantee admissibility of forensic evidence in court proceedings should be developed. Legislation that will regulate the storage, handling, and presentation of forensic evidence in court should also be enacted.

Furthermore, there is a need for courts to develop appropriate internal guidelines that are in line with international best practices. These guidelines help to set detailed standards as to the admissibility of forensic evidence to ensure consistency in the assessment of forensic evidence. Similarly, it is essential for prosecutors to have clear institutional guidelines for the use of forensic evidence. Guidelines can help ensure that prosecutors use forensic evidence consistently and appropriately. Guidelines can also provide prosecutors a discretionary power to decide which evidence to use and how to present it in court.

At last, a comprehensive database system should be established to connect all entities within the federal criminal justice system, enabling the seamless interconnection of criminal records for suspects. Moreover, joint law enforcement database system should be developed to foster interconnection between regional and federal law enforcement agencies.