



Research Article

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An explorative analysis of the Deoxyribonucleic Acid evidence chain of custody in the Northern Cape, South Africa¹

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Abstract

This study explores the objective of this study was to explore the chain of custody for rape Deoxyribonucleic Acid (DNA) evidence in the Northern Cape Province. A convenience sample of 57 participants from the South African Police Service in the Northern Cape, SAPS Forensic specialists from SAPS Forensic Science Laboratory in Pretoria, DNA specialists from the Council for Scientific and Industrial Research in Pretoria, and community members from the Northern Cape Province were purposively selected. The inductive Textual Content Analysis (TCA) was adopted to analyse the collected data. The qualitative research approach was adopted, with the phenomenological research design. Unstructured Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) involving community members were employed for data collection. Non-participative observation was also adopted alongside documentary studies. This study established that the chain of custody is often compromised by novice SAPS investigators at crime scenes. Handling of DNA samples from rape scenes to the SAPS FSL for analysis and storage does not happen in a timely manner, and the collected evidence is not protected to avoid contamination. Results further indicate that the CJS process is weakened, with the presentation of DNA evidence in court rendered ineffective. It is recommended that relevant stakeholders be adequately trained to properly identify, analyze, collect, and preserve DNA exhibits to maintain the chain of custody. This study highlights the importance of continuous training and refresher courses for all rape investigators. The existing technicalities and limited basic knowledge on DNA analysis should be urgently revisited to

¹ This article has been extracted from an unpublished Ph.D. thesis titled: *Critical analysis of Deoxyribonucleic Acid as evidence during rape investigation in the Northern Cape Province* (2023).

easily identify DNA samples and sources. Lastly, collaboration between SAPS FSL, LCRC, SAPS investigators, DNA analysts, and community members to combat, investigate, and prevent this scourge in the Northern Cape is recommended.

Keywords: Chain of custody, Deoxyribonucleic Acid evidence, Exploratory study, Northern Cape, Rape.

1. Introduction

Crime is a global crisis that threatens the safety and security of our communities. It threatens the country's stability, its economy, and its development. Rape cases are reported in shocking numbers throughout South Africa, and, most disturbing, is the fact that very few cases end in convictions. The cause for such few convictions demands research, and its significance and relevance are that it will probe into the cause and recommend solutions. Deoxyribonucleic acid (DNA) has been used in most criminal cases worldwide as a tool that has not only aided the Criminal Justice System (CJS) in placing perpetrators behind bars and making sure that they account for their actions with conclusive evidence but has also helped justice systems to exonerate the innocent in cases where they were wrongly apprehended. Rape is claimed to be the most vicious and monstrous crime against human beings, as it not only leaves physical scars but also permanent emotional and mental scars to the victims and their families. Since its advance during the early 1980s, DNA-testing technology has influenced society in incalculable ways. It has facilitated the resolution of paternity questions, pinpointed hereditary diseases, and developed novel biological products. It has further altered the passage of criminal law by enabling the identification of biological evidence deposited by a perpetrator at a crime scene and by serving as an instrument to catch the 'bad guy' and exonerate the 'innocent guy' (Medwed, 2017). DNA is a molecule that transmits genetic instructions for growth, function, development, and reproduction in all known viruses and many living organisms (McInnes, 2017). Forensic scientists extract DNA from semen, blood, saliva, skin, or hair gathered at the crime scene in order to find DNA matching that of anyone who has been present at the crime scene, such as an offender. This procedure is formally known as 'DNA profiling and individualisation' (Alberts, Johnson, Lewis, Raff, Roberts & Walter, 2014). During his speech on the *National Strategic Plan on Gender Based Violence and Femicide*, in the Cape Town Parliament, the President of the Republic of South Africa, Mr. Cyril Ramaphosa, clearly stated the following:

"South Africa holds the shameful distinction of being one of the most unsafe places in the world to be a woman. We have amongst the highest rates of intimate partner violence, and recently released data from Crime Statistics SA show that rape and sexual violence have become hyper-endemic. This is a scourge that affects us all: young and old, black or white, rich and poor, queer or cis, rural or urban. It pervades every sphere of our society. Women and girls are being abused, assaulted, and murdered in our country every day, at the hands of men. We are in the throes of a deep crisis that must be brought to a decisive end" (National

Strategic Plan, 2020).

MacGregor, Villalta, Clarke, Viner, Kramer, and Khadr (2019) state that many women experience long-lasting health impacts, including direct and indirect psychological and physical morbidities, and further submit that psychological impact includes Post Traumatic Stress Disorder (PTSD), as well as other anxiety disorders, depression, and suicidality. Extraordinary figures of rape cases have been reported, but very few cases stand out during trial, or even see convictions. The causes of such a low conviction rate call for research. Adams, Caddell, and Kritzinger (2004) argue that cases are resolved with evidence, criminals are sentenced on the basis of unquestionable evidence beyond criticism, and, subsequently, victims obtain justice based on such evidence. Therefore, it is never enough merely to have the evidence. The evidence must be gathered and processed appropriately. It must be collected lawfully, by means that are beyond criticism, and which prove the guilt or innocence of the accused beyond any element of doubt. DNA has proved to be the solution to these problems, as it has helped many innocent people be exonerated while also assisting investigators in catching the real criminals (Adams, Caddell & Kritzinger, 2004). This study, by means of a literature review, describes DNA as an adequate tool that has high potential to evidence a number of crimes that are verified through any action that has been conducted in a mutual (human body contact) manner, including rape. According to the South African Criminal Law (Sexual Offences and Related Matters Amendment Act) [SORMA] (No. 32 of 2007), rape should be defined as the forceful, violent and illegal penetration of a penis into a female's sexual organ (Vagina), but this definition is also extended to a female who might force someone to perform sexual acts on them without the male's consent, the same as for the male to male, in the case of penetrating the anal organ of another male or female with their penis. Moreover, according to Garrett (2004), framework legislation is particularly useful as a strategy because it addresses collective action problems, particularly by "entrenching certain macro-objectives so that future decisions are more likely to align with them". The following laws and regulations will be reviewed in this study. Most importantly, Section 205(3) of the Constitution of the Republic of South Africa, 1996, directs that the SAPS, amongst other relevant stakeholders, should perform the following objectives: prevent, combat and investigate crime, maintain public order, protect and secure the inhabitants of the Republic and their property, as well as uphold and enforce the law (Burger, 2006; South Africa, 1996). However, researchers of this paper posit that potential rape perpetrators seem to be in contradiction with the existing Constitutional mandates in the selected locations of the Northern Cape, as this crime keeps increasing. Therefore, the Criminal Procedure Act [CPA] (No. 51 of 1977) regulates the criminal procedure in the South African legal system. It outlines the procedure for the entire criminal justice system, including search and seizure, arrest, charging, bail, pleading, witness testimony, verdict, sentencing, and appeal (Devenish, 1977). The SAPS Act (No. 68 of 1995) exercises its responsibility to combat, prevent, investigate crime, maintain public order, protect and secure the

residents of the Republic, as outlined in the Constitution (1996) of the country. The local SAPS are also required to uphold and enforce existing laws and provide a safe and secure environment for all people in South Africa, while ensuring that potential rape criminals are brought to justice by making the necessary efforts to participate and address causes of crime (Lampbrechts & Prinsloo, 1996; The SAPS Act, 1995). The Criminal Law (Sexual Offences and Related Matters) Amendment Act [SORMA] (32 of 2007) reforms and codifies the law relating to sexual offences. It abolished various common law crimes (including rape and indecent assault) and replaced them with gender-neutral statutory crimes. It expanded the definition of rape, previously limited to vaginal sex, to include all non-consensual penetration; and it equalised the age of consent for heterosexual and homosexual sex at 16 years old (Lampbrechts & Prinsloo, 1996). The Criminal Law (Forensic Procedures) Amendment Act (No. 37 of 2013), also referred to as the DNA Act, 2013, aims to provide for the collection of certain bodily samples from certain groups of people for the purpose of forensic DNA analysis, to ensure the protection of the rights of women and children with regard to the collection of DNA samples (Meintjes-van der Walt & Knoetze, 2015; South Africa, 2014). Equally, the objective of this study was to explore the chain of custody for rape DNA in Northern Cape Province. Through this process, the staged investigations can possibly expose a real perpetrator who committed rape at the identified scene. Thus, the intervention of DNA evidence reduces the investigation process by providing a quick and adequate response to the reported rape cases.

2. Literature review

Rasool and Rasool (2020) indicate that from the identification of DNA materials to the time they are collected and sent to the Forensic laboratory, the aim is to identify any biological evidence that may link a suspect to the crime. The collected samples are sent to a forensic laboratory for testing, where they are evaluated and analysed to achieve positive identification. The analysis process aims to provide a match between the suspect and the DNA materials found in the crime scene or the victim's body. It is, however, worth noting that the collection process of DNA samples during rape investigations must be guided by strict guidelines to prevent further victimisation or accusations of victimisation and contamination of evidence. It is always advisable that, even when there is visible evidence, only trained personnel should collect such evidence. Moreover, in cases where evidence is at risk of compromise, those at the scene must do their level best to protect it. No crime scene is completely free of evidence because criminals invariably bring something into the scene and leave something behind. An inability to find and collect physical evidence does not mean it is a perfect crime; reliable physical evidence can always be found. Technological developments have revolutionised forensic sciences, particularly forensic DNA profiling (Rasool & Rasool, 2020).

One of the cornerstones of the judicial process is the presentation of evidence in a

court of law. The integrity of evidence is vital to reassure the courts that the correct procedures were followed throughout all the processes it underwent, from the time it was collected at the crime scene through transportation to its arrival at the analysis centre. In South Africa, the SAPS FSL in Pretoria analyses and stores evidence. The storage facility should help prevent contamination or degradation of evidence, thereby improving service quality and output. The proper delivery of evidence can lead to the conviction of suspects and to the freedom of the innocent. The preservation of the integrity of DNA evidence is thus a continuous responsibility from the time it is discovered until it is presented in court, or until the final settlement of the case determines its disposal (Mphephu, 2022). De Wet, Oosthuizen, and Visser (2011) state that DNA evidence is currently at the forefront of the evidence employed in criminal trials. To ensure its optimal use in criminal proceedings, it is imperative that the legal fraternity be well-versed in the scientific basis, handling, and presentation of such evidence, as well as its potential pitfalls.

The application of DNA technology has revolutionized forensic science and investigation. The scope of a complete DNA analysis consists of identification, collection, storage, transportation, and interpretation. Often, due to the investigator's lack of scientific knowledge, DNA evidence is compromised or destroyed at the scene, during collection and/or transportation, and during storage (Bell, 2008). Berg and Horgan (1998) further stress that many factors contribute to the generation or degradation of high-quality DNA evidence; therefore, careful collection and storage of biological samples can yield useful information during DNA analysis.

Butler (2015) states that the integrity of a biological sample is very important in any forensic casework. Biological contamination of evidence from another source is a very real possibility, especially when dealing with trace evidence. Precautions should be taken to analyze. This can be done by wearing full protective suits, face masks, and disposable gloves before touching any evidence, and by changing gloves between handling different items. Investigators should use disposable instruments or clean them thoroughly before and after handling each sample. They (investigators) should avoid touching the area where they believe DNA may exist, and must avoid talking, sneezing, or coughing over evidence, and touching their face, nose, or mouth when collecting and packaging evidence. Moreover, Butler (2015) advises that investigators must always place evidence into new paper bags or envelopes, not into plastic bags, and that each piece of evidence should be packaged separately in paper bags. Biological evidence with forensic interest may be found in several cases of assault, being particularly relevant if sexually related. Sexual assault cases are characterised by low rates of disclosure, reporting, prosecution, and conviction. Ferreira-Silva, Porto, Magalhães and Caine (2019) argue that, biological evidence is sometimes the only way to prove the occurrence of sexual contact (Rape) and to identify the perpetrator, therefore, attention should be devoted to avoiding contamination, degradation, and loss of biological evidence, as well as respecting specific measures to properly handle evidence (i.e. Selection, collection, packing, sealing, labelling, storage, preservation,

transport, and guarantee of the chain custody). Biological evidence must be carefully managed since the relevance of any finding in Forensic Genetics is determined, in the first instance, by the integrity and quantity of the samples submitted for analysis. Ferreira-Silva *et al.* (2019:3) add that DNA analysis is highly beneficial to the court, as it provides comprehensive and just legal proceedings. The identification and collection of evidence, knowing that the patient's body is the crime scene, is a significant point for investigators; therefore, evidence must be identified, collected, packaged, secured, and maintained correctly, in ways that are beyond reproach, following strict chain of custody rules. Matheson (2015:11) suggests that evidence does not officially exist until someone recognises an item's potential value to the investigation and prosecution of this crime. Locating and collecting evidence must be done in a way that does not alter it in any way or cause the alteration of other evidential items around it. In contrast, throughout its life cycle. DNA is a type of evidence that can be found on a number of exhibits, and because of that, it is very easy to tamper with or contaminate. It must therefore always be properly documented, handled, and analysed. Matheson (2015) further highlights that, for anyone to properly maintain the condition and integrity of evidence, they will require knowledge of the best way to package each type of evidential item, and all aspects of evidence handling must be meticulously documented throughout its life, to ensure that it retains its value to the CJS. According to Alghafri, Pajnič, Zupanc, Balažic, and Shrivastava (2018), biological evidence from a rape scene needs to be collected carefully, transported, and stored properly prior to its being presented in courts. Most biological evidence is best preserved when stored dry and frozen. Contamination in the context of DNA analysis is the introduction of extraneous DNA (biological material containing DNA) into a sample. The DNA profiling process is extremely sensitive, and constant vigilance is required to prevent contamination from affecting the results. Because of this sensitivity, contaminating DNA may still be observed even with careful precautions, and will routinely be monitored in laboratories. The forensic scientist must use all available information to assess whether, if a contamination event occurs, it has impacted the results in a specific case. Alghafri *et al.* (2018) further note that *DNA analysis is the most preferred and often considered one of the most reliable methods in forensic and criminal investigations.* Forensic DNA typing is used in a variety of cases to prove innocence. From lifting exhibits at the crime scene or recovering evidence from the victim or suspect to their transportation, laboratory analysis, and reporting, while maintaining the chain of custody, these tasks are critical and must be handled by investigators. All these steps should be free from contamination and cross-contamination. According to the Royal Society (2017), biological materials at crime scenes first need to be detected, and they may be identified visually, by chemical analysis or testing, or using different types of light sources. Sometimes, the approach to testing targeting is more intuitive and relies on the investigator's expectations of where a person may have handled an object, depending on the circumstances of each case. One of the most common methods for collecting biological material from hard surfaces (e.g., a broken window or a knife) is

using a swab. The swab is moistened with sterile then rubbed over the surface to be sampled. This might be followed by a second swab to ensure any remaining material is collected. The Royal Society (2017) explains that biological material exhibits might be collected from fabrics by cutting out a stain or by using sticky tape to collect surface material (such as from the collar of a shirt). In choosing sampling sites for material not visible to the eye, such as cells left by handling an object, the investigator will use their knowledge of the circumstances to determine where to collect the material. For example, if an assailant has grabbed a bag, the area of the bag that was grabbed will be sampled, or if an assailant has tied a ligature around a complainant's/complainer's neck, the areas where the ligature will have been handled most in tying the knot will be sampled. In allegations of rape or sexual assault, the victim will be medically examined, and will have intimate samples, such as from the vagina or anus, and swabs of any skin areas alleged to have been touched or licked by the perpetrator, taken by a medical practitioner. Meintjes-Van der Walt and Dhliwayo (2021:24) reach consensus that the DNA analysis process is an extremely sensitive, relentless matter; therefore, extreme care must be taken to avoid contamination. Investigators or specialists collecting evidence can contaminate samples if proper care is not taken. One way contamination can occur at a crime scene is if an investigator or crime-scene examiner does not change. One way contamination can occur at a crime scene is if an investigator or crime-scene examiner does not change gloves when handling different exhibits or talks without a properly fitted face mask. Likewise, the scientist analysing the DNA can inadvertently add their own DNA to the sample. It is important that all disposable items (e.g., swabs) and all chemicals and kits used in the analytical process are free of DNA before use. It is critical that investigators ensure that, during the arrest of suspects, cross-contamination between suspects or from a suspect to a police officer, and hence potentially to a victim or crime scene, is avoided at all costs. For example, a suspect in relation to a sexual assault should not be transported in the same vehicle as was previously used to transport the victim. Similarly, if multiple suspects are arrested, they should be processed, detained, and biological samples taken separately. If intimate samples are to be collected by different medical practitioners at different facilities. According to De Wet, Oosthuizen, and Visser (2023), transporting DNA evidence in a secure and controlled manner is crucial to maintaining its integrity and ensuring that it can be used as reliable evidence in a court of law. De Wet *et al.* (2023) provide the following useful guidelines on handling rape DNA evidence during transportation:

- Packaging: Immediately after identification, DNA evidence should be properly packaged and labelled to avoid contamination or degradation during the process of transportation. This means using sterile swabs, paper envelopes or approved plastic bags, and sealable containers that protect DNA materials from temperature changes, moisture, and other environmental factors.
- Chain of custody: Maintaining a strict chain of custody is essential to ensuring that DNA evidence remains intact throughout the transportation process. The chain of

custody should be documented at every stage of transportation, from collection to delivery at the SAPS FSL.

- Security: Transporting DNA evidence requires a high level of security to prevent theft or loss of evidence. Transporting DNA samples should be done only by authorised personnel, with proper security measures such as tamper-evident container seals, Global Positioning System (GPS) tracking, and locked storage during transportation.
- The SAPS FSL delivery: Delivery of the collected DNA evidence must be carefully tracked and managed to avoid any loss of evidence. The delivery must be time-bound, preferably by a recognised courier company or law enforcement personnel.
- Liability: Transporting DNA evidence can come with significant legal liabilities, which must be factored in when planning for transportation. Agencies or personnel are adequately insured, and those responsible for transportation must ensure they are adequately insured and have established policies and procedures that protect both the victim and the suspect from accidental or intentional mishandling of evidence. The recent murder case (*in progress when the paper was written*) of the late Bafana Bafana and Orlando Pirates goalkeeper, Senzo Meyiwa, *refers*: The DNA evidence presented in court by the forensic expert, Sergeant Thabo Mosia, came under a great deal of attack, due to the manner in which he collected the evidence, including the fact that he failed to collect the DNA evidence on the first day, only to come on the second day to collect it (De Wet *et al.*, (2023). Moreover, the way in which he packaged, transported, stored, and presented the evidence in court was questioned. Sergeant (Sgt) Mosia collected what he viewed as important evidence on the first day and then realised the following day that he might have left other important evidence materials at the crime scene. Sgt Mosia then returned on the second day with the intention of collecting more evidence, only to find that there had been movement and interference since he left the crime scene. Sgt Mosia kept the evidence in his car rather than storing it in an approved facility. Even though this case has not reached a verdict, it has been a clear and profound lesson for investigators, particularly regarding DNA evidence. Moreover, it is important to note that DNA is vital in the pursuit of justice; therefore, mishandling it can compromise the case when presented in court. Sgt Mosia came under heavy attack, and the profession of forensic investigators, including the South African Police Service Investigators, was put under a strong spotlight (De Wet *et al.*, 2023). According to researchers, there are numerous other cases in which evidence is attacked and thrown out of court due to loss of integrity along the chain of custody. This gives an expensive lesson to the entire justice system, not to mention the impact on the victims and their families. We therefore recommend that the aspects of identification, collection, transportation, and presentation be handled with great caution.

3. Materials and methods

Through the application of the qualitative research approach, which is defined by Minnaar, Mistry, Patel, and Rustin (2016), as a research approach, which is generally associated with interpretative epistemology, which tends to be utilised to refer to different forms of collecting data and interpretation that depend on understanding, with a prominence on meaning. This research approach also refers to a set of strategies that most often include the use of smaller sample sizes and an in-depth examination of participants' experiences.

Moreover, the phenomenological research design was adopted in this study to explore their understandings and experiences on this subject. This research design aims to provide a deeper understanding of the nature of the meaning of our everyday experiences, which are facts rather than opinions. The phenomenological approach allowed participants, through the applied interviewing type and technique, to reflect on their own meanings of their experience in a community where students become victims of crime, which also attracts criminals. This research design aims to describe individuals lived experiences (Phenomena) in an attempt to enrich lived experience by drawing out its meaning" (Holloway, 2005). This research design was supported by the exploratory research objective, by ensuring that the selected participants are familiar with the subject, in order to increase their understanding of the chain of custody for rape DNA evidence in Northern Cape Province. These participants were selected to address the problem under research (Maluleke, 2016), and the study employed a phenomenological research design, which is the most appropriate method and approach in this study. This research objective offers the true meaning of phenomena explored through individuals' existing experiences. It is inductive in nature, as the selected study sample shared unique experiences on this subject (Burns & Grove, 2003).

This study was confined to the five (5) selected police stations (Kimberley, Jan Kempdorp, Galeshewe, Roodepan, and Pampierstad) of the Northern Cape. About twenty-five (25) Northern Cape SAPS investigators (Sample 'A') who deal directly with rape investigations were purposively selected for this study. Five (5) participants, involving three (3) SAPS Forensic specialists from SAPS FSL, situated in Arcadia (Sample 'B'), and two (2) DNA specialists from the CSIR, based in Pretoria, as well as 25 community members from the Northern Cape Province (Sample 'C'). For data collections, the unstructured KIIs were applied with the 'Sample A' and 'Sample B' targeting the SAPS rape investigators, SAPS FSL, and DNA specialists; this interview type involved 30 participants. The FGDs were only directed to the 25 community members. Overall, 55 participants participated in this study. The interview types were aided by the application of a simple observation schedule to observe the reactions of samples 'A' and 'C,' and by a non-participative observation schedule, as much of the most significant information came outside the parameters of the conducted KIIs and FGDs. Furthermore, the documentary review was also used

during data collection, involving textbooks on the research subject; journal articles on DNA evidence and rape, internet sources on DNA evidence and rape combating, investigation and policing, dissertations and Theses on crime combating, prevention and policing of rape and DNA evidence.

The inductive TCA was adopted to analyse the collected data. Braun and Clarke (2014) state that this analysis focuses on identifying and classifying patterns or themes in qualitative data. This study utilised the inductive TCA approach. According to Alhojailan (2012), the inductive TCA approach means that the themes identified are strongly linked to the data themselves. The researcher followed Braun and Clarke's (2014) inductive TCA model to analyse the collected data. The six (6) phases of the adopted analysis type were used, namely 1) Familiarisation with data, 2) Generating codes, 3) Identifying themes, 4) Reviewing themes, 5) Defining themes, and 6) Report writing (Producing the final manuscript).

4. Research findings

Collected data from literature study, focus group interviews, questionnaires, and observation revealed the following:

Chain of custody of evidence

Most of the interviewed participants (55 out of 57, or 96.4%) reported that the chain of custody of evidence is of great concern, as most cases are withdrawn from court due to insufficient or no evidence. This is corroborated by the literature, which indicates that the integrity of the evidence determines the outcome of successful prosecution (Rasool & Rasool, 2020). One of the interviewed participants responded as follows: *"What is important is that the chain of evidence should be maintained at all times."* Literature supported by interviews with SAPS members, SAPS Forensic specialists from the SAPS FSL, SAPS DNA specialists, and community members revealed that the chain of custody should be maintained at all times until the case is decided in court. De Wet, Oosthuizen, and Visser (2011:23) highlighted that DNA evidence is at the forefront of the list of evidence used in criminal trials. Therefore, it is crucial that investigators ensure the optimal use of DNA evidence in criminal proceedings and that its handling and presentation are not compromised. This view is supported by some participants who stated that: *"It must be maintained from start to finish, when handing over any piece of evidence."* Another participant said, *"It must be done through proper documentation."*

These questions were posed to the selected participants. For example, the analysis of data from literature study, focus group interviews, and observations revealed the following: Crime scene evidence, especially DNA evidence in most rape crime scenes, is compromised due to unprofessional crime scene management from the South African Police Service. This is corroborated by the literature, which underscores the significance of DNA evidence in pursuing justice. During focus group interviews, participants were asked a number of questions to elicit their views on various

aspects of crime scene management. For instance, a question was asked: Can you please explain the chain of custody of evidence from the time you arrive at the scene until it is presented to the courts? and a few quotes (verbatim responses) follow in this section: Another participant from the focus group interviews responded to the question as follows: *"From the time the evidence is collected from the crime scene till the case is finalised, it must never be compromised"* *"Chain of evidence is what guides those who are responsible for evidence from collection to presenting the evidence in court"* *"The rule is the same and that is that evidence must be transported in a manner that doesn't leave question marks"* This indicates that participants view chain of evidence as a very significant policy position that must be adhered to, and complied with by all investigators of rape crime scenes. Their perspectives show that these participants have identified potential loopholes that may compromise the integrity of the evidence. Some participants from SAPS, SAPS Forensic specialists from the SAPS FSL, SAPS DNA specialists, and community members believe that first responders must play a role in securing the scene and evidence, as they are the first to arrive at crime scenes. Moreover, first responders must be trained to activate relevant stakeholders based on the type of incident. One participant had the following to say: *"That is done by the forensic experts"* *"That is done by the forensic experts"* *"The most important thing about the chain of evidence is that, its chain must be maintained with great care and must never be questioned"* *"The most important thing about the chain of evidence is that, its chain must be maintained with great care and must never be questioned"* *"What is important is that, the chain of evidence should be maintained at all times"* *"The rule is the same and that is that evidence must be transported in a manner that does not leave question marks"* Literature corroborate the fact that collected DNA materials must be dispatched to the SAPS FSL for analysis by investigators and should always be protected from any possible damage or contamination (Sing, 2021:37). Furthermore, Sing highlight the fact that, many factors contribute to the generation or degeneration of good DNA evidence; therefore, careful collection and storage of biological samples can provide useful information during DNA analysis. It is important to note that DNA analysts are responsible for extracting the required evidence while ensuring that the cornerstone of the judicial process is maintained for the presentation of DNA evidence in court. DNA evidence for rape cases does not officially exist until someone recognises an item's potential value to the investigations and related prosecutions. Thus, the biological evidence from rape scenes needs to be collected carefully, transported, and stored properly prior to court presentations. Useful guidelines on handling rape DNA evidence during transportation should be prioritised at all costs. Other participants responded as follows: *"I understand the process and ensure that procedures are followed when attending crime scenes."* *"I ensure that evidence collected from crime scenes is kept safe until presented to court as evidence."* *"We keep a record of all activities related to evidence collected from crime scenes and ensure the integrity of evidence is maintained."* *There is no room to compromise the integrity of evidence, and we ensure that evidence is properly documented and/or recorded."* DNA evidence during rape investigations plays a major role in solving this crime. In

addition, DNA evidence obtained from rape scenes can be used positively to link a potential suspect to the alleged rape crime. This technology can be used to exonerate or exclude innocent people suspected of committing this crime. The selected South African legislative frameworks, SAPS policies, and SAPS National Instructions offer guidelines on how to manage DNA evidence during rape cases. Thus, adherence to the selected legislative frameworks, SAPS policies, and National Instructions is essential in this regard, and the SAPS Local Criminal Record Centre (LCRC) and SAPS FSL are responsible for the management of DNA evidence during rape investigations and are expected to adhere to the available legislative frameworks, SAPS policies, and National Instructions. It is also revealed that the standing order must be developed and included in the guidelines, stating that such collection must be performed by forensic fieldworkers only and for the purpose of collecting biological exhibits. The guidelines must clarify that responsibility lies with analysts, not SAPS investigators or other relevant stakeholders.

The selected sources of DNA evidence during rape investigations

Some participants from SAPS, SAPS Forensic specialists from the SAPS FSL, SAPS DNA specialists, and community members indicated that they understand selected sources of DNA evidence during rape investigations. However, some participants indicated that there is a need to improve and change existing narratives surrounding sources of DNA evidence during rape investigations. They argued that this can enhance existing knowledge on the preservation and protection of DNA evidence in the selected study locations. According to some interviewed participants, investigators of rape crime scenes must be properly equipped to be able to understand sources of DNA evidence during rape crime scenes. These, they argue, will ensure that a watertight case is brought before the court, which will eventually result in the successful prosecution of alleged perpetrators of rape crimes. Supported by literature, they further indicated that the successful prosecution of rape crime scenes hinges on collected evidence.

Non-compliance with the legislative framework

Non-compliance with legislative frameworks, SAPS policies, and National Instructions is guided by the Constitution, the CPA, 1957, the SAPS Disciplinary Regulations, and the SAPS Code of Conduct. The DNA Act of 2013 is the current legislation that oversees the usage of DNA samples collected at rape scenes and from possible victims. The suspect's DNA samples are stored in a database for comparison and linking to potential suspects. The collected DNA evidence is packaged in a prescribed container and properly sealed to minimise contamination. The prescribed protective gear must be worn during the collection process and be changed regularly after the collection of certain items. Documentation for handling DNA evidence is provided to SAPS investigators to prevent tampering. The SAPS investigators involved in the management of DNA evidence often experience various challenges, including instances where rape scenes are not properly secured, weather

conditions, humiliation experienced by potential victims after a rape incident, inexperienced investigating officers, as well as inexperienced bystanders/onlookers next to the identified rape scenes. The experiences of the selected participants (SAPS investigators and DNA analysts) in this study showcased the importance of DNA evidence, as located from rape crime scenes, and for them to undergo specific training to gain the expertise to perform their duties effectively remains of utmost importance. However, the community members were found to have limited knowledge of the usage of DNA evidence during rape investigations. One participant responded to this aspect as follows: *"It is a common challenge most investigators experience in our police station."* Some participants, as indicated in the literature, must be familiar with the legislative framework governing their responsibilities for investigating crime scenes (South Africa, 2014).

Crime Scene Management

In the pursuit of justice, crime scene management is the backbone of any criminal investigation. In addition, the way crime scenes are managed involves a balance between preserving evidence and ensuring successful prosecution. While there is a set roadmap for investigators to follow, some investigators compromise these guidelines and policies, resulting in contamination of crime scene evidence. In order to preserve the integrity of evidence and/or clues found at crime scenes, investigators must ensure that crime scene evidence is properly collected and preserved. It is important to note that crime scene management is crucial for everyone who attends these incidents, from first responders to forensic analysts/experts. Responding to these aspects, participants responded as follows: *"It plays a huge role with regard to solving rape cases."* *"Yes, definitely, it is a major contributor to solving rape cases."*

The literature, supported by interviewed participants, indicates that crime scenes must be processed by investigators who are properly skilled and resourced to ensure that evidence collected at these scenes is handled professionally, thereby resulting in successful prosecution. Crime Scene Investigation: A Guide for Law Enforcement (2000) emphasises the importance of adhering to crime scene management protocols, which ultimately preserve evidence integrity and lead to successful verdicts in court. This perspective was further corroborated by some focus group participants. Some participants stated, *"I understand the process and ensure that procedures are followed when attending crime scenes."* *"I ensure that evidence collected from crime scenes is kept safe until presented to court as evidence."* *We keep a record of all activities related to evidence collected from crime scenes and ensure the integrity of evidence is maintained."* *There is no room to compromise the integrity of evidence, and we ensure that evidence is properly documented and/or recorded."*

From the above responses, it is evident that what at the crime scene affects the outcome of court cases. Withdrawn or unsuccessful prosecutions are a result of unprofessional handling of crime scenes.

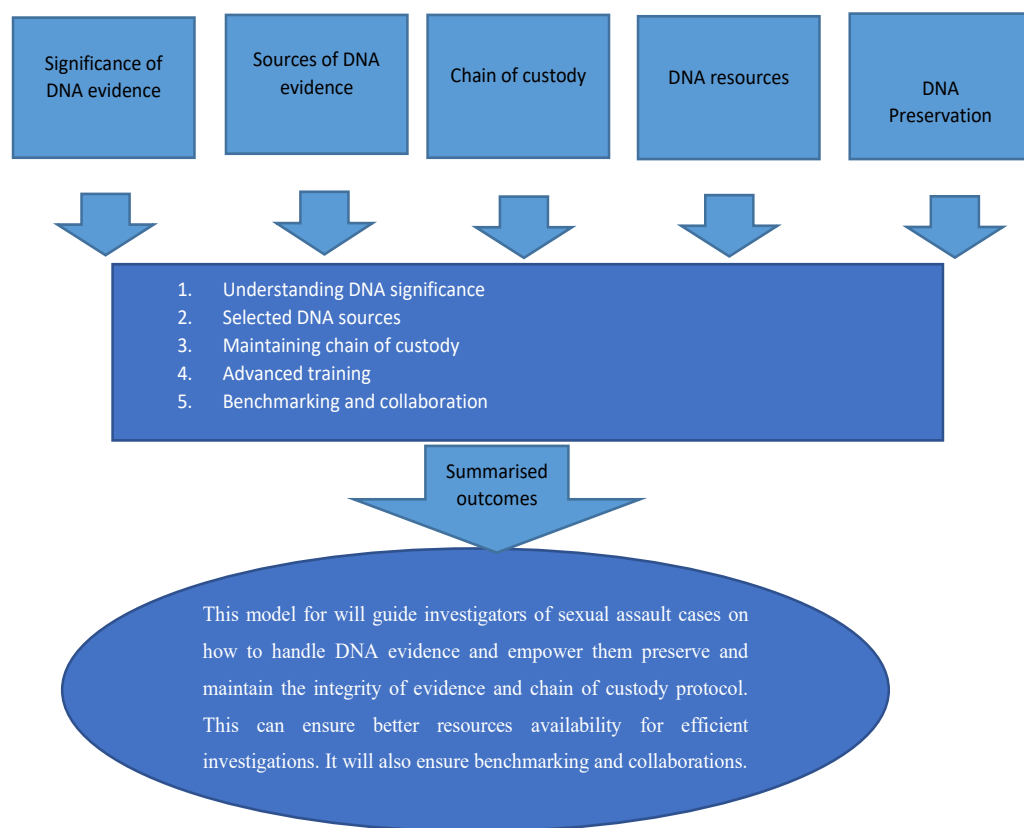


Figure 1: Conceptual Model for DNA analysis during rape investigations

Source: Researcher's illustration (2023)

5. Recommendations

This research not only sheds light on the significance of DNA evidence but also meticulously integrity, examining the chain of custody and integrity of evidence in the unique context of the Northern Cape province, South Africa. Moreover, the research contributed to its practical implications for the criminal justice system. To this end, the following recommendations are made:

Adherence to policies and procedures

There is a need for an aggressive awareness campaign to reorient investigators to the significance of adhering to established procedures to ensure crime scenes are managed professionally and that successful prosecutions are achieved. DNA evidence is either dismissed or accepted depending on the officials' recklessness or professionalism. It is a fact that DNA evidence will always be present at crime scenes, waiting to be discovered, preserved, collected, packaged, and presented to the court

by skillful investigators. The most common challenge is that. Sometimes, victims, or those who arrive first at the crime scene, do not understand the value of each piece found there. It sometimes happens that even first responders to the rape scenes do not exercise caution on their arrival at the scene, and that has had a very negative impact. It is therefore recommended that training in the identification, analysis, collection, and preservation of DNA exhibits to maintain the chain of custody be prioritised. This should also be accompanied by inductions of refresher courses, which should be made compulsory for all rape investigators, while considering technological advancements. Moreover, this should be included in the investigation courses of the SAPS basic training.

Evidence handling and integrity

Successfully prosecuted rape cases should be used as a blueprint to improve the maintenance of the chain of custody during rape investigations. Proper analysis of DNA evidence should always be prioritised. Furthermore, the associated technicalities and limited basic knowledge on DNA analysis should be revisited. This is also in light of the limited knowledge of DNA samples and available sources. Knowledge of DNA analysis can help preserve the integrity of DNA evidence. Preserving the integrity of DNA evidence is crucial; contamination and tampering must be avoided by ensuring the chain of custody is not compromised. Adequate resources should be made available to the SAPS FSL, LCRC, and SAPS investigators. This can assist in speeding up rape cases and finalising DNA evidence, to reduce the backlog currently existing in Northern Cape police stations. It is recommended that in instances where there is a shortage of personnel from the listed units, staff members should be hired, and those who have completed courses relating to DNA analysis of rape crime should continue to support each other in their respective investigations of rape.

Training

In this context, training refers to the education, skills, and experiential knowledge that individuals have acquired in a specific, focused environment. Furthermore, training involves exploring the participants' past experiences, qualifications, and training relevant to a particular specialised field or context. Some focus group participants raised concerns that they are not given opportunities to enhance their skills because of the rising crime levels in the country. For this reason, it is of the utmost importance that identified police officers in police stations in the Northern Cape be consistently exposed to the available relevant and advanced training that will develop their knowledge systems on DNA analysis during rape investigations. These selected police stations, together with the SAPS crime scene (Rape) investigators, SAPS Forensic specialists from the SAPS FSL, SAPS DNA specialists, and community members to a certain extent, should be encouraged to share and coordinate their intelligence-gathering and analysis capabilities better, and establish a unified strategic view of DNA evidence resources for rape investigations. However, it was established that

some participants are highly qualified in accordance with the criteria to be analysts in the Forensic Science Division.

Collaboration and information exchange

The Intelligence-led operations currently employed by the SAPS crime scene (Rape) investigators, SAPS Forensic specialists from the SAPS FSL, and SAPS DNA specialists require a new approach, involving interactions and information exchange on preserving DNA evidence during rape investigations in the Northern Cape. This approach will offer the establishment of intelligence functions to produce operational and tactical intelligence concerning DNA evidence analysis during rape investigations within Northern Cape Province, which are currently inadequate, based on rape scene investigations. Be part of this process, with frequent meetings to foster closer cooperation with the mentioned stakeholders.

6. Limitation of the study

Although researchers could not cover the entire province due to practical challenges, this did not in any way limit the research objective. In addition, the sensitive nature of the research meant that some interviewees were reserved in their responses, leading to the withholding of information that could have enhanced the quality of the research. However, the majority of participants in the focus group interviews fully participated and provided the required information. The researchers were cognisant of participants' personalities and were upfront in communicating this to them (Leedy & Ormrod, 2015). The differences in cultural settings and personalities were not a limitation; participants openly shared their thoughts and feelings. Language was also not a barrier, and researchers ensured that a commonly understood language by participants was used during focus group interviews. The fact that the research was conducted in only one province, namely the Northern Cape, is a limitation. However, it should be noted that the maximum number of participants was reached, rendering the responses relevant to the broader South African context.

7. Conclusion

The explorative DNA evidence handling and analysis play a crucial role in the criminal justice system. For this reason, sufficient evidence. The findings of the research underscore the need for professionalism, training in crime scene management, and strict adherence to standardised policies and procedures. This will ensure the successful prosecution of rape perpetrators not only in the Northern Cape but throughout South Africa.

References

- Adams, T.F., Caddell, A.G. & Kritzinger, J.L. 2004. *Crime scene investigation*. 2nd Edition. Upper Saddle River, NJ: Pearson Education.
- Alberts, B., Johnson, A., Lewis, J., Raff, M., Roberts, K. & Walter, P. 2014. *Molecular Biology of the Cell*. 6th Edition. New York: Garland Science.
- Alghafri, R., Pajnič, I.Z., Zupanc, T., Balažic, J. & Shrivastava, P. 2018. *Rapidly mutating Y-STR analyses of compromised forensic samples*. *International Journal of Legal Medicine*, 132:397.
- Alhojailan, M. I. 2012. TA: A critical review of its process and evaluation. *West East Journal of Social Science*. 1(1), 39-45.
- Bell, S. 2008. *Encyclopedia of forensic science*. Revised edition. New York: V B Hermitage/ Infobase Publishing.
- Berg, B.L. & Horgan, J.J. 1998. *Criminal investigation*. 3rd Edition. New York: Glencoe/McGraw-Hill.
- Braun, V. & Clarke, V. 2014. What can "thematic analysis" offer health and well-being researchers? *International Journal of Qualitative Studies on Health and Well-being*, 9(1), 1-7.
- Burger, F.J., 2006. Crime combating in perspective: A strategic approach to policing and the prevention of crime. *Acta Criminologica: African Journal of Criminology and Victimology*, 19(2), 105-118.
- Butler, J.M. 2015. *Advanced topics in forensic DNA typing: interpretation*. St Louis,MO: Academic Press- Elsevier Inc.
- Devenish, G.E. 1977. The Criminal Procedure Act (No. 51 of 1977). *Journal of De Rebus*, 1977(117), 515-532.
- De Wet, S., Oosthuizen, H. & Visser, J. 2023. DNA profiling and the law in South Africa. *PER, Potchefstroom*, 14 (4), 171-207.
- De Wet, S., Oosthuizen, H. & Visser, J. 2011. DNA Profiling and the law in South Africa. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, 14(4):171-207.
- Ferreira-Silva, B., Porto, M.J., Magalhães, T. & Cainé L. 2019. Contribution to the development of guidelines in the analysis of biological evidence in sexual assault investigations. *Journal of Forensic Science*, 64(2):534-538.
- Garrett, E. 2004. The purposes of framework legislation. *Journal of Contemporary Legal Issues*, 14, 717.
- Grove, S.K., Burns, N. & Gray, J.R. 2013. *The practice of nursing research: appraisal, synthesis, and generation of evidence*. 7th Edition. St Louis, MO: Elsevier Saunders.
- Holloway, I. 2005. *Qualitative research for Nurses*. Cambridge, MA: Blackwell Science.
- Lampbrechts, DS & Prinsloo, J. 1996. The powers and functions of the South African Police Service a 'new' socio-legal perspective. *Acta Criminologica: African Journal of Criminology and Victimology*, 9(2), 85-89.
- MacGregor, K.E., Villalta, L., Clarke, V., Viner, R.M., Kramer, T. & Khadr, S.N. 2019. A systematic review of short and medium-term mental health outcomes in young people following sexual assault. *Journal of Child and Adolescent Mental Health*, 31(3):161-181.
- Maluleke, W. 2016. *The use of Deoxyribonucleic Acid in combating stock theft in South Africa*. Unpublished Doctor of Technologiae: Policing Thesis. Soshanguve South: Tshwane University of Technology.
- Matheson, G. 2015. *Evidence retention and reservation*. Washington, DC: National Commission on Forensic Science.
- McInnes, J. 2017. *Genetics and heredity biology*. New York: Guilford Publications.
- Medwed, D.S. 2017. Talking about a revolution: a quarter century of DNA exonerations (2–13). In D.S. Medwed (Ed.). *Wrongful convictions and the DNA revolution: twenty-five years of freeing the*

innocent. Cambridge: Cambridge University Press.

Meintjes-van der Walt, L. & Knoetze, I. 2015. The Criminal Law (Forensic Procedures) Amendment Act 37 of 2013: a critical analysis. *South African Journal of Criminal Justice*, 28(2):131-162.

Meintjes-Van der Walt, L. and Dhliwayo, P., 2021. DNA Evidence as the Basis for Conviction. *Potchefstroom Electronic Law Journal/Potchefstroomse Elektroniese Regsblad*, 24(1).

Minnaar, A., Mistry, D., Patel, C & Rustin, C. 2016. *Criminal Justice Research Methodology*. Hartfield: University of South Africa. (Study guide SEP3707).

Mphephu, K. 2022. Forensic analyst. Forensic Science Laboratory, South African Police Service, Pretoria. 29 July.

National Strategic Plan on Gender-Based Violence & Femicide. 2020. Pretoria:Department of Women, Youth and Persons with Disabilities.

Rasool, N. & Rasool M. 2020. *DNA evidence in sexual assault cases in Pakistan*. *Medicine, Science and the Law*, 60(4):270-7.

Royal Society. 2017. *Forensic DNA analysis: a primer for courts*. London: Royal Society.

South Africa. 2014. Summary: Criminal Law (Forensic Procedures) Amendment Act [No. 37 of 2013] (The 'DNA Act'). *Government Gazette*, Vol. 583 No. 37268, 27 January. Pretoria Central: South Africa Government.

South Africa. 1996. The Constitution of the Republic of South Africa, as adopted by the Constitutional Assembly on 8 May 1996 and as amended on 11 October 1996. Pretoria: *Government Printer*. (B34B-96).

Republic of South Africa Constitution, 2006. *South African Criminal Law (Sexual Offences and Related Matters) Amendment Act (No. 32 of 2007)*. Government Gazette: Pretoria.