

**A PROFILE OF HANGING DEATHS ADMITTED TO POLOKWANE AND
LEBOWAKGOMO FORENSIC PATHOLOGY SERVICE LABORATORIES,
LIMPOPO PROVINCE**

by

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DEDICATION BY STUDENT

This study is dedicated to my father, late mother, sisters and my children (Reabetswe and Lesedi).

DECLARATION

I declare that the mini dissertation is hereby submitted to the University of Limpopo, for the degree of Masters of Medicine in Forensic Pathology had not previously been submitted for a degree at his or any other university; that is my work in design and in execution, and that all material contained herein has been duly acknowledged.

Matlala MM

25 April 2022

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ABSTRACT

Introduction and background: Hanging deaths contribute to premature mortality locally and globally.

Aim: The study aimed to provide a profile of hanging deaths in Polokwane and Lebowakgomo Forensic Pathology Service laboratories in the Limpopo Province.

Method: A quantitative retrospective study was conducted using sample size of 141 hanging death victims that were selected using systematic random sampling from hanging deaths admitted to Polokwane and Lebowakgomo Forensic Pathology Service laboratories over a period of 2 years.

Results: The study revealed that majority of hanging deaths were adults aged 20-29. There was male predominance and majority of the victims were unemployed. The hanging deaths victims were mostly discovered in the morning and the peak period was over the weekend. The peak season was summer. The post-mortem neck findings included visible ligature mark, located above the thyroid cartilage and there were few associated injuries on the internal neck structures. The alleged manner of death of the cases was predominantly suicide, few of the deaths were homicide hanging deaths and no there were no reported accidental cases.

Conclusion: The profile of hanging deaths identified was similar to that of reviewed literature.

Keywords: Hanging, suicide, homicide, accident, Polokwane Forensic Pathology Services, Lebowakgomo Forensic Pathology Services.

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DEFINITION OF CONCEPTS

Accident: is an unpleasant incident that occurs unexpectedly and causes injury (Oxford Dictionary, 2006). Accidental hanging deaths in the study will be defined as hanging deaths that occur unexpectedly.

Adult: is defined as a person older than 19 years of age (WHO, 2013). The study will define adults the same.

Children: are defined by the World Health Organization (2013; 2014a) as people below 19 years of age, with children between 10 and 19 years regarded as adolescents. Children's Amendment Act considers persons under the age of 18 years as children (South Africa, 2007). In this study, children will be hanging death victims below the age of 19 years of age, which will further categorise them as children from 0 to 10 and adolescents from 11 to 19 years of age in accordance with the WHO (2013) standards.

Decomposition: is disintegration of body tissues, due to self-dissolution by body enzymes released from disintegration of cell and bacterial and by microorganisms and destruction of tissues by predators (Saukko & Knight, 2015; Spitz & Spitz, 2006). In the current study, decomposition will refer to early decomposition changes of the body, excluding skelotinisation or predator activity on the body.

Elderly persons: are defined as individuals above the age of 60 (WHO, 2002). The current study will consider elderly as defined above.

Hanging: is a form of ligature strangulation in which force affecting neck structures is derived from gravitational drag of the body or part of the body (Nouma, Ben Ammar, Bardaa, Hammami & Maaatoug, 2016; Taktak, Kumral, Unsal, Ozdes, Buyuk & Celik, 2015). In this study, hanging will refer to deaths that results from alleged application of ligature material around the neck intentionally, unintentionally by the victim or perpetrator.

Homicide: refers to death resulting from the intentional use of physical force, threatened or actual against another person or community (Fowler, Jack, Lyons, Betz & Petrosky, 2014; WHO, 2017). In this study, homicide will refer to deaths resulting from alleged intentional use of ligature material against another person or community.

Post mortem findings: refer to findings from scene of death, autopsy and ancillary examinations (Wyatt, Squires, Norfolk & Payne-James, 2011). In this study, post mortem findings will refer to findings at scene of death and findings in autopsy only.

Profile: is description that gives beneficial information regarding something or a specific event (Oxford Dictionary, 2006). In the study, profile of hanging deaths will refer to description of socio-demographic details of the hanging deaths, timing of hanging deaths and post-mortem injuries in hanging deaths.

Suicide: is a death resulting from the intentional use of force against oneself (Fowler et al., 2014; Wyatt et al., 2011). In this study, suicide will refer to hanging deaths that occur as a result of intentional use of ligature material around the neck.

Timing of the hanging death: is defined as the time when death occurs (Oxford Dictionary, 2006). Timing of the hanging death in this study will refer to time of day the hanging victim was discovered, day of the week and month of the year and the season of the year when the deaths occur.

LIST OF ABBREVIATIONS

- DHA: Department of Home Affairs
- FPS: Forensic Pathology Services
- NIMSS: National Injury Mortality Surveillance System
- SAPS: South African Police Services
- SDG: Sustainable Development Goals
- SPSS: Statistical Package for the Social Sciences
- WHO: The World Health Organization

CHAPTER 1

INTRODUCTION, BACKGROUND AND ORIENTATION TO THE STUDY

1.1 INTRODUCTION AND BACKGROUND

Hanging is one of the common methods of violent deaths encountered globally (Ambade, Tumram, Meshram & Borkar, 2015b). It is the 10th leading cause of unnatural deaths with almost a million deaths per annum globally (Mohammed, 2017). There is an absence of consolidated reports of profiles of hanging deaths in South Africa. The majority of the available literature in South Africa relating to hanging deaths is described as part of suicide deaths (Engelbrecht, Blumenthal, Morris & Saayman, 2017; Kootbodien, Naicker, Wilson, Ramesar & London, 2020).

The National Injury Mortality Surveillance System (2013a; 2013b) reports that alleged suicide-hanging deaths contribute almost 50% and 69% of suicide deaths in Gauteng Province and Mpumalanga Province respectively, in South Africa. However, there is no detailed data on alleged accidental hanging deaths and alleged homicide hanging deaths in the different provinces of South Africa, therefore further contributing to the unavailability of data on hanging deaths.

Literature reports that hanging deaths are usually due to suicide, with accidental and homicide hanging deaths as rare occurrences (Rao, 2016). Therefore, hanging deaths are predominantly described with the typical socio-demographic profile of the victim as middle-aged male, unemployed with pre-existing medical/psychiatric conditions, history of drug abuse and previous attempt of suicide (Ambade et al., 2015b). Contrary to the above mentioned, the researcher observed an emerging trend in their daily practice which showed an increase in extreme of ages of the victims. This trend was observed across the different manners of death in hanging deaths. The post mortem findings are

generally limited to neck findings associated with the ligature material utilised regardless of the alleged manner of death (Lockyer, 2019).

The researcher observed that the lack of available researched data in Limpopo Province of hanging deaths results in knowledge gap in this regard. This further impedes the implementation of Sustainable Development Goals health target 3.0 which promote wellbeing for all at all ages and contribute to the prevention of global mortality (WHO, 2020). Furthermore, the prevention of premature deaths requires multi-dimensional approach that recognizes demographics, social, psychological and cultural impacts (WHO, 2018b).

In an attempt to contribute to knowledge gap, the study profiled hanging deaths admitted to Polokwane and Lebowakgomo Forensic Pathology Service laboratories over a period of 2 years between 1 January 2018 and 31 December 2019. This was achieved by conducting a quantitative retrospective descriptive study, which selected a sample using systematic random methods.

The study revealed that there is male predominance with majority of the victims aged between 20-29 and unemployed. The hanging death victims were discovered on Fridays, Saturdays and Sundays, with peak times between 06:00-11:59 (morning). The hanging deaths occurred throughout the year and peaked during summer months. Majority of the victims used firm ligature material. The external ligature mark was located above the thyroid cartilage in greater number of the hanging death cases. The documented internal injuries were on the sternocleidomastoid muscles, strap muscle and thyroid gland in few of the hanging cases. Hyoid bone and thyroid cartilage fractures were also documented in some of the hanging death cases. The dominant alleged manner of death was suicide with few cases of homicide hanging deaths. There were no reported cases of accidental hanging deaths.

1.2 RESEARCH PROBLEM

In spite of the interventions to reduce the number of premature deaths, suicide hanging continue to contribute significantly to premature mortality globally. In light of this, there is no published research on profile of hanging deaths in the Limpopo Province. The study profiled hanging deaths in the local area. The data on profile of hanging deaths may highlight essential aspects required to understand profile of hanging deaths locally and possibly assist in implementation of preventative strategies for hanging deaths as detailed by the Sustainable Development Goals health targets.

1.3 AIM OF THE STUDY

The study aimed to provide a profile of hanging deaths in Polokwane and Lebowakgomo Forensic Pathology Service laboratories in the Limpopo Province.

1.4 OBJECTIVES

The objectives of the study were:

- To determine the demographic profile of hanging deaths in Polokwane and Lebowakgomo Forensic Pathology Service laboratories.
- To evaluate the timing of the hanging deaths.
- To explore the patterns of post mortem findings of the hanging deaths.

1.5 RESEARCH QUESTIONS

- What is the demographic profile of hanging deaths in the Polokwane and Lebowakgomo Forensic Pathology Service laboratories?
- What is the timing of the occurrence hangings deaths?
- What are the patterns of post mortem findings in hanging deaths?

1.6 SIGNIFICANCE OF THE STUDY

This study aimed to add to existing information in the Limpopo Province with regard to demographic profile of hanging deaths, timing of the occurrence of the hanging deaths and post mortem findings of the hanging deaths. The information obtained during the study added to existing scientific knowledge in the forensic pathology community, since there is insufficient existing researched data on hanging deaths in the communities served by Polokwane and Lebowakgomo FPS laboratories. The study may help make judgements regarding trends of hanging deaths, which may be disseminated to public health authorities and social services for assessments. Furthermore, the derived assessments may be used to develop possible measures that can be implemented to prevent all manners of hanging deaths.

1.7 CONCLUSION

This chapter provided introduction and background of the study. The aim and objectives of the study were explained. The significance of the study was highlighted as well as the possible outcomes. The following chapter will describe the literature review.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Hanging deaths are reported globally as a significant contributor to premature mortality (Ambade et al., 2015b). The researcher observed that there is an absence of consolidated global reports of the profile of hanging deaths. Alleged suicide hanging deaths contribute to the majority of victims between 15 to 29 years of age (Ambade, Dayanand, Tumram, Meshram, Pawar & Kukde, 2015a; Dogan, Dermerci & Deniz, 2015; WHO, 2018a).

In South Africa, Engelbrecht et al (2017) argue that hanging deaths contribute 43.2% of overall suicide deaths in Pretoria town located in the Gauteng Province. Furthermore, the Injury surveillance studies in Mpumalanga and Gauteng, over a period of 12 months, show that suicide hanging deaths contribute 69.7% of the 455 and 50.7% of 1335 suicide deaths, respectively (NIMSS, 2013a, NIMSS, 2013b). In spite of an extensive literature search, there is inadequate researched data available on the profile of hanging deaths in the Limpopo province. The available literature predominately describes suicide hanging death, with limited literature on accidental and homicide hanging deaths (Engelbrecht et al., 2017, Kootbodien et al., 2020).

The literature review will briefly discuss a general overview of hanging deaths. It will further describe the demographic profile of hanging deaths. The literature review will elicit trends of hanging death victims in the extreme of ages globally and in the South African context. The above mentioned will assist in highlighting essential information necessary to understand the profile of hanging deaths globally and locally. The information derived from the literature review may assist in the appreciation of the required preventative strategies of hanging deaths as detailed by the Sustainable Development Goals health targets (WHO,

2020). The literature review will further evaluate the timing of the hanging deaths and explore the post mortem examination findings in hanging deaths. The detailed findings of the timing of hanging deaths and post mortem findings will assist in determining the cause of death and ascertain the different alleged manners of death.

In order for the researcher to have sufficient information regarding hanging deaths as described in the preceding paragraph, the information was sourced from online data sources and journals. The data sources that were used for the literature review include Pubmed, Sage, Google Scholar, Science Direct, Research gate, Ovid and recent journals from the University of Limpopo library.

2.2 Hanging deaths

Hanging is a common method of violent deaths encountered in forensic pathology practice (Ambade et al., 2015b). Hanging is defined as a form of ligature strangulation where the weight of the body or part of the body affects the neck structures by causing gravitational drag resulting in obstruction of the neck structures (Kumral et al., 2014; Taktak et al., 2015). The suspension may be partial or complete resulting in possible neck injuries (Russo, Verzeletti, Piras & De Ferrari, 2016; Tulapunt, Phanchan & Peonim, 2017). The mechanisms of deaths predominantly occur in combination, which include cerebral anoxia, cerebral congestion, cerebral ischemia and asphyxia (Lockyer, 2019; Russo et al., 2016; Tulapunt et al., 2017). The mechanisms of deaths and neck injuries are similar in the different manners of death (Zátopková, Janík, Urbanová, Mottlová & Hejna, 2018).

2.3 Demographics of hanging deaths

The global demographic profile of alleged accidental and alleged homicide hanging deaths is not clearly defined. However, alleged suicide hanging deaths show middle-aged male predominance with pre-existing suicide risk factors like

depression and previous suicide attempts (Tugaleva, Gorassini & Shkrum, 2016). The unavailability of demographic profile in Limpopo Province hinders the identification of potential victims of hanging deaths and possible intervention for individuals at risk to die from hanging (Russo et al., 2016; WHO, 2019).

2.3.1 Age of the hanging victims

The WHO (2019) reports an increase in suicide death in victims aged between 15 and 29 years. There are variations in the different regions globally of peak age incidences. In India, cases are between 21-30 years of age whilst in Bangalore cases are between 31-40 years of age and Turkey reports cases between 19-41 years of age with few cases of less than 10 years of age (Ambade et al., 2015a; Rao, 2016; Taktak et al., 2015). Nouma et al (2016) report that the majority of the hanging deaths occur in the 31 to 50 year age group in Italy. It is the researcher's opinion that the variations of peak age may be attributed to cultural and social differences in the different regions.

Similar variations are observed in South Africa, where the National Injury Mortality Surveillance System (2013a) reports hanging as the predominant (87.5%) method of suicide in children between 0-14 years in the Gauteng Province, whilst only 64.8% of the victims are between 15-24 years of age (NIMSS, 2013a). This is a stark contrast to studies by Ambade et al. (2015a) and Taktak et al. (2015). Ambade et al (2015a) further reveal that only 5.5% of the victims are older than 60 years of age. However, in Mpumalanga Province, hanging is a method of choice (83.2%) for committing suicide in victims aged between 15-24 years of age (NIMSS, 2013b). In light of the above mentioned, questions arise regarding the distribution of alleged suicide hanging deaths in the surrounding communities served by Polokwane and Lebowakgomo Forensic Pathology Service laboratories.

The differentiation of alleged accidental hanging deaths from alleged suicide hanging deaths is always difficult. However, there are reports in Turkey that

show alleged accidental hanging deaths are usually between the ages of 1 and 13 years in children (Kumral et al., 2014). Factors that can assist in differentiating alleged suicide hanging deaths from alleged accidental hanging deaths may include bizarre circumstances and history that is inconsistent with the autopsy findings. The greater numbers of accidental hanging victims are children that are already exploring their environment (Nouma et al., 2016; Kumral et al., 2014). The above stated does not exclude the occurrence of accidental hanging deaths in adults (Bhosle, Zanjad, Dake & Godbole, 2015; Kumral et al., 2014). There are literature reports of isolated cases of alleged accidental hanging deaths in different regions globally (AlBuhairan, AlMutairi, Al Eissa, Naeem & Almuneef, 2015; Bhosle et al., 2015; Tugaleva et al., 2016). In adolescents and adults, alleged accidental hanging deaths occur in a wide range of circumstances which include sporting activities, autoerotic misadventures or choking games (AlBuhairan et al., 2015; Nouma et al., 2015).

Alleged homicidal hanging deaths are rarely encountered (Monticelli, Brandtner, Kunz, Keller & Neuhuber, 2015; Sharma, Khanagwal & Paliwal, 2011). Literature shows that the age of the homicide hanging victims varies depending on the circumstances of the homicide (Monticelli et al., 2015; Sharma et al., 2011). To illustrate this, Doberentz, Markwerth and Madea (2019) argue that homicide hanging victims are predominantly children, incapacitated adults, or victims of offenders that are physically superior. However, the exact ages of the homicide hanging victims are not clearly stated in the literature. Furthermore the unavailability of data may be due to rarity of alleged homicide hanging deaths.

Ultimately, the majority of the cases encountered are alleged suicide hanging deaths therefore, suicide hanging deaths are thoroughly researched (Zátopková et al., 2018).

2.3.1 Gender of hanging victims

Gender distribution of different manners of hanging deaths is dependent on the circumstances of the death and the age of the victims. It is widely known that men are generally prone to be involved in violent and dangerous behaviour (Engelbrecht et al., 2017). This is evidenced by literature that illustrates that there is a male predominance of hanging deaths, regardless of the alleged manner of death (AlBuhairan et al., 2015; Ambade et al., 2015a; Doberentz et al., 2019; Kumral et al., 2014; Sharma et al., 2011; Tugaleva et al., 2016). Contrary to that study by Rao (2016), reports shows an equal number of male and female hanging death victims. The study by Bhosle et al. (2015) reports the predominance of female hanging death victims in adolescents compared to male hanging death victims. The likely contributor to increased number of adolescent's female victims might be psychological disorders (Bhosle et al., 2015).

In South Africa, there are reports of the male predominance of alleged suicide hanging deaths in the Gauteng province and Mpumalanga province (NIMSS 2013a; NIMSS 2013b). Smith (2021) also reports a similar trend of male predominance in Free State province of alleged suicide hanging deaths. The researcher could not find any reports illustrating the trends of hanging deaths in other provinces and including the Limpopo Province. Therefore, there is no published data on the gender distribution of hanging deaths in different age groups in the different districts of the Limpopo Province.

2.3.2 Occupation

The occupation profile of hanging death victims is varied depending on the alleged manner of death, age and gender of the hanging death victims (Lavender, Ramirez-Irizarry, Bayakly, Koplán & Bryan, 2016). The unemployed victims are known to have high-risk factors for alleged suicide hanging deaths (WHO, 2014). There is high unemployment rate in South Africa and in the Limpopo province (Maluleke, 2021). Therefore, the high number of hanging deaths victims might be expected.

Employed victims show a variety of risk factors, depending on the type of employment (Lavender et al., 2016). Studies show that the repair and maintenance industry, media, entertainment, health care industry and government employees have a high propensity for alleged suicide hanging deaths. The propensity of the industries to suicide hanging is attributed to the high-pressure environment of the workplaces (Lavender et al., 2016; Tulapunt et al., 2017). Bhosle, Batra and Kuchewar (2014) report that farmers and labourers constitute significant numbers of occupation in hanging deaths. The farmers' deaths were attributed to failure of crops, poverty, bankruptcy and stress (Bhosle et al., 2014). The researcher observed that there is inadequate literature regarding the occupational status of all manners of death in hanging globally and in the local area.

2.4 Timing of the hanging deaths

The timing of the hanging deaths is evaluated in three areas, namely: time when the deceased was discovered, the day of the week that the death occurred, the month of the year and the season of the year. The precise time of hanging deaths is difficult to determine as the deaths occur in seclusion (Saukko & Knight, 2015). Literature predominantly documents the timing of suicide hanging deaths in detail with limited or no information on accidental and homicide hanging deaths (Rao, 2015; Taktak et al., 2015). The majority of the hanging deaths occurred between 06:00 am and 06:00 pm in Bangkok (Tulapunt et al., 2017). However, the study did not outline the methods utilised to determine the time of death. In South Africa, NIMSS (2013a, 2013b) report the majority of hanging deaths occurring between 12h00-15h00 and 08h00-11h00 in Gauteng and Mpumalanga province. The reasons for the time of death reported are not stipulated (NIMSS 2013a; NIMSS 2013b). The researcher also experienced in their practice that it is difficult to determine with certainty the time of death of the hanging deaths unless the deaths are witnessed.

There are reports of alleged suicide hanging deaths on Mondays, Wednesdays and Saturdays with peak seasons being summer and spring (Ambade et al., 2015a; NIMSS 2013a; Russo et al., 2016; Tugaleva et al., 2016). Russo et al. (2016) cite that reasons for deaths to occur on Monday may be associated with the stress of the upcoming week for employed people and depression caused by the absence of an active role in society in unemployed people. The underlying mechanisms to the preponderance of suicide hanging deaths in spring are poorly understood. Some studies explore the relationship between seasonality and suicide rates (Silveira, Wexler, Chamberlain, Money, Spencer, Reich & Bertone-Johnson, 2016). The studies explore factors like elevated temperature and sunshine that may affect biochemical constituents like melatonin degradation which affect the mood of the victims. However, the findings were inconclusive (Silveira et al., 2016). Some studies indicate that there are no significant variations of the hanging deaths in the different seasons globally (Ambade et al., 2015a; Tulapunt et al., 2017).

2.5 Post mortem findings related to hanging deaths

Post mortem findings are essential in ascertaining the cause of death and assisting the judicial system in determining the manner of death as per Inquest Act (South Africa, 1959). Most hanging deaths do not pose a challenge from an investigation point of view (Tugaleva et al., 2016). Classically hanging deaths do not display extensive external injuries to the body (Tugaleva et al., 2016). However, challenges may arise when there is a need to differentiate between alleged suicide deaths from alleged homicide or alleged accidental hanging deaths from the scene of death, autopsy findings and ancillary examination (Tugaleva et al., 2016).

2.5.1 Scene of death findings

The location of the scene of death in hanging cases differs depending on the manner of death (Ambade et al., 2015b; Bhosle et al., 2015; Karbeyaz, Celikel,

& Balci, 2017). Alleged suicide hanging deaths are located indoors because the majority of the victims desire privacy (Ambade et al., 2015b). Few cases are found in a public or outdoor location like agricultural farms, secluded land, forests or mountains. Tugaleva et al. (2016) and Russo et al. (2016) show that deaths also occur in prisons, in patients admitted in a psychiatric hospital and rarely in motor vehicles. In the researcher's experience, the hanging deaths do not only occur in psychiatric hospitals but also occur in general hospitals even though the deaths occur rarely.

The scene of alleged accidental hanging deaths is determined by the age of the hanging death victim and the circumstances of the death (Kumral et al., 2014; Monticelli et al., 2015). Children accidental hanging deaths occur in homes, cars or playgrounds (Kumral et al., 2014; Monticelli et al., 2015). Accidental hanging deaths involve commonly used household items like curtain strings, high chairs, swing ropes or chains (Nouma et al., 2016). Alleged accidental hanging deaths in adults occur as autoerotic misadventures in the home or hotels (Tugaleva et al., 2016; Tulapunt et al., 2017). The scene is usually highly suggestive of autoerotic death when pornographic paraphernalia is present (Doberentz et al., 2019; Tugaleva et al., 2016).

Scenes of alleged homicide hanging deaths are almost always difficult to differentiate between suicide deaths (Sharma et al., 2011). The alleged homicide hanging scene deaths will display evidence of a struggle, especially in an adult victim (Tugaleva et al., 2016). Alleged homicide hanging deaths can be suspected in hanging victims found in outdoor locations. however, the outdoor location does not suggest that homicide hanging deaths do not occur indoors (Bhosle et al., 2015; Dogan et al., 2015; Karbeyaz et al., 2017; Russo et al., 2016; Taktak et al., 2015). Autopsy findings will assist in determining the exact manner of death if the history and scene findings are ambiguous (Zátópková et al., 2018).

2.5.2 Autopsy findings

The autopsy findings are divided into different areas, namely the ligature material as well as associated neck injuries (Ambade et al., 2015b; Zátopková et al., 2018). The choice of ligature material in alleged suicide hangings depends primarily on the ease of accessibility, social and cultural influences (Ambade et al., 2015b; Bhosle et al., 2015; Karbeyaz et al., 2017; Tugaleva., 2016). Studies show that ligature of choice in alleged suicide hanging deaths is firm material (rope, wire or electric cords) followed by soft material like clothing material (Ambade et al., 2015a; Lockyer 2019; Russo et al., 2016; Tulapunt et al., 2017). Ambade et al. (2015b) revealed that the majority ligatures had fixed knots. Contrary to Ambade et al. (2015b), a study by Rao reveals common knots are slip knots.

Similar ligature materials are used in alleged homicide hanging deaths with a fixed knot. There may be interposition of the surrounding clothing or hair into the knot (Monticelli et al., 2015). Contrary to alleged homicide hanging deaths and alleged suicide hanging deaths the ligature materials used in alleged accidental hanging deaths are household material comprising of high chair straps, car seat belts, skipping ropes, ties, helmet strings, belts, necklaces, pacifier strings, scarves and many more (Kumral et al., 2014; Tugaleva et al., 2016).

Literature reports the neck ligature mark of alleged suicide and accidental hanging deaths are classically located above the thyroid cartilage on the anterior aspect of the neck, running obliquely and superiorly on the lateral aspects of the neck towards an inverted V suspension point on the back (Karbeyaz et al., 2017; Lockyer, 2019; Rao, 2016; Tulapunt et al., 2017). The ligature mark is leathery, firm, parchment-like and grooved into the neck tissues if the suspension period is prolonged (Karbeyaz et al., 2017; Rao, 2016; Tugaleva et al., 2016). There may be associated linear abrasions on the skin which may represent self-rescue attempts (Payne-James, Jones, Karch & Manlove, 2011).

Doberentz et al. (2019) cite that unconscious homicide hanging death victims have ligature marks around the neck similar to that of alleged suicide victims. Furthermore, Monticelli et al. (2015) explain that the lack of other neck injuries may make proving alleged homicide hanging deaths difficult. In conscious victims, there may be the presence of oval to round bruising consistent with a finger pad impression, crescent-shaped abrasion from nails impressions and linear scratch abrasions associated with the neck ligature mark (Saukko & Knight, 2015).

2.5.3 *Ancillary examinations*

Toxicology analysis should be performed in all hanging deaths to determine whether the individual is capable of self-suspension (Payne-James et al., 2011). The performance of toxicology analysis is not always feasible in poorly resourced countries, in such regions the forensic pathologist collects specimens for toxicology analysis if deemed necessary (Auckloo, 2016). The following drugs are commonly detected during toxicological analysis: ethanol, pesticides, barbiturates, benzodiazepines, amphetamines, therapeutic drugs, analgesics, cardiovascular drugs, antihistamine, anti-epileptics, opioids, antipsychotics and anaesthetic drugs (Ambade et al., 2015a; Karbeyaz et al., 2017; Taktak et al., 2015; Tulapunt et al., 2017). The use of drugs is commonly administered to incapacitate the adult homicide-hanging victim (Dogan et al., 2015). The common drugs include cocaine, sedatives, opioids and cannabinoids (Russo et al., 2016; Taktak et al., 2015). In some suicide deaths, the use of more than one method of committing suicide is utilised therefore analysis of the drugs/ poisons employed is necessary.

2.6 **Conclusion**

Hanging deaths are commonly encountered in forensic pathology practice with the predominance of suicide hanging deaths compared to accidental and homicidal hanging deaths. The typical socio-demographic profile of suicide

hanging deaths is a middle-aged male, unemployed with pre-existing medical or psychiatric conditions, history of drug abuse and previous attempt of suicide. Post-mortem neck findings have a significant role in making a distinction between the different alleged manners of hanging deaths. The post mortem findings are generally limited to neck findings associated with the ligature material utilised by the victim or the perpetrator. There is limited data of socio-demographic profile on suicide, accidental and homicide hanging deaths in South Africa and the Limpopo Province.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

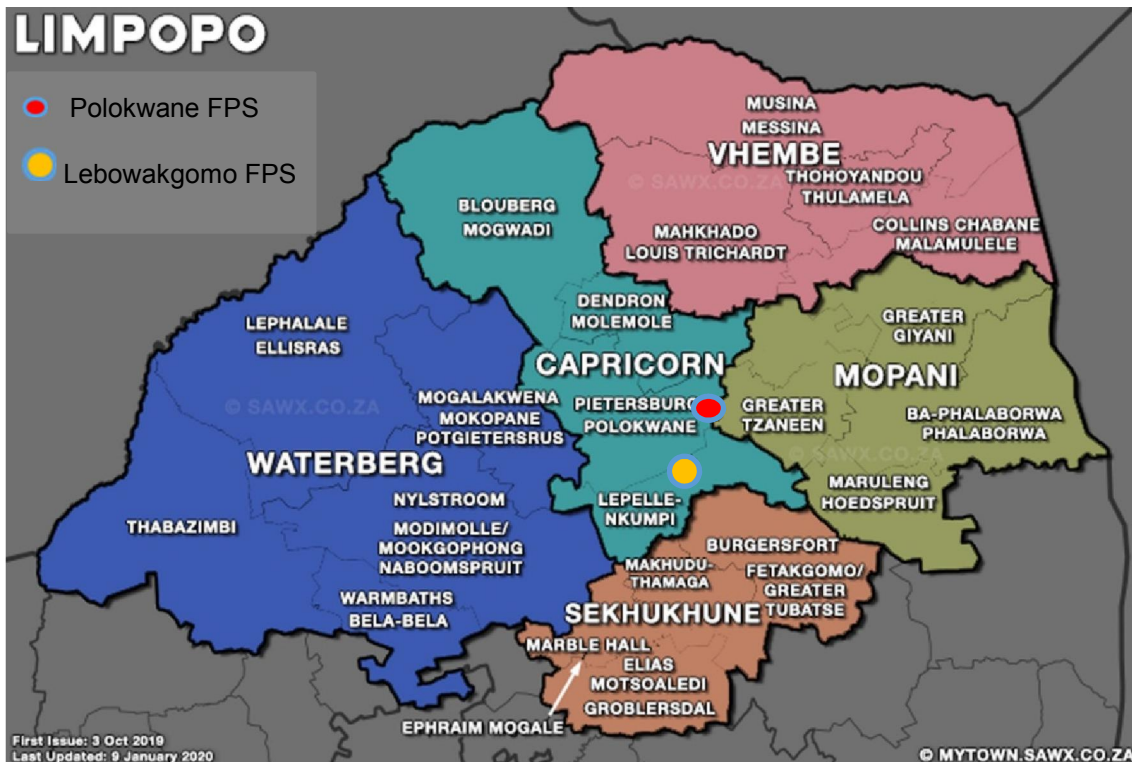
The chapter discusses the research methodology utilised in the study, which includes research design, research setting, study population and sampling. The chapter further describes how the data was collected and analysed. The validity, reliability and ethical consideration are also detailed in this chapter.

3.2 Research design

This was a retrospective quantitative descriptive study. The study utilised numerical data to answer the research question and describe characteristics of the population being investigated (Leedy & Ormrod, 2015, Joubert & Ehrlich, 2007). This was achieved by objectively measuring and describing variables of hanging deaths by utilising numerical values to determine the socio-demographic profile of the hanging deaths (age, gender and occupation), the timing of the hanging deaths and the post mortem findings of hanging deaths admitted to Polokwane and Lebowakgomo Forensic Pathology Service laboratories.

3.3 Research setting

A study was conducted on medico-legal cases of hanging deaths performed at Polokwane and Lebowakgomo Forensic Pathology Service laboratories of the Limpopo province (Figure 3.1). The facilities are located in the Capricorn district of the Limpopo province. These facilities admit unnatural deaths that must undergo medico-legal investigation, which also include hanging deaths from the Capricorn district, parts of Mopani and Sekhukhune districts.



<https://sawx.co.za/province-district-municipality-maps/>

Figure 3.1 Map of Study setting: Limpopo Province showing the different districts

3.4 Study population and sampling

3.4.1 Study population

Study population is defined as the entire group of people that meet the criteria that the researcher is interested in studying (Brink, van der Walt & van Rensburg, 2012). The population of the study comprised of all hanging deaths admitted at Polokwane and Lebowakgomo Forensic Pathology Service laboratories for medico-legal investigation.

3.4.2 Sample size and technique

A sample is a group that is selected from the study population, which is representative of the target study population (Brink et al., 2012; Jacobsen, 2017; Kumar, 2011). The sample frame comprised of all hanging cases examined during the period of 01 January 2018 up to 31 December 2019. There was an estimated 260 cases of alleged hanging deaths in Polokwane and Lebowakgomo Forensic Pathology Service laboratories over 2 years according to the Forensic Pathology Services statistics available at the time. The sample size was calculated using the Yamane formula (1967). The formula components where n - refers to sample size, N - refers to population size and e - refers to error term (which is a constant: 0.05). This accounted for error margins.

$$n = \frac{N}{1 + Ne^2}$$

$$= \frac{260}{1 + 260(0.05)^2}$$

$$= 158$$

The minimum sample size required was calculated to be 158 case records.

A sample was selected from the population using systematic random sampling from the study population of 318 case records. This was achieved by randomly selecting a starting point from the population list, which was at number 08 on the list of case records of the population of the study. Thereafter, the case records were chosen following sampling interval of 1 as calculated using the sampling interval formula: $K = \frac{N}{n}$. The total number of case records selected was 159 where the minimum sample required was 158.

Inclusion criteria

- All hanging deaths between 01 January 2018 and 31 December 2019 were included in the study.

Exclusion criteria

- Decomposed hanging cases including hanging cases that do not have an ascertained cause of death at the time of post-mortem examination were not included in this study.
- Hanging cases with incomplete data were excluded from the study. The missing data of the hanging cases may introduce bias.
- Referral cases from other districts that are not part of the study setting were not included in the study.

3.5 DATA COLLECTION AND STUDY TOOL

The researcher used secondary data retrieved from Polokwane and Lebowakgomo Forensic Pathology Service laboratories case records. The data was retrieved from the case records and used data from South African Police (SAP) 180 form, scene forms, Department of Home Affairs (DHA) 1663 form and post mortem reports of hanging deaths.

The SAP 180 form is a form completed by the investigating officer at scene of crime. The SAP 180 form details information of the location of the death, the alleged manner of the death, timing of death that included the time of day, day of the week and month of the year. The scene form provided information on the scene of the deaths and timing of death. The DHA 1663 form supplied demographic information of the deceased including age, gender and occupational status. The relatives of the deceased supplied the information on the DHA 1663 form. The researcher retrieved post-mortem findings from post mortem reports that include ligature material used and post mortem neck findings.

A data collection tool (see Annexure A) was utilised to collect data from the case records of the Polokwane and Lebowakgomo FPS laboratories. The researcher developed the data collection tool after exhaustive review of the

relevant literature. The data collection tool detailed socio-demographic profile (age, gender and occupation), the timing of the hanging deaths (time of day, day of the week and season) and post mortem findings (scene findings and autopsy findings). The data collection tool was revised due to extensive list of types of occupation as advised by the statistician.

3.6 Data analysis

The collected data was captured on excel and analysed using Statistical Software for the Social Science (SPSS) version 26.0. The variables were documented in graphs, pie charts, tables and the variables were presented as percentages. Cross tabulation, analysis was used to understand the correlation between socio-demographic and time with post mortem outcome of the hanging deaths. The continuous variables were expressed as mean +/- SD.

3.7 Reliability and Validity

Reliability refers to the degree that the collection data tool can be relied upon to yield similar results if used repeatedly (Brink et al 2012; Leedy & Ormrod 2015). A pilot study was conducted before the commencement of the study on a few alleged hanging cases to ascertain the reliability and of the data collection and to reduce bias. The following were recognised during the pilot study. The ages of the deceased were initially listed individually. However, for purposes of ease of analysis and reporting, the ages of the hanging victims were grouped according to age groups. The occupations were grouped into formal and informal employment for ease of analysis. The other types of occupations were pensioners, scholars and students. There were cases where the ligature, ligature knot and ligature marks were not described in detail and the data collection tool was modified to include other ligatures, ligature knot and ligature mark. The location of deaths was expanded to include more indoor and outdoor areas. In addition, the types of ligatures were also expanded including ties and bathrobe belts. This was to ensure that the data is adequately represented and

also attempt to limit bias. After the pilot study, the results were discussed with the supervisor and co-supervisor and the contents were changed accordingly.

Validity of the instrument seeks to ascertain that the instrument accurately measures what it is supposed to measure (Brink et al., 2012; Leedy & Ormrod 2015). To ensure this the researcher discussed the contents of the data collection tool with the supervisor.

3.8 Bias

Bias refers to influence of any condition, or group of conditions that distort the data obtained or conclusion drawn from research (Leedy & Ormrod, 2015). Bias can be introduced in different ways to the study. Sampling bias can occur when the population being studied is poorly represented. Sampling bias was avoided by using systematic random sampling of cases diagnosed as hanging deaths during the period of the study (Joubert & Ehrlich, 2007; Leedy & Ormrod, 2015). Bias may be unavoidable if there is missing information from the case records.

Instrumentation bias is encountered when measuring instrument distorts results obtained during research process (Leedy & Ormrod, 2015). The data collection tool was modified accordingly following the pilot study and the data was collected as indicated in the case records. This will assist in limiting instrumentation bias.

3.9 Ethical consideration

3.9.1 Ethical clearance

The researcher obtained ethical clearance from Turfloop Research Ethical Committee (TREC) before the commencement of the study (Annexure B). Permissions to conduct the study were further obtained from the Limpopo Provincial Department of Health (Annexure C), with further clearance from

Pietersburg-Mankweng Research Ethical Committee (Annexure D). For access to records, authorization was obtained from the Department of Forensic Pathology and the Pietersburg Tertiary Hospital management. Informed consent was not required as case records were utilised. Waiver of consent was sought and granted by Pietersburg-Mankweng Research Ethical Committee.

3.9.2 Right to privacy and confidentiality

Privacy in research is maintained by providing anonymity to the participants (Trochim, Donnelly & Arora, 2016). Anonymity is the assurance that no one will be able to link data to a specific participant (Trochim et al., 2016). Anonymity was achieved by using the post mortem number only as a guide to collect data. The post-mortem numbers were coded on a separate data sheet, thus ensuring the anonymity of the hanging death victim.

Trochim et al. (2016) describe confidentiality as the researcher's promise not to share personal information of the participants with anyone outside the study. The participant's personal information was not used during data collection. Confidentiality in the study was ensured by keeping the collected data in a secure office at Polokwane and Lebowakgomo Forensic Pathology Service laboratories. The data was saved in a computer with controlled access that was only available to the researcher and supervisors.

3.9.3 Non-maleficence and beneficence

The researcher avoided non-maleficence by ensuring the data collected was reported in a manner that no harm was inflicted to the families of the deceased (Brink et al., 2012; Jacobsen, 2017).

The study's conclusions and recommendations will benefit the communities of the surrounding areas of Polokwane and Lebowakgomo FPS laboratories in

identifying and preventing potential hanging deaths (Brink et al., 2012; Trochim et al., 2016).

3.9.4 Respect and dignity

The researcher maintained dignity and respect of the victims of hanging deaths by ensuring that the secondary data utilised during research is anonymous. The data collected was handled with respect and dignity and ensuring that no harm is experienced by the surviving relative of the hanging victims.

3.10 CONCLUSION

The study used quantitative descriptive methods to determine profile of hanging deaths in Polokwane and Lebowakgomo FPS laboratories. This was achieved by collecting secondary data from case records using collection data tool developed by the researcher. The data was analysed using SPSS statistical software version 26.0. The reliability of the collection tool was ensured by conducting pilot study prior to conducting the study. Prior to commencement of the study relevant ethical clearance were obtained.

CHAPTER 4

PRESENTATION AND INTERPRETATION OF RESULTS

4.1 INTRODUCTION

The study profiled hanging deaths in Polokwane and Lebowakgomo Forensic Pathology Service laboratories in the Limpopo province. The socio-demographic profile, timing and the post mortem findings of the hanging death victims were analysed and interpreted in numerical values. The chapter will present and interpret the analysed data.

4.2 DATA ANALYSIS AND RESULTS

The socio-demographic profile included age, gender and occupation of the hanging death victims that were investigated. The timing (time, day, month and season), post mortem findings and alleged manner of death of the hanging victims were also investigated.

4.2.1 Demographics of the hanging deaths

Age of the hanging victims

The majority of the hanging deaths victims (figure 4.1) in the study were aged between 20-29 years 33%, followed by hanging victims between 30-39 years (18%), 40-49 years (16%), 50-59 years (12%) and followed by victims above 60 years of age contributed 11% of the hanging. The hanging victims between 11-19 years were 10% and 0-10 years made up 1% of the hanging death victims.

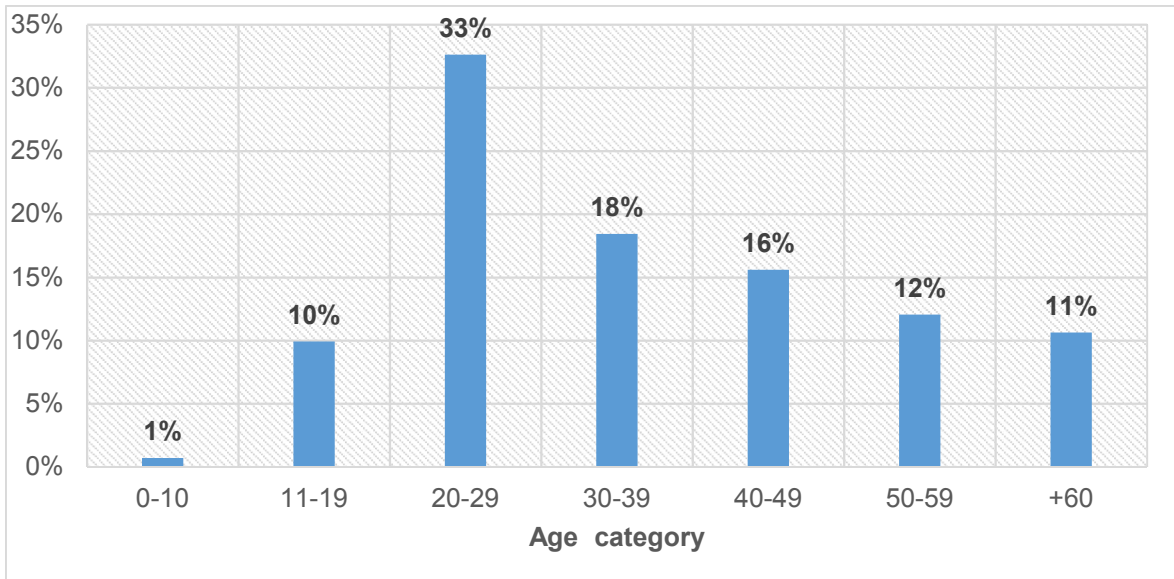


Figure 4.1 Hanging death victims according to age category

Gender of hanging death victims

The study had 141 hanging death victims. The majority of the hanging death victims as depicted in figure 4.2 were males 84% and females hanging death victims were 16%.

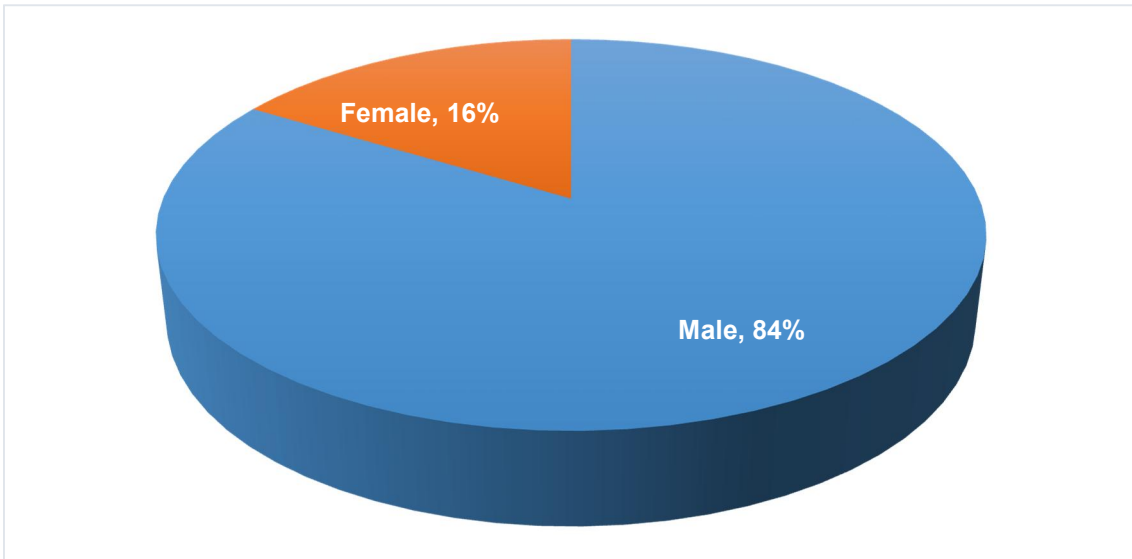


Figure 4.2 Gender of hanging death victims

Occupation of hanging death victims

The majority of the hanging death victims in the study (figure 4.3) were unemployed (40%), followed by informal employment (20%) and scholar (15%). Pensioners were (11%), formal employment (9%) and the least victims were (3%) students. The occupation of the hanging victims was unknown in (1%).

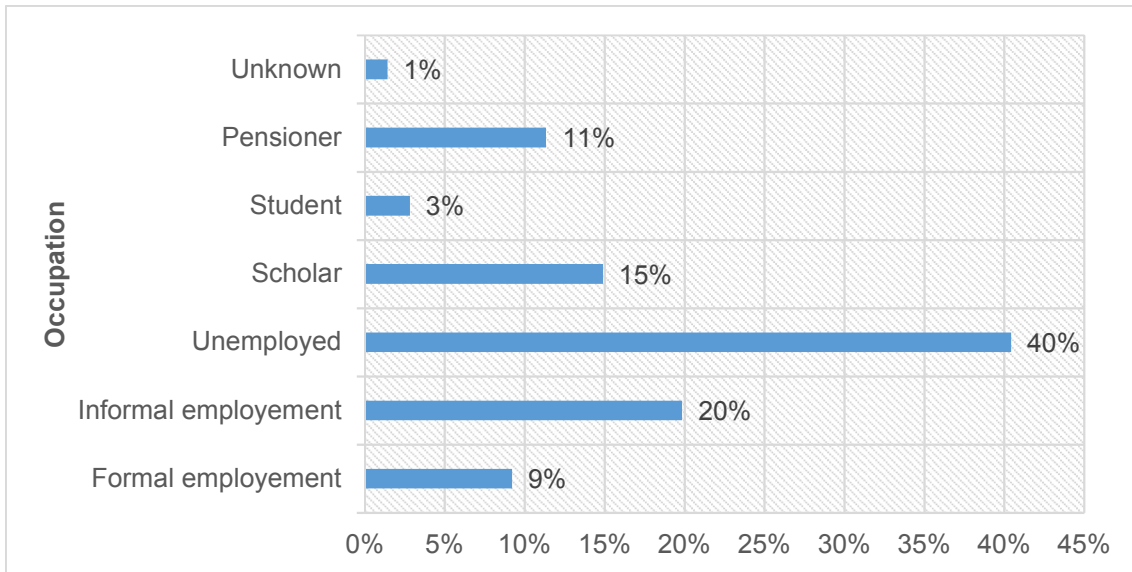


Figure 4.3 Summary of occupation of hanging deaths victims

4.2.2 Timing of the hanging deaths

The majority of hanging death victims 43% in the study (figure 4.4) were discovered in the morning (06:00-11:59), followed by 23% in the afternoon (12:00-17:00) and night (20:01-5:59) 20% with the least 11% of hanging victims discovered in the evening (17:01-20:00).

The majority of hanging death victims in the study (figure 4.5) were discovered on Friday (17%), followed by Saturday (16%) and Sunday (16%) and the least of the hanging death cases were discovered on Monday 11%.

Hanging deaths predominantly occurred in February (12%), followed by December (11%), January and October 10%. The majority of hanging deaths occurred in summer (33%), also in winter and spring (23%) seasons.

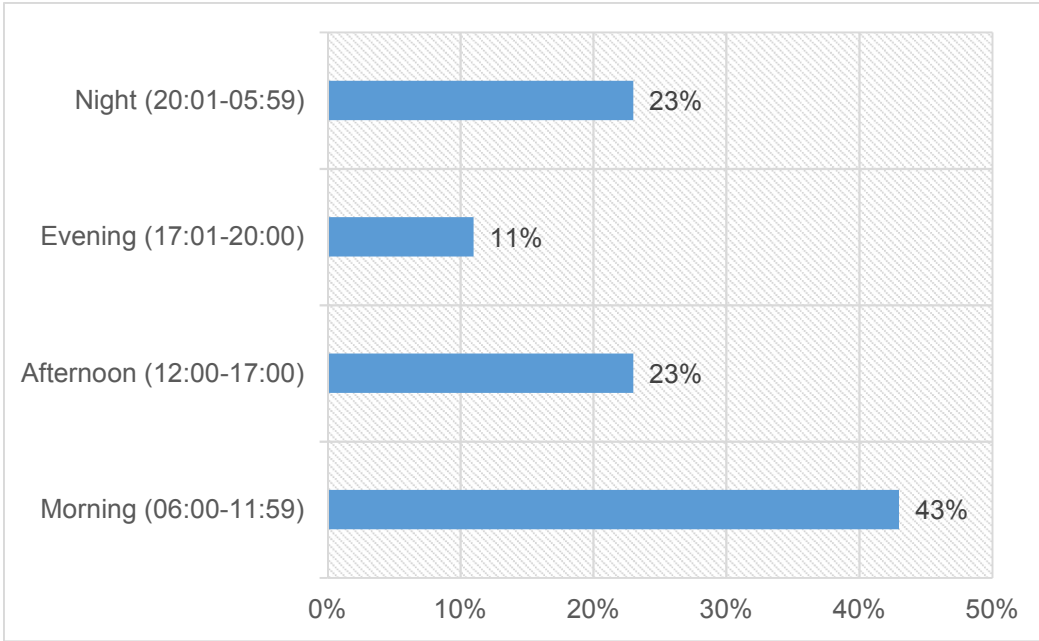


Figure 4.4 Time of day of hanging deaths

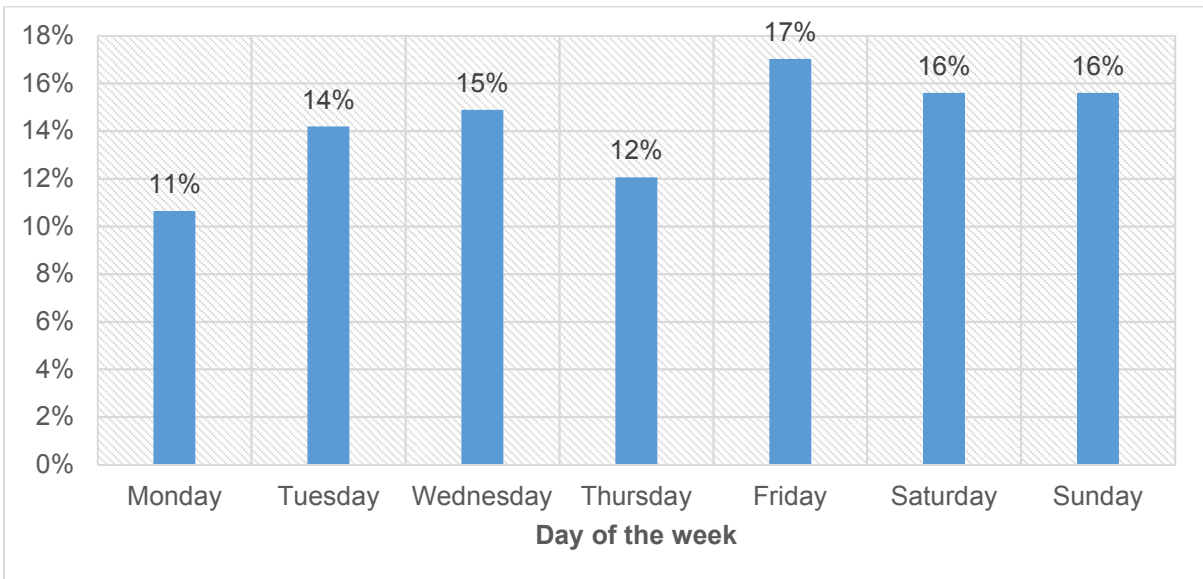


Figure 4.5 Day of the week of hanging deaths

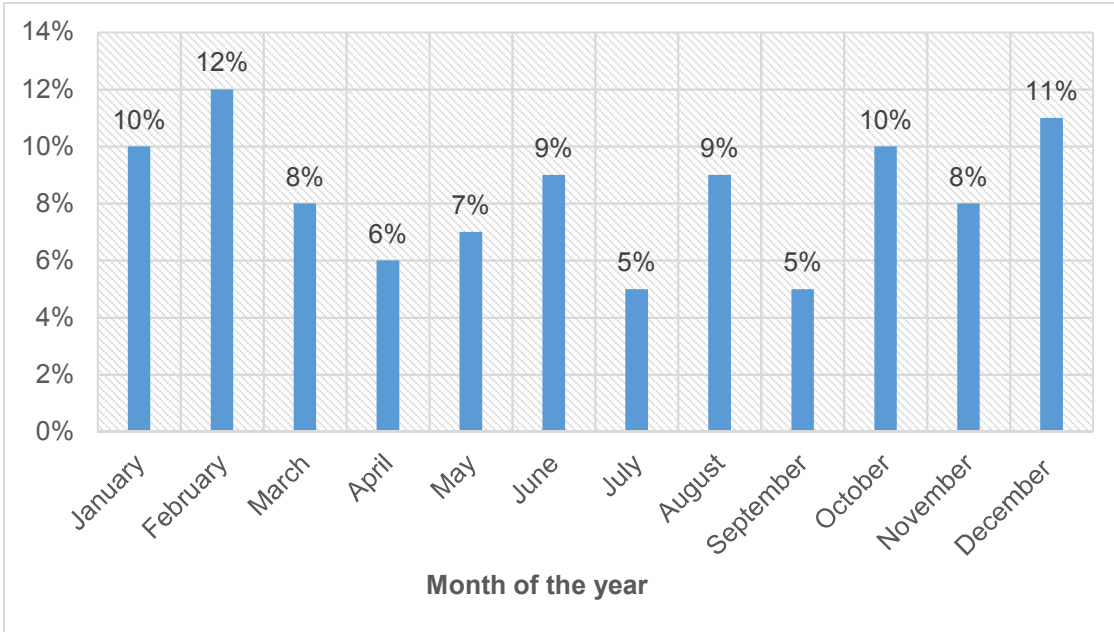


Figure 4.6 Time of hanging deaths in months

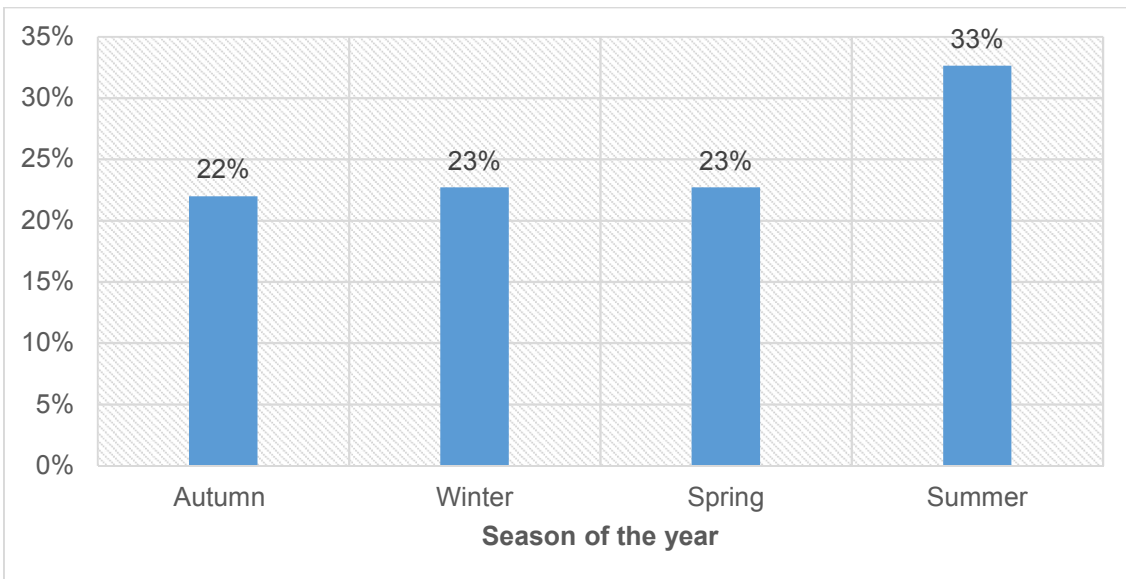


Figure 4.7 Seasonality of the hanging deaths

4.2.3 Post mortem findings

The majority of the hanging deaths 83% occurred indoors (home, office, classroom, hospital, etc.) and the remaining 17% occurred outdoors, as shown in Table 4.1. Most hanging deaths used firm ligature material such as rope (52%) and electric cord (16%), whilst for soft ligature material the hanging

victims used scarf (33%). Slip ligature knot was seen in 68% of all hanging deaths in the study.

Table 4.1: Frequency and percentage of scene of death, ligature material and ligature knot.		
	Frequency	Percentage %
Scene of death		
Outdoor	24	17
Indoor	117	83
Firm ligature material		
Belt	9	7
Electric cord	21	16
Rope	68	52
Wire	19	14
Others	15	11
Soft ligature material		
Scarf	3	33
T-shirt	1	11
Trousers	1	11
Gown	1	11
Jacket	1	11
Others	2	22
Ligature knot		
Fixed	26	18
Slipknot	96	68
Unspecified	19	14

In this study, the location of the ligature mark on the neck was above thyroid gland in 90% of the cases as shown in Table 4.2. The ligature mark was visible in 97% of the hanging death victims. I think it is important to note that majority (96%) of hanging death cases had no other external neck injuries. Nonetheless, it can be deduced that linear abrasions accounted for (4 out of 5 cases = 80%) of the other external injuries observed. Sternocleidomastoid muscle accounted for 37% of the internal neck injuries identified, whilst hyoid bone fractures and injuries to the strap muscles contributed 18% of the internal injuries documented in the study. The predominant manner of death (99%) of the hanging deaths was alleged suicide.

Table 4.2: Frequency and percentages of external neck injuries, internal neck injuries and alleged manner of deaths.

Table 4.2: Frequency and percentages of external neck injuries, internal neck injuries and alleged manner of deaths.		
Location of the ligature mark		
Above thyroid cartilage	127	90
Level of thyroid cartilage	10	7
Below thyroid cartilage	1	1
Other	3	2
Ligature appearance		
Visible	137	97
Faint	4	3
Other external neck injuries		
Linear abrasions	4	3
Crescent abrasions	1	1
No external injuries	136	96
Internal neck injuries		
Strap muscle injuries	2	18
Sternocleidomastoid muscle injuries	4	37
Thyroid gland injuries	1	9
Thyroid cartilage fracture	1	9
Hyoid bone fracture	2	18
Carotid artery injuries	1	9
Alleged manner of death		
Suicide	139	99
Homicide	2	1
Accident	0	0

Table 4.3 shows whether there was any relationship between indoor hanging, age groups, gender and occupation. It showed absence of statistically significant relationship between age groups, gender and occupation with indoor hanging (P-value > 0.05). This implies that indoor hanging is unaffected by age, gender, or employment.

Table 4.3 Indoor vs age, gender or occupation			
	Indoor		Chi-square P-value
Age	No	Yes	0.378
0-19	2 (8%)	13 (11%)	
20-29	8 (32%)	38 (33%)	
30-39	6 (24%)	20 (17%)	
40-49	6 (24%)	16 (14%)	
50-59	3 (12%)	14 (12%)	
+60	0 (0%)	15 (13%)	
Gender			0.963
Male	21 (84%)	97 (84%)	
Female	4 (16%)	19 (16%)	
Occupation			0.092
Formal employment	0 (0%)	13 (11%)	
Informal employment	5 (20%)	23 (20%)	
Unemployed	15 (12%)	42 (36%)	
Scholar	3 (12%)	18 (16%)	
Student	1 (4%)	3 (3%)	
Pensioner	1 (4%)	17 (15%)	

4.3 DISCUSSION OF RESEARCH FINDINGS

The research profiled hanging deaths admitted to Polokwane and Lebowakgomo Forensic Pathology Services, Laboratory to identify the ages of the hanging deaths, the timing and the post-mortem finding of the hanging deaths.

4.3.1 Demographics of the hanging death

Age of the hanging victims

The study revealed that the predominant age group for hanging deaths was between 20-29 years of age and 99% of the hanging deaths were suicide. There were slight variations from this study compared to different parts of the world like Bangalore where hanging deaths occurred between 31-40 years of age (Ambade et al., 2015a; Rao, 2016; Taktak et al., 2015). The WHO (2019) reports an increase of suicide death in victims aged between 15 and 29 years of age, which is similar to the current study. Hanging deaths in Turkey were between 21-49 years of age, where there was a slight variation to the current study (Taktak et al., 2015). The reasons for the variations were not stipulated in

the literature. However, it is the researcher's opinion that there may be cultural and economic factors determining the peak age incidence in the different regions.

The study showed hanging victims of less than the age of 10 contributed only a small percentage of the participants. There were few reported hanging victims in literature of less than 10 years of age, which was consistent with the findings of the current study (Ambade et al., 2015a, Rao, 2016). Furthermore, few hanging death victims between ages of 11 and 19 were observed in the current study. Similar findings were reported by Ambade et al. (2015a). The contributing factors to alleged suicide hanging deaths are varied which include depressive disorders especially in females and children that are victims of bullying. The hanging victims above 60 years of age were few in the study. A study by Ambade (2015a) revealed that hanging deaths victims older than 60 years of age were slightly lower compared to the current study.

In the study, few cases were alleged homicidal hanging deaths. This is consistent with literature (Monticelli et al., 2015; Sharma et al., 2011). Literature shows that the age of the alleged homicide-hanging deaths varies depending on the circumstances of the homicide, in the current study there were only 2 alleged homicide hanging victims which differed in age (Monticelli et al., 2015; Sharma et al., 2011). The first case of alleged homicide hanging death was that of a 5 year old child who was hanged by the father following an altercation with the mother of the child. The second case was that of a 20 year old male hanged by unknown people after he was subdued and there was presence of other external injuries.

Ultimately the majority of the cases encountered are alleged suicide hanging deaths as a consequence suicide hanging deaths are thoroughly researched (Zátópková et al., 2018). Moreover, the ages of the hanging victims vary depending on the manner of death (AlBuhairan et al., 2015).

Gender of hanging victims

There was a predominance of male hanging victims in the study, which is consistent with literature. This is evidenced in the literature which illustrates that there is a male predominance of hanging deaths globally and locally regardless of the alleged manner of death (AlBuhairan et al., 2015; Ambade et al., 2015a; Doberentz et al., 2019; Kumral et al., 2014; NIMSS, 2013; Sharma et al., 2011; Smith, 2021; Tugaleva et al., 2016). The male predominance of hanging deaths maybe attributed to the fact that men are generally prone to be involved in violent and dangerous behaviour (Engelbrecht et al., 2017). There were variations reported in literature where a study by Rao (2016) showed an equal number of male and female victims whilst there was female predominance in study conducted by Bhosle et al. (2015). The likely contributor to increased number of female victims might be psychological disorders.

Occupation of the hanging victims

The current study revealed that the majority of the hanging death victims were unemployed. The findings are not startling, as there is a persistent increase in the unemployment rate in South Africa with the highest unemployment experienced between ages 15-24 (Maluleke, 2021). Therefore, the high number of unemployed victims is expected, as unemployed victims are known to have high-risk factors for alleged suicide hanging deaths (WHO, 2014). This may be attributed to increased psychosocial stressors associated with unemployment and suspected lack of purpose and feelings of failure.

The informally employed victims (self-employed, mechanics, gardener, maids, street vendors, hair dressers, casual construction workers brick layers, casual farm workers: vegetable/ fruit pickers) showed a considerable number of hanging victims followed by formally employed hanging death victims (health, agriculture, education, finance, information technology) in the study. Employed victims show a variety of risk factors depending on whether the victims are

formally or informally employed (Lavender et al., 2016). The reasons may range from instability of the informal employment of the income, including the seasonality of the employment. Studies show that the repair and maintenance industry, media, entertainment, health care industry and government employees have a high propensity for alleged suicide hanging deaths and this is attributed to the high-pressure environment of the workplaces (Lavender et al., 2016; Tulapunt et al., 2017). The findings regarding occupation of the hanging death victims may differ because the study is conducted in a developing country and predominantly rural area.

4.3.2 Timing of hanging deaths

The majority of the hanging death victims were discovered in the morning (06:00-11:59) in the current study. Tulapunt et al. (2017) reported that in Bangkok the majority of the hanging deaths occurred between 06:00 am and 06:00 pm. However, the study did not outline the methods employed to determine the time of death. In South Africa, there are reports that the majority of hanging deaths occur between 12h00-15h00 and 08h00-11h00 in Gauteng and Mpumalanga provinces. The reasons for the time of death reported are not clearly stipulated (NIMSS, 2013a; NIMSS, 2013b). The reason of the discovery of the hanging death victims in the morning may be that the deaths occurred during the night although it is difficult to determine the precise time of death, as the deaths were not witnessed.

The majority of the hanging death victims were discovered more frequent on weekends. There a stark contrast to literature where alleged suicide hanging deaths occurred on Mondays, Wednesday and Saturdays (Ambade et al., 2015a; NIMSS, 2013; Russo et al., 2016; Tugaleva et al., 2016). Russo et al. (2016) cite that reasons for deaths to occur on Monday may be associated with the stress of the upcoming week for employed people and depression caused by the absence of active role in society in unemployed hanging victims.

The hanging deaths occurred throughout the year peaking in February, followed by December, January and October. The peak season of the hanging deaths was summer, which is in keeping with literature (Russo et al., 2016; Tugaleva et al., 2016). However, of note there was an equal distribution of the hanging deaths in winter and spring with slight decline in autumn. The reasons for preponderance for spring and summer were attributed to biochemical changes in the body due to exposure to environmental factors like sunlight and elevated temperature (Silveira et al., 2016).

4.3.3 Postmortem findings of hanging death victims

Scene of death findings

Significant percentage of the hanging deaths occurred indoors (home, office, classroom, hospital, etc.) and the remainder of the hanging deaths occurred outdoors. The findings were consistent with literature as majority of the deaths were indoors because the victims require privacy (Ambade et al., 2015b). Few cases were found in public or outdoor location like agricultural farms, secluded land, forests or mountains. Tugaleva et al. (2016) and Russo et al. (2016) show that hanging deaths also occur in prisons, in patients admitted in a psychiatric hospital and rarely in motor vehicles.

There were no documented cases of alleged accidental hanging deaths in the current study. The reason for this may be that accidental deaths are rarely encountered and the deaths can be incorrectly classified as suicide deaths. However in circumstances like hanging deaths at a playground or deaths during autoerotic misadventures which may be highly suggestive of accidental hanging deaths (Kumral et al., 2014; Monticelli et al., 2015; Tugaleva et al., 2016; Tulapunt et al., 2017). The researcher could not identify any circumstances that may be suggestive of alleged accidental deaths as there were no alleged accidental hanging deaths documented in the study.

Autopsy findings

The autopsy findings are divided into different areas which include the ligature material as well as associated neck injuries (Ambade et al., 2015b; Zátopková et al., 2018). Most hanging death victims used firm ligature material such as rope, electric cord and wire, whilst for soft ligature material the hanging death victims used scarf. The reason preponderance to use firm ligature may be ease of access and the fact that the ligatures are inexpensive. A slip ligature knot was seen in majority of the hanging deaths in the study. The study findings are consistent with studies that show ligature of choice in alleged suicide hanging deaths is firm material followed by soft material like clothing material (Rao, 2016). However, the type of ligature knot in the current study is not consistent with other literature that reveal the common ligature knot is fixed (Ambade et al., 2015a; Lockyer, 2019; Tulapunt et al., 2017). The preference to use a slip knot in the current study could not be ascertained however, it may be assumed that the hanging victim's choice was guided by personal preference and ease of use. Furthermore, the reasons to use a fixed knot during the hanging deaths was not clearly stated in literature.

Similar ligature materials are used in alleged homicide hanging deaths with a fixed knot however, there may be interposition of the surrounding clothing or hair into the knot (Monticelli et al., 2015). The alleged homicide deaths did not show any atypical findings on the neck in the study.

In this study, the location of the ligature mark was above thyroid cartilage prominence. The ligature mark was visible in majority of the hanging death victims. Literature reports the neck ligature mark of alleged suicide and accidental hanging deaths are classically located above the thyroid cartilage on the anterior aspect of the neck (Karbeyaz et al., 2017; Lockyer, 2019; Rao, 2016; Tulapunt et al., 2017). Few of the hanging death cases showed linear abrasions on the neck. There may be associated linear abrasions on the skin,

which may represent self-rescue attempts (Payne-James, Jones, Karch & Manlove, 2011).

Sternocleidomastoid muscle injuries were observed in majority of the internal neck injuries documented. There were injuries to the strap muscles of the neck, thyroid gland and carotid artery. Fractures to hyoid bone and thyroid cartilage were also identified. The internal findings in the study were consistent with literature. Internal neck findings of alleged suicide hanging deaths and alleged accidental hanging deaths are minimal (Tugaleva et al., 2016). Lockyer (2019) states that injuries sustained on the neck structures are due to traction or pressure from the ligature. The injuries include strap muscles haemorrhage, laryngohyoid bone fracture, thyroid gland haemorrhage, carotid arteries and jugular vessels injuries and rarely cervical spine fracture.

4.4 CONCLUSION

The study demonstrated that there is a male predominance of hanging death victims compared to female victims. The hanging victims are aged between 20-29 and the least of the hanging victims were less than 10 years of age. The majority of the hanging death victims were unemployed with the least of the victims as students. The hanging death victims were from Friday to Sunday with peak times between 06:00-11:59 (morning). The hanging deaths occurred throughout the year peaking in February, December, January and October consecutively.

Majority of the victims used firm ligature material with rope as predominant firm and belt as the least firm ligature of choice. The soft ligature material used by majority of the hanging victims was a scarf. The external ligature mark was located above thyroid cartilage in greater number of the hanging cases with few of the cases at the level and below thyroid cartilage. The internal injuries sustained were predominantly on the sternocleidomastoid muscle and least documented injuries were on the thyroid cartilage and thyroid gland. The

predominant alleged manner of death was suicide with few cases of homicide hanging deaths. There were no reported cases of accidental hanging deaths. Furthermore, relationship between indoor hangings, demographic profile of the hanging victims was explored. The choice of indoor hanging is unaffected by age, gender, or employment.

CHAPTER 5

SUMMARY, RECOMMENDATIONS AND CONCLUSION

The chapter will summarize the findings of the study, recommendations, limitations and conclusion.

5.1 SUMMARY OF THE STUDY

Hanging deaths admitted to Polokwane and Lebowakgomo FPS laboratories were profiled in the study. A quantitative retrospective descriptive study was conducted which aimed to provide a profile of hanging deaths in Polokwane and Lebowakgomo Forensic Pathology Service laboratories in the Limpopo Province.

There was a population of 318 hanging death cases, from where a sample was selected using systematic random sampling method. The final sample size was 141 due to exclusion of cases that did not meet the inclusion criteria. The study revealed that there was male predominance of the hanging death victims. The majority of the hanging deaths occurred in adults between 20-29 years of age and the victims were unemployed.

The majority of the hanging death victims were discovered in the morning (06:00-11:59). However, the precise time of death could not be ascertained as the deaths were not witnessed. The hanging deaths occurred over the weekend and peak season was summer. Hanging death victims predominantly used firm ligature material that had slipknot. The post-mortem neck findings were a visible ligature mark, located above thyroid cartilage and a few of the cases had associated injuries on the internal neck structures. The manner of death of the cases was predominantly suicide with few homicide hanging deaths and accidental cases were not reported.

5.2 RECOMMENDATIONS

The study identified that there is male predominance of hanging death victims and various age groups are affected by hanging deaths, which include elderly and children. The majority of the hanging death identified is unemployed, which may be the one of the risk factors. The timing of the hanging deaths in the study occurred over the weekend and during the summer season. The data on demographic profile and timing of the hanging deaths may be disseminated to department of social services, department of health and relevant government officials (local and provincial). The information may be used by relevant authorities to formulate and subsequently disseminate the information to community regarding risk factors and possible preventative strategies of hanging deaths. The strategies developed may be implemented in attempt to reduce premature deaths as outlined by the Sustainable Development Goals targets.

The post mortem findings identified predominant use of firm ligature, associated ligature mark above the thyroid cartilage prominence and in a few cases injuries to the neck muscles and laryngo-hyoid. The ligature materials used indicate that the ligatures are inexpensive and easy to access. Furthermore, the study revealed that the prominent manner of death in the hanging death was suicide. The data of autopsy findings of hanging deaths will add on the existing body of literature in the forensic pathology practice. Furthermore, the data of post mortem findings will assist the relevant authorities to have in-depth understanding of the methods used during the hanging deaths as the majority of the hanging deaths were suicide. The information can contribute in improvement of the existing preventative strategies and coping mechanisms which are relevant to the local community.

Forensic medical practitioners are encouraged to perform meticulous examination of hanging death cases. Furthermore, the autopsy findings must be described in detail following the post-mortem examination. This may be achieved by continued evaluation of standard autopsy practices and auditing of

the post-mortem reports. The evaluation of post mortem records will allow forensic medical practitioners to improve quality of the post mortem techniques and the quality of reporting of post mortem findings in the hanging death cases.

5.3 RESEARCH LIMITATIONS AND DELIMITATIONS

The first limitation was unavailability of some of the case records of hanging deaths. The study was a quantitative retrospective study which made it difficult to retrieve all the case records. This resulted in reduction of the sample size. The reduction in sample size may introduce bias by giving underrepresentation or over presentation of results.

Furthermore, from the cases that were retrieved for the study, some of the case records had missing information. The missing information was due inadequately captured information in the case records. There was also poor documentation of ligature type and some of the external neck injuries including description of the ligature mark. The poor documentation of the information may introduce bias. Therefore, the findings were classified as unspecified. In addition, timing of the hanging deaths could not be ascertained, as the hanging deaths were not witnessed. The manners of death were not ascertained, as the hanging cases did not include the outcome of the inquests from the Department of Justice.

Delimitations of the study included unavailability of toxicology analysis results as the results may have a pivotal role in assisting to differentiate between the different manners of death. The toxicology analysis may contribute as a risk factor in determining risk factors of hanging death especially in accidental deaths. The toxicology results were excluded from the study because of the unavailability of the results due to delayed turnaround time by chemistry laboratory.

Psychological autopsy was not done. Psychological autopsy would have provided further information of the hanging death victims (previous suicide

attempts, extensive medical history) and there will be better understanding of the risk factors in the different alleged manners of deaths. In the future, studies can include psychological autopsy with collaboration of other stakeholders including the department of social services.

A future study can be conducted that will include psychological autopsy and toxicology analysis for extensive in-depth analysis of the possible risk factors of the different manners of death of hanging deaths Limpopo and other provinces. A multi-disciplinary approach is required to identify, reduce and/ or prevent the untimely hanging deaths.

5.4 CONCLUDING REMARKS

The profile of hanging deaths admitted to Polokwane and Lebowakgomo Forensic Pathology Services was studied. The socio-demographic profile, timing and pattern of the neck injuries of the hanging deaths were identified as indicated in the literature. It is the researcher's opinion that further research is required to supplement the findings and overcome the limitations and delimitations of the current study which will aid in preventing hanging deaths especially in the vulnerable groups.

REFERENCES

- AlBuhairan, F, AlMutairi, A, Al Eissa, M, Naeem, M & Almuneef, M. 2015. Non-suicidal self-strangulation among adolescents in Saudi Arabia: case series of the choking game. *Journal of Forensic and Legal Medicine* 30:43-45.
- Ambade, V.N, Dayanand, K, Tumram, N, Meshram, S, Pawar, M & Kukde, H. 2015a. Characteristics features of hanging: a study in rural district of central India. *Journal of Forensic Sciences* 60:1216-1323.
- Ambade, V.N, Tumram, N, Meshram, S & Borkar, J. 2015b. Ligature material in hanging deaths: the neglected area in forensic examination. *Egyptian Journal of Forensic Sciences* 5(3):109-113.
- From:<https://www.sciencedirect.com/ultmillen.ul.ac.za/science/article/pii/S2090536X1400046X> (accessed 06 June 2019).
- Auckloo, MBKM. 2016. A post-mortem toxicological investigation: understanding the role of drugs of abuse in violent fatalities in Cape Town, South Africa. MA (Biochemical Forensic Science) dissertation. University of CapeTown. Cape Town. From: <http://hdl.handle.net/11427/20515> (accessed on 6 December 2021)
- Bhosle, SH, Batra, AK & Kuchewar SV. 2014. Violent asphyxial death due to hanging: a prospective study. *Journal of Forensic Medicine, Science and law* 23(1):1-8.From:<http://mlam.in/pdf/currentissue/04-dr-sh-bhosale-violent-asphyxial-death-due-to-hanging.pdf> (accessed 12 December 2021).
- Bhosle, SH, Zanjad, NP, Dake, MD & Godbole, HV. 2015. Deaths due to hanging among adolescents - a 10 year retrospective study. *Journal of Forensic and Legal Medicine* 29:30-33.
- Brink, H, van der Walt, C & van Rensburg, G. 2012. *Fundamentals of research methodology for healthcare professionals*. 3rd edition. Cape Town: Juta & Company.

Dogan, KH, Demirci, S & Deniz, I. 2015. Why do people hang themselves on trees? An evaluation of suicidal hangings on trees in Konya Turkey, between 2001 and 2008. *Journal of Forensic Sciences* 60:87-92.

Doberentz, E, Markwerth, P & Madea, B. 2019. Differentiation of homicidal or suicidal strangulation. *Forensic Science International* 301:44-48. From: <https://www.sciencedirect.com/ultmillen.ul.ac.za/science/article/pii/S0379073819302506> (accessed 29 June 2020).

Engelbrecht, C, Blumenthal, R, Morris, NK & Saayman, G. 2017. Suicide in Pretoria: a retrospective review, 2007-2010. *South African Medical Journal* 107 (8):715-718. From: <https://www.ajol.info/index.php/samj/article/view/159602> (accessed 25 June 2019).

Fowler, KA, Jack, SPD, Lyons, BH, Betz, CJ & Petrosky, E. 2018. Surveillance for violent deaths- national violent death reporting System, 18 states, 2014. *Centers for Disease Control and Prevention: Morbidity and mortality weekly report* 67(2):1-36. From: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5829936> (accessed 13 June 2020).

Jacobsen, KH. 2017. *Introduction to health research methods: a practical guide*. 2nd edition. Burlington: Jones& Bartlett Learning.

Joubert, G & Ehrlich, R. 2007. *Epidemiology: a research manual for South Africa*. 2nd edition. Cape Town: Oxford University Press South Africa (Pty) Ltd.

Karbeyaz, K, Celikel, A & Balci, I. 2017. Suicidal hanging in Eskisehir, Turkey: 25 year analysis. *Journal of Forensic Research* 8:1-5. From: <https://www.researchgate.net/publication/321099219> (accessed on 11 November 2019).

Kootbodien, T, Naicker, N, Wilson, KS, Ramesar, R & London, L. 2020. Trends in suicide mortality in South Africa, 1997 to 2016. *International Journal of Environmental Research and Public Health* 17(6):1850. From: <https://doi.org/10.3390/ijerph17061850> (accessed 7 December 2021).

Kumar, R. 2011. *Research methodology: a step by step guide for beginners*. 3rd edition. London: Sage publications.

Kumral, B, Ozdes, T, Avsar, A & Buyuk, Y. 2014. Accidental deaths by hanging among children in Istanbul, Turkey: retrospective analysis of medicolegal autopsies in 33 years. *The American Journal of Forensic Medicine and Pathology* 35:271-274.

Lavender, A, Ramirez-Irizarry, V, Bayakly, AR, Koplan, C & Bryan, JM. 2016. Violent deaths among Georgia workers: an examination of suicides and homicides by occupation, 2006-2009. *American Journal of Preventative Medicine* 51:241-250. From: <https://www.sciencedirect.com/science/article/pii/S0749379716303014> (accessed 13 June 2020).

Leedy, PD & Ormrod, JE. 2015. *Practical research planning and design*. 11th edition. England: Pearson Education.

Lockyer, BE. 2019. Death by hanging: examination of autopsy findings and best approach to post-mortem examination. *Diagnostic Histopathology* 25:423-430. From: <https://www.sciencedirect.com/ultmillen.ul.ac.za/science/article/pii/S1756231719301021> (accessed 11 November 2019).

Map of Study setting: Limpopo Province and the different districts. 2020. From: <https://sawx.co.za/province-district-municipality-maps/> (accessed 26 September 2020).

Mohammed, AAQ. 2017. Hanging as a method of suicide: a retrospective study. *The Medical Journal of Basrah University* 35(2): 97-104. From: https://mjbu.uobasrah.edu.iq/article_134241.html (accessed 11 November 2019).

Monticelli, FC, Brandtner, H, Kunz, SN, Keller, T & Neuhuber, F. 2015. Homicide by hanging: a case report and its forensic aspects. *Journal of Forensic and Legal Medicine* 33:71-75.

National injury mortality surveillance system: *A profile of fatal injuries in Gauteng 2011*. 2013a. Medical Research Council.

From: <https://www.samrc.ac.za/reports/national-injury-surveillance-system-nimss> (accessed 29 May 2020).

National Injury Mortality Surveillance System: *A profile of fatal injuries in Mpumalanga 2011*. 2013b. Medical research Council. From: <https://www.samrc.ac.za/reports/national-injury-mortality-surveillance-system-nimss> (accessed 29 May 2020).

Nouma, Y, Ben Ammar, W, Bardaa, S, Hammami, Z & Maatoug, S. 2016. Accidental hanging among children and adults: a report of two cases and review of the literature. *Egyptian Journal of Forensic Sciences* 6:310-314. From: <https://www.sciencedirect.com/science/article/pii/S2090536X15000519> (accessed 17 March 2019).

Oxford Advanced Learner's Dictionary. 2006. Sv "accident". 7th edition. New York: Oxford University Press.

Oxford Advanced Learner's Dictionary. 2006. Sv "profile". 7th edition. New York: Oxford University Press.

Oxford Advanced Learner's Dictionary. 2006. Sv "timing". 7th edition. New York: Oxford University Press.

Payne-James, J, Jones, R, Karch, SB & Manlove, J. 2011. *Simpson's forensic medicine*. 13th edition. London: Horder Arnold.

Rao, D. 2016. An autopsy of death due to suicidal hanging-264 cases. *Egyptian Journal of Forensic Science* 6:248-254. From: <https://www.sciencedirect.com/science/article/pii/S2090536X15000052>. (accessed 17 March 2019).

Russo, MC, Verzeletti, A, Piras, M & De Ferrari, F. 2016. Hanging deaths: a retrospective study regarding 260 Cases. *The American Journal of Forensic Medicine and Pathology* 37:141–145.

Saukko, P & Knight, B. 2015. *Knights's forensic pathology*. 4th edition. London: CRC Press.

Sharma, L, Khanagwal, VP & Paliwal, PK. 2011. Homicidal hanging. *Legal Medicine* 13:259-261. From: <https://www.sciencedirect.com/science/article/abs/pii/S1344622311000800> (accessed 13 June 2020).

Silveira, ML, Wexler, L, Chamberlain, J, Money, K, Spencer, RMC, Reich, NG & Bertone-Johnson, ER. 2016. Seasonality of suicide behavior in Northwest Alaska: 1990-2009. *Public Health* 137:35-43. From: <https://www.sciencedirect.com/science/article/abs/pii/S0033350616000676?via%3Dihub> (accessed 30 November 2019).

South Africa. 1959. *Inquest Act, no. 58, 1959*. From: <https://www.gov.za/documents/inquests-act-3-jul-1959-0000> (accessed 11 October 2020).

South Africa. 2007. *Children's Amendment Act, no. 41, 2007*. From: <https://www.golegal.co.za/wp-content/uploads/2018/11/childrens-act-38-of-2005.pdf> (accessed 11 October 2020).

Smith, Z. 2021. Death due to hanging: A retrospective descriptive study of the socioeconomic and demographic profiles of hanging victims in central South Africa. *Forensic Science, Medicine and Pathology* 17(2):223-229. From: [https://pubmed.ncbi.nlm.nih.gov/33492631/#:~:text=Forensic%20Sci%20Med,2\)%3A223%2D229](https://pubmed.ncbi.nlm.nih.gov/33492631/#:~:text=Forensic%20Sci%20Med,2)%3A223%2D229) (accessed 10 December 2021).

Spitz, WU & Spitz, DJ. 2006. *Spitz and Fisher's medicolegal investigation of death: guidelines for the application of pathology to crime investigation*. 4th edition. Illinois: Charles C Thomas publishers.

Maluleke, R. 2021. Quarterly labour force survey (QLFS) Q2:2021. From: <http://www.statssa.gov.za/publications/P0211/Presentation%20QLFS%20Q2%2021.pdf> (accessed 07 December 2021).

Taktak, S, Kumral, B, Unsal, A, Ozdes, T, Buyuk, Y & Celik, S. 2015. Suicidal hanging in Istanbul, Turkey: 1979-2012 autopsy results. *Journal of Forensic and Legal Medicine* 33:44-49.

Trochim, W.M, Donnelly, J.P & Arora, K. 2016. *Research methods: the essential knowledge base*. Boston: Cengage Learning.

Tugaleva, E, Gorassini, D.R & Shkrum, M.J. 2016. Retrospective Analysis of hanging deaths in Ontario. *Journal of Forensic sciences* 61: 1498-1507.

Tulapunt, N, Phanchan, S & Peonim, V. 2017. Hanging fatalities in central Bangkok, Thailand: a 13-year retrospective study. *Clinical Medicine Insight: Pathology* 10: 1-10. From: <https://journals.sagepub.com/doi/full/10.1177/1179555717692545> (accessed 11 November 2019).

World Health Organization. 2002. *Health statistics and information systems. Proposed working definition of an older person in Africa for the MDS project.* From: <https://www.who.int/healthinfo/survey/ageingdefnolder/en/> (accessed 14 September 2020).

World Health Organization. 2013. *HIV/AIDS, definition of key terms.* From: <https://www.who.int/hiv/pub/guidelines/arv2013/intro/keyterms/en/> (accessed 14 August 2020).

World Health Organization. 2014a. *Health for the world's adolescents: a second chance in the second decade.* From: <https://www.apps.who.int/adolescent/second-decade/section2/page1/recognizing-adolescence.html> (accessed 27 June 2020).

World Health Organization. 2014b. *Preventing suicide: a global imperative.* From: <https://www.who.int/mentalhealth/suicide-prevention/world-report-2014> (accessed 06 June 2020).

World Health Organization. 2017. *Homicide. Global health estimates (2015update).* From <https://apps.who.int/violence-info/homicide/> (accessed 06 June 2020).

World Health Organization. 2018a. *WHO Methods and data sources for country-level causes of death 2000-2016. Department of Information. Evidence and Research.* Geneva: World Health Organization. From: https://www.who.int/.../GlobalCOD_method_2000-2016.pdf (accessed 02 June 2020).

World Health Organization. 2018b. *National suicide prevention strategies: progress, examples and indicators*. Geneva: World Health Organization.

From: <https://apps.who.int/iris/bitstream/handle/10665/279765/9789241515016-eng.pdf> (accessed 11December 2021)

World Health Organization. 2019. *Suicide in the world: global health estimates*.

From: <https://apps.who.int/iris/rest/bitstreams/1244794/retrieve> (accessed 11 November 2019).

World Health Organization. 2020. SDG 3: *Ensure healthy lives and promote wellbeing for all ages*. From: <https://www.who.int/sdg/tatgets/en/> (accessed 10 August 2020).

Wyatt, J, Squires T, Norfolk G & Payne-James J. 2011. *Oxford handbook of forensic medicine*. New York: Oxford university press.

Yamane, T. 1967. *Statistics: An introductory analysis*. 2nd edition. New York: Harper and Row.

Zátopková, L, Janik, M, Urbanova, P, Mottlova, J & Hejna, P. 2018. Laryngo-hyoid fractures in suicidal hanging: a prospective study with an updated review and critical appraisal. *Forensic Science International* 290:70-84. From:

<https://www.sciencedirect.com/science/article/abs/pii/S0379073818302974>

(accessed 29 June 2020)

ANNEXURES

Annexure A: Data collection tool

Case record reference number:

Demographic data

Age

- a. 1. 0-10 2. 11-19 3. 20-29 4. 30-39
b. 5. 40-49 6. 50-59 7. >60

Gender

- a. Male
b. Female

Occupation

1. Formal employment

- | | | | | | |
|--------------------|--------------------------|------------------|--------------------------|----------------|--------------------------|
| a. Finance | <input type="checkbox"/> | b. Transport | <input type="checkbox"/> | c. Health | <input type="checkbox"/> |
| d. Education | <input type="checkbox"/> | e. Entertainment | <input type="checkbox"/> | f. Agriculture | <input type="checkbox"/> |
| g. Government | <input type="checkbox"/> | h. IT | <input type="checkbox"/> | i. Real estate | <input type="checkbox"/> |
| j. Mining/quarry | <input type="checkbox"/> | k. Retail | <input type="checkbox"/> | | |
| l. Social services | <input type="checkbox"/> | m. Other | <input type="checkbox"/> | | |

2. Informal employment

- | | | | |
|--------------------------------|--------------------------|-------------------------------|--------------------------|
| a. Gardner | <input type="checkbox"/> | b. Hair dressers | <input type="checkbox"/> |
| c. House keepers | <input type="checkbox"/> | d. Street vendors' | <input type="checkbox"/> |
| e. Mechanics | <input type="checkbox"/> | f. Casual agriculture workers | <input type="checkbox"/> |
| g. Casual construction workers | <input type="checkbox"/> | h. Casual mechanics | <input type="checkbox"/> |
| i. Others | <input type="checkbox"/> | | |

3. Unemployed

4. Scholar

5. Students

6. Pensioners

7 Unknown

Timing of the hanging deaths

a. Time of the day

b. Day of the week

1. Monday 2. Tuesday 3. Wednesday 4. Thursday
5. Friday 6. Saturday 7. Sunday

c. Month of the year

1. January 2. February 3. March
4. April 5. May 6. June
7. July 8. August 9. September
10. October 11. November 12. December

d. Season of the year

1. Autumn (March- May) 2. Winter (Jun-August)
3. Spring (Sept- Nov) 4. Summer (Dec-Feb)

Postmortem findings

a. Scene of death

1. *Indoor*

- Home
Office
Classroom
Hospitals
Prison
Hotels
Others

2. *Outdoor*

- School yard
Home yard
Mountain/veld
Others

b. Autopsy findings

1. Firm ligature material

- Belt
Electric cord
Rope

2. Soft ligature material

- Scarf
T-shirt
Shirt

Car seatbelt
Necklace
Others

Trousers
Shoelace
Others

2. Ligature knot

Fixed Slipknot Others

3. Ligature mark

Location of the ligature mark

Above thyroid
Level of thyroid
Below thyroid
Other

Ligature appearance

Visible
Faint
Not visible

4. Other external neck injuries

Linear abrasions
Oval bruising
Crescent abrasions
No injuries

5. Internal neck injuries

Strap muscles haemorrhage
Sternocleidomastoid muscle
Thyroid gland injuries
Thyroid cartilage fracture
Cervical spine fracture

Floor of the mouth muscles
Jugular vein
Carotid artery
Hyoid bone fracture
Decapitation

Alleged manner of death

Suicide Accidental Homicide

ANNEXURE B: UNIVERSITY ETHICS APPROVAL LETTER



University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
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TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 14 October 2021

PROJECT NUMBER: TREC/256/2021: PG

PROJECT:

Title: A Profile of Hanging Deaths Admitted to Polokwane and Lebowakgomo Forensic Pathology Service Laboratories, Limpopo Province.

Researcher: MM Matlala

Supervisor: Dr TA Mamashela

Co-Supervisor/s: Dr MI Hlahla

School: Medicine

Degree: Master of Medicine in Forensic Pathology

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:

- i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
- ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
- iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

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ANNEXURE C: DEPARTMENT OF HEALTH LIMPOPO LETTER OF APPROVAL



LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref : LP_2021-11-007
Enquires : Ms PF Mahlokwane
Tel : 015-293 6028
Email : Phoebe.Mahlokwane@dhsd.limpopo.gov.za

MALEKGOPO MOLOGADI MATLALA

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

A profile of hanging deaths admitted to Polokwane and Lebowakgomo forensic pathology service laboratories, Limpopo Province

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
 - a. Present this letter of permission to the institution supervisor/s a week before the study is conducted.
 - b. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
 - c. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
 - d. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
 - e. The approval is only valid for a 1-year period.
 - f. If the proposal has been amended, a new approval should be sought from the Department of Health
 - g. Kindly note that, the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated



pp **Head of Department**

06/12/2021

Date

Private Bag X9302 Polokwane
Fidel Castro Ruz House, 18 College Street, Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.
Website: <http://www.limpopo.gov.za>

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ANNEXURE D: PIETERSBURG –MANKWENG RESEARCH COMMITTEE
APPROVAL LETTER



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF HEALTH

PIETERSBURG/MANKWENG RESEARCH ETHICS COMMITTEE (PMREC)

ENQUIRIES: DR MA POOPEDI

DATE: 25 November 2021

MANAGER: CLINICAL RESEARCH

ananiaspopedi@gmail.com

REFERENCE

PMREC 25 November UL 2021/A

DATE

25 November 2021

RESEARCHER

Dr MM Matlala

(PRINCIPAL INVESTIGATOR)

RESEARCH

POST-GRADUATE RESEARCH

DEPARTMENT

Forensic pathology

Protocol Title : A profile of hanging deaths admitted to Polokwane and Lebowaqomo forensic pathology services, Limpopo province.

CANDIDATE

Dr MM Matlala

APPROVAL STATUS

Approved

SIGNED:

Prof TAB Mashgo, PhD
Chairperson: Pietersburg/Mankweng Complex Research Ethics Committee
School of Medicine
University of Limpopo
REC 300408-006

LETTER FROM EDITOR



University of Limpopo
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TO WHOM IT MAY CONCERN

This letter serves to confirm that I, **Prof T.W Molotja** of the Department of Language Education (English Language Teaching), School of Education, University of Limpopo, have proofread and edited the research report for **MALEKGOPO MOLOGADI MATLALA**, Student number **210474774**

entitled:

**A PROFILE OF HANGING DEATHS ADMITTED TO POLOKWANE AND LEBOWAKGOMO
FORENSIC PATHOLOGY SERVICE LABORATORIES, LIMPOPO PROVINCE**

The research report is edited focusing on the following:

- Coherent writing.
- Eliminating spelling errors.
- Fluency in reading.
- Academic writing.

I therefore recommend for its submission.

Yours Sincerely

Date: 27/12/2021



Prof TW Molotja

Finding solutions for Africa