Death due to hanging: A retrospective descriptive study of the socioeconomic and demographic profiles of hanging victims in central South Africa.

Principal researcher
Zandré Smith, Department of Forensic Medicine, University of the Free State, Bloemfontein, South Africa.

Corresponding author: Dr. Z Smith
drzsmith.forensicpath@gmail.com
ORCID: 0000-0001-6230-5991

Declaration
"Submitted in fulfillment of the requirements in respect of the Master's Degree MMed (Forensic Medicine) in the Department of Forensic Medicine in the Faculty of Health Sciences at the University of the Free State."

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Supervisor
Dr. Stefan Jansen van Vuuren, Department of Forensic Medicine, Faculty of Health Sciences, University of the Free State, Bloemfontein, South Africa.

Declaration of authorship (own work) reading

"I, Zandré Smith, declare that the coursework Master's Degree mini-dissertation that I herewith submit in a publishable article format for the Master's Degree qualification MMed (Forensic Medicine) at the University of the Free State is my independent work and that I have not previously submitted it for a qualification at another institution of higher education.

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Abstract

Purpose

Hanging by the neck is the leading method of suicide globally. Practitioners of forensic medicine are in a unique position to study the epidemiological risk factors for suicidal hanging. This information can be used to construct a sociodemographic profile of victims of hanging. This study aimed to describe the socioeconomic and demographic profiles of hanging victims in Bloemfontein for the period between 1 January 2008 and 31 January 2015. The socioeconomic and demographic profile can then be used in the future to identify those individuals who are at the highest risk of committing suicide by hanging for a referral to a suicide prevention programs.

Method

A retrospective descriptive study was performed using data from the Bloemfontein Forensic Mortuary.

Results

During the study period, 9085 autopsies were performed at the Bloemfontein Forensic Mortuary. Three hundred and fifty-five (355) hanging victims were identified and included in the study. This number accounted for 3.91% of the total amount of autopsies performed. The median age of hanging victims were 31.39 years, with an age range of 11 to 78. The majority of cases (38.92%) were in the age group of between 21 and 30 years. Men predominated the study population at 90.99%. In our study, 63.94% of the individuals were single, and 56.62% of the individuals were unemployed. Of our study population, 36,34% completed their high school education. The most common location where the victims of hanging were found was at home.

Conclusion

Males between the ages of 21 to 40, who are single and unemployed are at the highest risk for committing suicide by hanging. The population group at the lowest risk appears to be individuals who are older than 60 years of age, people who are married, people who are employed, and those with tertiary education. These results offer the first sociodemographic profile of individuals who die due to hanging in central South Africa. It calls for the implementation of a National Suicide Prevention Program via a multidisciplinary team approach.

Keywords

Hanging; Suicides; Suicide prevalence; Suicide prevention; Suicide trends; Suicide methods; Forensic Pathology; Autopsy; Mortality; Asphyxia; South Africa.

List of Abbreviations

WHO	World Health Organisation

List of Appendices

A. Letter of approval from the Health Sciences Research Ethics Committee
B. Permission from the Department of Health
C. Permission from the Head of the Free State Forensic Pathology Services
D. Permission from Head of Department of Forensic Medicine
E. Permission from the Bloemfontein Forensic Mortuary Manager
F. Permission from the Department of Biostatistics
G. Copy of the research protocol approved by the HSREC
H. Data capture sheet
I. Instructions to authors of the named peer-reviewed journal
J. A summary report compiled in the Turnitin Plagiarism Search Engine

CHAPTER 1: CRITICAL AND SYNTHESIZED LITERATURE REVIEW

Suicide has been defined as "the death of a person caused by any intentional direct or indirect actions taken, or self-inflicted injuries caused by the person, who was aware that the action would result in his or her death" [1].

In 1995, the World Health Organisation (WHO) announced that suicide was a worldwide health epidemic, some authors calling it a global health hazard or a principal contributor to the extensive health issue [2–7]. It was also potentially preventable [8]. According to the most recent data from the WHO of 2016, self-harm was the 18th most prevalent cause of death. The global estimated total of suicidal deaths were 793 307 and accounted for about 1.4% of the total deaths annually [9].

It was estimated that with the current trends, a projected 1.53 million people would have committed suicide successfully in 2020, with the number of those who attempt suicide totaling about 10 to 20 times more. These figures equate to one person dying by suicide every 20 seconds, and one person attempting suicide each second [10,11].

In 2016, the WHO ranked the suicide rate in South Africa as the 54th highest in the world, and the 6th highest in Africa with an average rate of 11.6 suicides per 100 000 of population. Although there was an isolated increase in suicide rates in 2012, the annual average for suicide rates has remained unchanged since 2000, remaining 11.6 per 100 000 [12]. In South African, between 6 000 and 8 000 people commit suicide annually, which is estimated to about 16 to 22 cases daily [1].

Data from the Free State appears to be marginally lower than the national value, with a rate of 10.9 per 100 000 [1].

Internationally, hanging by the neck is the leading method of suicide, especially in low- and middle-income countries like South Africa. Hanging contributes to almost 90% of all suicides [1,3,5,7,8,11,13–25]. In contrast to most of the world, suicide by hanging in the United States of America and France ranks in second place after firearm-related suicides. In India and China, suicidal death due to drug overdose is more common than hanging [4,6,13,14,16,24,26]. Hanging

consistently remained in the top three methods to commit suicide, along with firearmrelated suicides and drug overdoses, the combination of these three methods accounting for over 93% of suicides [3–5,17,18,25,27,28].

Hanging remains the most common method of suicide for three main reasons: the vast array of ligatures that are readily accessible, obtainable, cheap, and resilient enough to suspend the bodyweight. There is a multitude of locations with natural and constructed structures from which one can suspend oneself, including rafters, railings, doorknobs, hooks, and trees. The other reason is the high rate of success of death by hanging, it easy to perform, has associated privacy, death occurs quickly, and hanging is relatively painless and bloodless [4-7,13–17,19,22,24,27–31].

Death due to hanging ensues when a ligature is fastened around the neck at one end and to a fixed point at the other end, where the force of gravity on the weight of the body, results in constriction of the ligature around the neck [6,13,14,29,32,33].

Death is a result of an interplay between compression of the jugular veins, the carotid arteries, the respiratory tract, and the carotid bodies. Respiratory tract compression, compression or obstruction of the blood vessels to and from the brain, and vagal inhibition with reflex cardiac arrest all lead to cerebral ischemia and death independently or synergistically [6,13,24,34].

Aside from judicial hanging (a practice which was abolished in South Africa in 1995) [35], most studies concluded that the manner of death in hangings is virtually always suicidal [6,13–15,19,21,29,32,33]. The described incidence has been calculated to be above 95%, some as high as 100% [14,15,29,33]. Taktak (2015) reported that 98.9% of the cases in their study were suicides [14].

A large number of studies in the literature reported that accidental hangings and homicide by hanging are exceptionally rare [6,13–15,19,21,29,33]. Sauvageau (2015) conducted a six-year retrospective study on true and simulated homicidal cases. The study reported eight accidental hanging cases (3.2%) and four homicidal hanging cases (1.6%) [33]. Russo (2016) reported two cases of unintentional hangings (0.8%) and one homicidal hanging (0.4%) out of 260 cases over 33 years [29].

Accidental hanging commonly occurs in children who are entangled while they are playing, or teenagers experimenting with hanging, without realizing the dangers involved. Adults also accidentally hang themselves while attempting specific activities, most often while under the influence of alcohol in a dangerous environment. Auto-erotic asphyxia is a rare but well-documented example of accidental hangings. Other populations at risk for unintentional hangings include the elderly and persons with severe primary psychiatric diseases, especially when restrained [15,33,36].

Two Canadian studies reported cases of homicide by hanging that included children as the victims of a murder-suicide, being defenseless against actions taken by the adult [15,33]. When adults are the victims, there are signs of violence present at the death scene, there are injuries to parts of the body other than the neck, and the presence of a combination of drugs and alcohol to debilitate the victims, most often simulating a suicide after the murder by strangulation [21,29].

Cases where the manner of death was indistinguishable as suicide, accidents, or homicide (i.e., unascertained), were infrequent. Tugaleva (2016) reported seven instances in which the manner of death remained unknown after complete investigation [15].

The rates of suicides by hanging increased over the last two to three decades [3,4,5,7,14,20,23-25,27–29]. Taktak (2015) who conducted a retrospective study on 4502 hanging victim in Turkey over 33 years, noted a two-fold increase in hanging deaths among females, and a five- to six-fold increase amongst men. According to Höfer (2012), the suicide rate for hanging in Poland increased from 8.8 to 15.2 per 100 000 from 1790 to 2009, equating to a prevalence increase of hanging from 78.4 % to 89.9% of the total suicide rates, and the research done by Lim (2014) reported the rates of suicidal hanging increased from 31.4% in 2001 to 50.5% in 2012. Bustamante (2015) reported an increase in suicidal hangings from 74.92% in 2001 to 81.66% a decade later, and Meel (2006) reported an increase in suicides by hanging from 5.2 per 100 000 in 1993 to 16.2 per 100 000 in 2003, an almost three-fold increase in just a decade [3,11,14,20,23].

Whereas the rates of hanging deaths have increased, the rates of suicide by firearms and poisoning declined, mostly due to the decrease in the accessibility of firearms and pesticides [3,5,22,23,28]. In the study done by Höfer (2012), the prevalence of suicidal poisoning cases reduced from 10.6% to 4.8% over the 40 years of their research. Where the hanging deaths in the study done by Bustamante (2016) increased in 10 years from 74.92% to 81.69 %, the deaths due to firearms

decreased from 11.29% in 2001 to 7.25 % in 2010. Hernández-Alvarado (2016) reported that the rate of suicide by hanging increased from 5.80 – 6.49 per 100 000 in 9 years, equal to a rate percentage increase of 11.89%, while the rate percentage of firearm-related suicide decreased with 68% and those of poisoning-related suicides decreased by 24% [3,5,23].

Lim (2014) reported that hanging was the most common method in *successful* suicide cases, constituting 52.2% of all suicide cases. Poisoning was the most common method used in *attempted* suicide cases, representing 75.2 % of all failed suicide attempts [20].

Hanging trends may indicate underlying physical, social, political, economic, and psychological problems within a specific community or region. Examples found in the literature were the economic recessions in the United Kingdom and Northern Ireland, examination-related stress among teenagers and student in India, imitation of the graphically depicted and enticing accounts of the suicides committed by celebrities, and political and social conflicts as well as economic instability in Eastern Europe after the collapse of the former Soviet Union and the high rate of unemployment in South Africa [1,4,8,19,20,23,25].

Nevertheless, the interplay between these factors was complicated, and no one specific variable could account for hanging trends in any country. Hanging trends and frequencies differed among communities, regions, cultures, and populations. The suicides rates in Lithuania, with hanging as the most common method, were four times higher than the average rates for other European Union member countries, hanging was second to firearm-related suicides the United States of America, the Islamic law still considers suicidal hanging a criminal act, and in India, the most common group to commit suicide by hanging was married females, who used saris or shawls after a domestic dispute [3–6,8,14,17,19,20,23,25,28,30].

A limited number of studies regarding hanging as a cause of death have been done in South Africa. The focus of these studies was on suicides in general rather than hanging [1,2,25,26]. The data available to us have, with regards to hanging, have not been updated in a decade [11]. The paucity of data regarding deaths by hanging, both suicidal and accidental, limits the quantification and extrapolation for clinical and administrative applications such as planning for interventions and prevention.

Furthermore, accurately calculating statistics on suicide in South Africa is impeded by various obstacles such as incomplete data from specific regions due to omission or nonparticipation of certain areas during national surveys, as well as the misreporting or underreporting of deaths due to suicide for financial, social, cultural or religious reasons and because of the stigma of suicides. Regional data from the Free state was not included in the first ten National Injury Mortality Surveillance Surveys, only appearing for the first time the 2009 survey [2,11,37–39].

The benefit to the relevant Department of Health and Department of Social Development is the possibility to focus on public health efforts identifying the high-risk individuals and to implement suicide prevention programs and intervention policies. The emphasis should be on alleviating the impoverished living situations, the high unemployment rate, alcohol, and drug abuse, as well as the management of acute psychological stressors, suicidal ideation, and primary psychiatric diseases [1,2-5,7,8,16,18,19,23,24,28].

A large number of suicide cases not only put a burden on the Department of Health, which is already resource restrained but on South Africa's economy as a whole since a significant quota of those who commit suicide is in the age range, which contributes to the workforce [7,11,25].

With this in mind, it should be noted that it is not only the absolute number and rates of deaths due to hanging that should be studied and published. What may be of more value is the sociodemographic profile of those who hang themselves (sex, age ranges, and, if applicable, the represented races) to identify the high-risk population in a community [10,11,25,26].

Practitioners of forensic medicine are in a unique position to study the epidemiological risk factors which predispose a person to commit suicide by hanging because these cases are sent for medico-legal post-mortems at the relevant forensic pathology mortuary [2,8].

Previous demographics indicated that the number of males and females are approximately equal [10,40]. Consequently, when studying the prevalence of hanging cases between the two sexes, it was both the percentage and the actual numbers that are higher in males when compared females, except in the teenage population [1,2,3,5,6,11,13–16,18,19,24–27,29,33,36]. Stark (2010), Meel (2006), Naidoo (2014) and Scribante (2004), all reported that males presented between 77% and 86% of the total numbers in their studies [1,11,25,26]. It appears that suicide by hanging may be as much as 6 to 7 times more prevalent in males than in females. The reason for this observation

is not clear yet; it may be that males are more successful in committing suicide by using more reliable methods [1,11,23,26]. Bhausaheb (2015) reported the lowest male predominance at 68.31%, and Kanamüller (2015) reported the highest male predominance at 84.00% [16,31].

Only a few studies reported that the males and female victims were equal in numbers, or that the female cases exceeded the male cases, albeit these numbers were only marginally higher. Bhosle (2015) studied hanging victims in the teenage population of 10 to 19 years and found 26 females (53.06%) and 23 males (46.93%) in a study focussing specifically on hanging. The study done by Rao (2015) found 136 female hanging victims (51.51%) and 128 male (48.48%) hanging victims [7,19,30].

The age distribution, as a biological variable, followed a standard distribution curve [15]. Stark (2010) found that more than half of their cases fell in the age range of 21 – 40 years, with another 11.5% falling in the age range of 11 – 20 years. The largest age group reported by Meel (2006) was between 20 and 29 years of age, with a rate of 32.8 per 100 000, whereas Naidoo (2014) reported the highest range to be 25 to 34 years, with a mean age of 34.1 (SD ± 1.34) and the age range of 5 – 98. The age range reported by Scribante was between 11 and 97 years [1,11,25,26]. The literature confirmed these values amongst those who hang themselves. The highest numbers occurred in the age group of 20 to 40 years. The age group of 21-30-year-olds accounted for 50.00% of the study done by Vinita (2015). A total of 2391 cases (53.10%) fell between the ages of 19 and 41 years in the study done by Taktak (2015). In the research done by Bhausaheb (2015), 66.33% of all the study population was in the second or third decade of life [6,13,14,27,29–31].

There were literature articles that report sporadic cases occurring above 80 years of age. Meel (2006) had 9 cases (2.2%) of people who died due to hanging, who was older than 70 years. The oldest person reported in the literature was in the study done by Taktak (2015) at 96 years, followed by a 95-year-old in Russo's study (2016), and a 94-year-old in the study conducted by Tugaleva (2016) [11,14–16,29].

The worrisomely high numbers of suicides among children and adolescents may have been attributed to various factors such as different forms of child abuse (including physical, emotional or sexual abuse), neglect by the caretakers, alcohol and illicit drug abuse by the parents, parental mental health issues, primary mental health issues in the child, loss of one or both parents, low

socioeconomic status, peer pressure and failure to perform according to expectations set by self or the parents [1,25]. Kõlves (2016) conducted a ten-year retrospective study on the suicide methods among children aged 10 to 19 years in 101 countries. There was a total of 46,895 cases of hanging in the total study population of 86,280, with hanging accounting for 54.35% of this large study population. Hanging was the most common method used to commit suicide in both sexes, with 35,041 male cases (57.98% of the total male suicide cases) and 11,854 female cases (45.86% of the total female suicide cases) [17].

Meel (2006) reported 2 cases of individuals who were under nine years of age, Taktak (2015) reported an incident of a ten-year-old, and youngest individual in the study by Kanamüller was 12 years old. Bhosle (2014) conducted a study focussing on adolescent hanging victims in India and reported a total of 51 hanging cases between the ages of 10 and 19 years over ten years, 49 of which were suicide cases (96.08%), and only 2 were accident (3.92%). Eight of the cases were younger than 14 years [11,14,16,19].

In the study done by Rao (2015), the author mentioned that social relationship status was a possible variable that may be linked to suicidal hangings. The total number of cases in the study was 264. They found that 186 of the cases were married (70.45%). The most common reason for suicidal hanging among married victims was domestic disputes (82 cases; 44.08%), with females (68 cases; 82.93%) accounting for the majority of those who committed suicide by hanging after the domestic dispute [30]. The study done by Naidoo (2014) reported the opposite, with 60.6% of their study population being single [25].

The other socioeconomic variable mentioned by various authors was unemployment or having a poor or lower socioeconomic status, stating that between 38.5% and 59.09% of their study populations were unemployed or had minimum wage jobs [1,7,8,11,16,25,30]. Rao (2015) found that 59.09% (156 cases) of their cases were unemployed or belonged to the lower-income group, 34.09% (90 cases) belonged to the middle-income group, and only 6.82% (18 cases) belonged to the high-income group [30]. Naidoo (2014) reported an unemployment rate of 43.3% in 2006 and 38.5% in 2007 [25].

In 2011, the unemployment rate in the Free State was 32.6%, 2.8% higher than the national average [41]. According to their study, Stark (2010) found that 56.9% of the study population in the Free State was unemployed, indicating that unemployment may be a strong risk factor for committing

suicide. Some researchers found in their studies that suicide by hanging was significantly less common in people with a tertiary degree when compared to those who were less educated [1,4,7,27].

Although it may be challenging to obtain a proper medical history from a deceased's relatives, mental illnesses are among the significant risk factors for committing suicide. Various studies reported cases where a positive history of a primary psychiatric diagnosis could be obtained. These included depressive disorders, anxiety disorders, bipolar and related disorders, schizophrenia spectrum disorders, substance-related and addictive disorders, personality disorders, and neurocognitive disorders [3,7,8,14–16,18,23,29]. Tugaleva (2019) found that depression may be present in as much as 60% of suicidal hanging cases, and substance abuse in up to 28% of these cases. In only 3% of cases, psychiatric history was negative. Psychiatric inpatients who commit suicide by hanging are reported in the literature, with an increased number of females compared to males. These include inpatients who were on the hospital premises at the time of hanging themselves, those who were on weekend passes, and one who escaped the facility [15,16,24].

Aside from the significant stressors already mentioned (domestic problems, relationships issues, financial difficulties, and primary psychiatric illnesses), chronic medical diseases and chronic pain, social isolation, grief, immigration, schooling, and career-related stress were also highlighted as a possible risk factor for committing suicide by hanging [3,8,16,18,19,27,29,30].

The most common locations where people hang themselves were in or outside the home, followed by isolated open areas, the workplaces, police or correctional facility cells, hospitals, and nursing homes, including mental health care institutes as well as military camps and graveyards [5,13,14,16,18,19,24,27,29,30]. The reasons for choosing the house as the most common location to commit suicide by hanging were giving by Rao and Kanamüller. These included familiarity with a beam from which to suspend oneself, concealment, and the lower risk of interference by another person during the act of hanging oneself [16,30].

Deaths in custody cases were reported by Tugaleva (2016). They reported 21 cases where the victims hanged themselves while incarcerated. All of these cases were male with an average age of 33 years. It was reported that all of their cases had a primary psychiatric diagnosis, and almost half had previous suicide attempts. Bedsheets and clothing seemed to be the ligatures most often used in custody, and are used either intact or torn [15].

The external findings of the neck in cases of hanging typically showed a single ligature abrasion, which was dark brown and parchment-like, between 1 to 2 cm wide, above the thyroid cartilage, with an oblique angle stretching to behind each ear. Most often, the ligature abrasion did not entirely encircle the neck but ends in an upside-down V-like shape with a gap at the back of the neck, or behind one of the ears. This feature was found where the upward pull of the ligature departs from the slanted head in the direction of the knot and the suspension point. Most often, this ligature abrasion may have been the only finding at autopsy. Other external findings included congestion of the face, conjunctival petechial hemorrhages, and biting of the tongue between the incisor teeth, with blackening and drying of the protruding tip. Central or peripheral cyanosis may have been present [13–15,27,29,31,32,42].

Near-hanging is a term used when the victim was resuscitated and survived for a period in the hospital. Tugaleva (2016) reported 44 cases where the victim survived for some time. Half of these cases died within 36 hours after being found or resuscitated, and the other half survived between 2 and 135 days. The cause of death, even in the long-term survivors, was still documented as death due to hanging, with the mechanism of death in the majority being hypoxic-ischaemic encephalopathy [15].

Tugaleva (2016) also reported on two cases of double suicides, a type of dyadic death. Dyadic deaths are rare findings. In the one case, two 13-year old girls hanged themselves from opposite ends of an electric cable thrown over garage beams. The second case involved a father and adult son who committed suicide by hanging in almost the same way, just using rope instead [15].

The other type of dyadic death is a murder-suicide, which was also reported in the study done by Tugaleva (2016). They reported three cases of murder-suicides in the same study, two of which involved young girls who were hanged by their mothers, who subsequently hanged themselves. The other one was a case of a man who took his own life after he killed his victim with a sharp instrument [15].

A shared limitation in various studies appeared to be the lack of vital information reaching the pathologist, including the location of the suicide and the type of ligature used, as well as the ligature not being brought to the mortuary. The reasons were a lack of communication between the officers involved at the scene of death, lack of appropriate training of the crime scene investigators, and a deficiency in skilled forensic investigators. Other limitations occurred where

the researchers had to omit cases from the studies because the files were not available, or no post-mortem was performed [13–15].

Research Question

Do socioeconomic demographics indicate that a person is at an increased risk of committing suicide by hanging?

Aims

To describe the socioeconomic and demographic profiles of hanging victims in Bloemfontein for the period between 1 January 2008 and 31 January 2015. The secondary aim was to correlate the findings with international data.

Objectives

The objective was to formulate a socioeconomic and demographic profile of those individuals who are at the highest risk for death due to hanging. This profile can then be used in the future to refere these indiciduals to a suicide prevention programs.

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CHAPTER 2: PUBLISHABLE MANUSCRIPT

Death due to hanging: A retrospective descriptive study of the socioeconomic and demographic profiles of hanging victims in central South Africa.

Smith, Z[1]

[1]Department of Forensic Medicine, University of the Free State, Bloemfontein, South Africa.

Corresponding author

Dr. Z Smith

drzsmith.forensicpath@gmail.com

ORCID: 0000-0001-6230-5991

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Abstract

Purpose

Hanging by the neck is the leading method of suicide globally. Practitioners of forensic medicine are in a unique position to study the epidemiological risk factors for suicidal hanging. This information can be used to construct a sociodemographic profile of victims of hanging. This study aimed to describe the socioeconomic and demographic profiles of hanging victims in Bloemfontein for the period between 1 January 2008 and 31 January 2015. The socioeconomic and demographic profile can then be used in the future to identify those individuals who are at the highest risk to commit suicide by hanging for a referral to suicide prevention programs.

Method

A retrospective descriptive study was performed using data from the Bloemfontein Forensic Mortuary.

Results

During the study period, 9085 autopsies were performed at the Bloemfontein Forensic Mortuary. Three hundred and fifty-five (355) hanging victims were identified and included in the study. This number accounted for 3.91% of the total amount of autopsies performed. The median age of hanging victims were 31.39 years, with an age range of 11 to 78. The majority of cases (38.92%) were in the age group of between 21 and 30 years. Men predominated the study population at 90.99%. In our study, 63.94% of the individuals were single, and 56.62% of the individuals were unemployed. Of our study population, 36,34% completed their high school education. The most common location where the victims of hanging were found was at home.

Conclusion

Males between the ages of 21 to 40, who are single and unemployed are at the highest risk for committing suicide by hanging. The population group at the lowest risk appears to be individuals who are older than 60 years of age, people who are married, people who are employed, and those with tertiary education. These results offer the first sociodemographic profile of individuals who die due to hanging in central South Africa. It calls for the implementation of a National Suicide Prevention Program via a multidisciplinary team approach.

Keywords

Hanging; Suicides; Autopsy; Mortality; Asphyxia; South Africa.

List of Abbreviations

DHA	Department of Home Affairs
FPS	Forensic Pathology Service
SAP	South African Police
SAPS	South African Police Service
WHO	World Health Organisation

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The author extends his gratitude toward the Free State Department of Health as well as the Bloemfontein State Mortuary, for granting permission to study the mortuary records.

Introduction

Suicide remains an epidemic of global proportions, and in 2016 suicidal deaths accounted for 1.4% of deaths globally. Worldwide, hanging by the neck is the leading method of suicide, especially in low- and middle-income countries like South Africa, where it contributes to up to 90% of all suicides [1–12]. Three reasons have been postulated for this phenomenon: i) the vast array of readily available ligatures, ii) the multitude of locations with natural and constructed structures from which one can suspend oneself, and iii) the high rate of success of death by hanging. It also has associated "advantages" like privacy, and death occurs quickly, is relatively painless and bloodless [6–9,13–25].

Hanging is generally defined as an asphyxial death due to constriction of a ligature around the neck, where the force of constriction is a result of the weight of the partially or complete suspension of the body [8,17,20,21,26,27]. The mechanism of death is an interplay between compression of the jugular veins, the carotid arteries, the respiratory tract, and the carotid bodies. These four mechanisms cause cerebral ischemia and death independently or synergistically [8,14,20,28]. In judicial hangings, the mechanism of death may also include neurogenic shock due to fracture and injury to the cervical spine [28].

Aside from judicial hanging, a practice which was abolished in South Africa in 1995, the manner of death in hangings is virtually always suicidal [8,17,20–22,25–27,29,30]. Various studies have reported that accidental (<3.2%) and homicidal (<1.6%) manner only accounted for a small proportion of hanging deaths [8,17,20–22,25,27,29].

There has been a global increase in suicides due to hanging [4–7,9,14–17,21,31,32]. Taktak (2015) reported a two-fold increase in hanging deaths among females, and a five- to six-fold increase amongst men over a period of 33 years in Turkey [21].

Throughout the literature, studies consistently showed that among the victims who committed suicide by hanging, males predominate between 68.31% - 84.00% of victims [8,17,19–23,33,34].

The highest numbers of suicidal hangings occur in the age group of 20 to 40 years, in some studies accounting for as much as 50% of the hanging victims [8,15,17–21].

Unemployment, or having a poor or lower socioeconomic status appears to be another critical variable. Some studies have found that nearly 60% of the hanging cases were unemployed or belonged to the lower-income group, and with as little as 7% belonging to the high-income group [1,4,9,12,18,23,33].

The most common locations where people hang themselves are in or outside the home, followed by isolated open areas, the workplaces, police or correctional facility cells, and hospitals, including mental health care facilities and nursing homes [7,14,15,17,18,20,21,23,25,34].

A limited number of studies have been done on suicides in South Africa [1,2,4,35]. These studies focussed on suicides rather than hanging and included all methods of suicide. Meel (2006) published research on suicide victims in the Transkei area. They found a 3-fold increase in hanging suicides from 1993 to 2003. They also reported the highest rate of suicidal hangings among the 20-29-years age group and a male to female ratio of 6.4:1 [12].

The paucity of data regarding deaths by hanging in South Africa limits its quantification and extrapolation for clinical and administrative applications such as planning for interventions and prevention.

In South Africa, practitioners of forensic medicine are in a unique position to study the epidemiological risk factors which predispose a person to commit suicide by hanging. In terms of the Inquests Act (58 of 1959), all deaths due to hanging must be investigated through a medico-legal post-mortem examination at designated forensic pathology mortuary [36].

Our study aimed to describe the socioeconomic and demographic profiles of hanging victims in Bloemfontein for the period between 1 January 2008 and 31 January 2015.

The Bloemfontein Forensic Mortuary is classified as an N6-grade facility and performs 1500 -2000 medico-legal post-mortems per annum [37]. This facility delivers forensic pathology services to the whole of the Free State Province and is centered in the Mangaung Municipality, which is the largest Municipality in the Free State.

Methods

Study design

A retrospective descriptive study was performed over a period of eight years, from 2008 to 2015.

A retrospective study design was chosen because it allowed the researcher to investigate and describe the socioeconomic and demographic profiles of victims of hanging deaths, which can be used in the future to identify high-risk individuals.

Study population

All deaths admitted to the Bloemfontein Forensic Mortuary between 1 January 2008 to 31 December 2015, where the cause of death was due to hanging, were included in the study.

Cases where the data from the files were incomplete, the files were lost, or where the cause of death was ambiguous, were excluded from the study.

Data source

The cases were identified from the Bloemfontein Forensic Mortuary Death Register, after which the mortuary case files were retrieved from the mortuary archives.

The Bloemfontein Forensic Mortuary works on a 'Death Register' number system, whereby a deceased person is given a Bloemfontein Death Register number. All attempts were made to keep case information anonymous, and no specific identifying information was used in the study. Only the principal investigator had access to the identity of the individuals included in the study, and the utmost care was taken to secure confidentiality.

Data were collected from the DHA-1663 (Department of Home Affairs - NOTICE OF DEATH / STILL BIRTH) form, as well as the FPS007 (Forensic Pathology Service - REPORT ON A MEDICO-LEGAL POST-MORTEM EXAMINATION) report.

Data collection tool

The demographics used in the study were collected from the case files and transcribed to the data collection sheet. These included the date of death, the date of birth, the age, the sex, the ethnicity, the marital status, the highest level of education, the occupation or employment status, the area

where the body was found, and whether or not the deceased was born in South Africa. If the deceased was not born in South Africa, the country of origin was noted.

Data management

All data were managed electronically using a Microsoft Excel spreadsheet, which was password protected.

Data analysis

Descriptive statistics, namely frequencies and percentages for categorical data and median and percentages for numerical data, were calculated. The data analysis for this study was generated using SAS software.

Pilot study

A pilot study was done to assess the feasibility of the planned project, the availability of the data in the case files, and the appropriateness of the research method, the data entry, and the data analysis. It was decided that the planned study would be feasible without changes to the protocol. The pilot study comprised the first 20 cases of the final study.

Ethical considerations and consent

Ethical approval for the conduction of the study was obtained from the Health Science Research Ethics Committee of the University of the Free State (UFS-HSD2017/0049),

Studies in forensic medicine and pathology may have legal implications, the researcher appropriately obtained permission from:

- The Free State Department of Health.
- The Head of the Free State Forensic Pathology Services
- The Head of the Department of Forensic Medicine
- The Manager of the Bloemfontein Forensic Mortuary

Results

A total of 9085 post-mortem examinations were performed at the Bloemfontein Mortuary during the study period. Of these, 355 cases of death due to hanging were identified and included in the study.

Table 1 shows the total number of autopsies performed annually, the number of autopsies that were performed in cases of hanging death yearly, and the percentage of the total caseload for which hanging cases accounted. There has been an increase of approximately 20% in the total number of hanging victims over the eight years. The percentage of the total caseload also showed an increase over the same period.

Table 1: Hanging cases as a number and percentage of the total number of post-mortems done per year for the period 2008-2015 in the Bloemfontein Forensic Mortuary (N=355)

Year	Total number of hanging cases	Total number of autopsies done	Hanging cases as a percentage of the total number of post-mortems done
2008	41	1221	3.36%
2009	39	1087	3.59%
2010	47	1076	4.37%
2011	36	1131	3.18%
2012	46	1215	3.79%
2013	52	1237	4.20%
2014	45	1097	4.10%
2015	49	1021	4.80%
Total	355	9085	3.91%

Males represented 90.99% (323 cases) of the suicide victims. The study population constituted 73.80% Africans (262 cases), 18.87% Caucasians (67 cases), and 7.32% mixed race (26 cases). No cases of people from Indian or Asian descent were reported. South African residents accounted for the majority of the total study population (344 cases; 96.90%). Five (1.41%) of the individuals were Lesotho citizens with valid passports, and one individual (0.28%) was an Ethiopian with official refugee status. The country of origin of the five unidentified cases remains unknown (1.41%).

Table 2: The frequency and percentage of sociodemographic characteristics of hanging victims according to age categories, relationship status, employment status, education status, and country of origin for the years 2008 to 2015 (N=355).

COVARIATE	
Age in years	
Median	31,39 years
IQR	16,31
Age categories	N (%)
11 – 20	38 (10,70%)
21 – 30	137 (38,59%)
31 – 40	84 (23,66%)
41 – 50	60 (16,90)
51 – 60	18 (5,07%)
61 – 70	10 (2,82%)
71 – 80	3 (0,85%)
Missing	5 (1,41%)
Relationship status	
Single	227 (63,94%)
Married	107 (30,14%)
Divorced	15 (4,23%)
Widowed	1 (0,28%)
Unknown	5 (1,41%)
Employment status	
Unemployed	201 (56,62%)
Employed	102 (28,73%)
Scholars	20 (5,63%)
Students	11 (3,10%)
Pensioners	9 (2,54%)
Incarcerated	6 (1,69%)
Disability grant	1 (0,28%)
Unknown	5 (1,41%)
Education	

None	8 (2,25%)
Primary school	72 (20,28%)
Secondary school	131 (36,90%)
Matric	129 (36,34%)
Tertiary education	7 (1,97%)
Unknown	8 (2,25%)

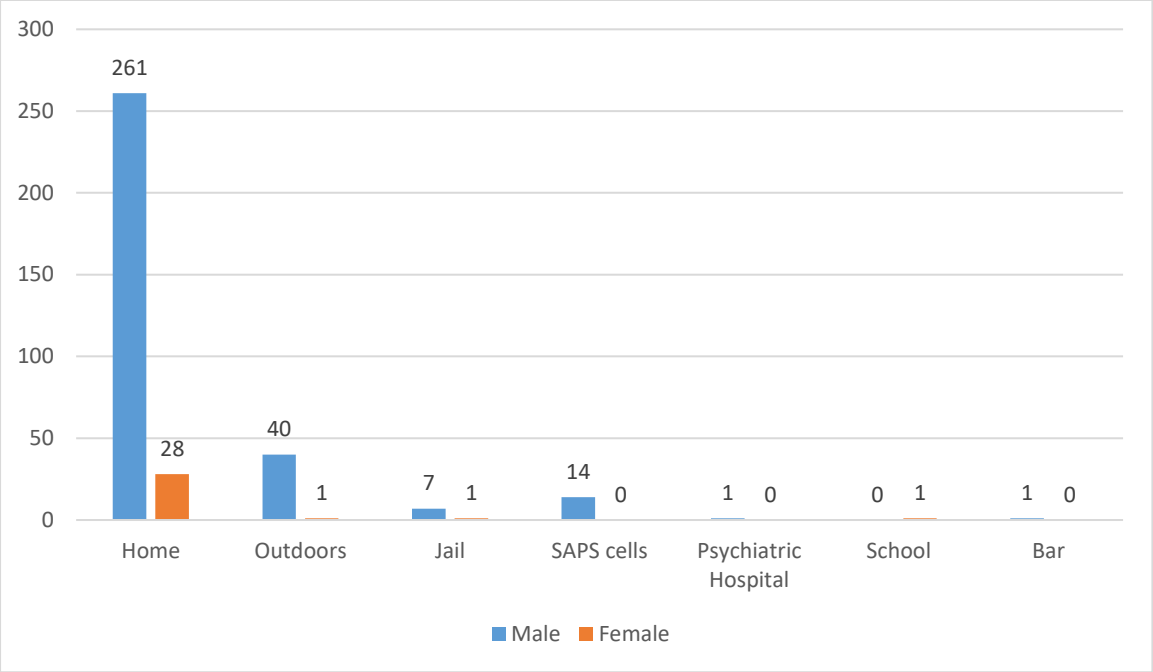
The median age was 31.39 years (IQR = 16.31). The majority of cases were in the age group of between 21 and 40 years (221 cases; 62.26%). The age range in the study population was between 11 and 78 years. In five cases, the individuals were never identified, and thus the age was not known (see table 2).

Single individuals accounted for the majority of cases, followed by those who were married. Divorced individuals accounted for 15 cases, and there was only one individual who was widowed (see table 2).

More than half of our study population were unemployed, with less than one third being employed. There were also cases where the victims were still scholars or were enrolled in some form of a tertiary education program. The study population included nine pensioners and one person who was receiving a disability grant. Six individuals were incarcerated at the time of their death (see table 2).

The median of the education status of our study population was grade 10. The categories with the highest number of cases were those who completed some form of secondary school education between grade 8 and grade 11, followed by those who completed high school. The lowest categories included those individuals with some tertiary education, followed by the people without any formal education. The data was not known for 8 of the cases (see table 2).

Graph 1: The locations where victims of hanging were found (N=355)



The most common location where people were found hanging was at home, followed by outdoor areas (see graph 1). The outdoors locations where the individuals were found included trees in open fields or on farms, a dumpsite, a cemetery, and the parking lot of a public hospital. One male hanged himself in the local psychiatric hospital, one female hanged herself at her school. One person was found hanging in a bar where he worked.

In the six cases where the person was incarcerated in a correctional facility, all were males between the ages of 21 to 36 years. There were two cases where the deceased person was found at the correctional facility, but lived or worked there and was not incarcerated.

There were 14 cases of individuals that hanged themselves while under arrest in a SAPS holding cell, but they were not incarcerated yet. The 11 SAPS stations involved were spread over the Free State. All of the individuals who hanged themselves in the police holding cells were male between the ages of 22 and 50 years old.

Two situations were encountered where the suicides appeared to be double suicides. In each case, a male and a female were found hanging together. In one case, both individuals used an electric cord, and in the other case, the male used a tie while the female used a nylon rope.

There was one case where the police suspected a murder-suicide. A man was found hanging by the neck after he bludgeoned his wife to death with a hammer.

Only one case of near-hanging was encountered. The victim was a man in his fifties who was found hanging by the neck, but he was still alive. He was rushed to the hospital, where he died a few hours later. The cause of death was still determined to be due to hanging.

Discussion

Various international studies have identified numerous risk factors, which through a complex interplay, may put an individual at high risk for committing suicide by hanging [6,8,12,17,18,21,23,25,32].

Our study aimed to describe the socioeconomic and demographic profiles of hanging victims in Bloemfontein for the period between 1 January 2008 and 31 January 2015. The socioeconomic and demographic profile can then be used in the future to identify those individuals who are at the highest risk of committing suicide by hanging.

There was a male predominance in our study population. Throughout the literature, this is a consistent finding [17,19–23]. We calculated a male to female ratio of 10.1:1, which is much higher than the male to female ratio of 6.7:1 reported by Meel (2006) [12]. Comparative international studies have shown the same predominance of male victims, with a rate ranging between 68.31% and 84% [19,23]. Only a few studies concluded that the males and female victims were equal in numbers, or that the female cases marginally exceeded the male cases [9,18,25].

The median age in our study was 31.39 years, with the largest proportion of cases between the ages of 21 to 40 years. This finding is consistent with international and national findings [12,15,19]. The high numbers in this category are worrisome since a significant quota of those who commit suicide is in the age range, which should contribute to the workforce [4,9,12]. The youngest victim in the current study was 11 years old, two years older than the youngest victim reported in the literature [12]. The oldest victim in this study was 78 years, 18 years younger than the oldest hanging victim in the literature [21].

In contrast to the study by Rao (2016), our research shows a predominance of single persons [18]. Naidoo (2014) also reported that the largest portion of suicide victims single, although their study focused on suicides in general, and not hanging per se [4]. The reason for this finding or the contribution of unmarried status to the motivation of the victim to commit suicide is uncertain.

More than half of our study population was unemployed, with the number being very similar to the study done by Stark (2010), 56,62% vs. 56.90% [1]. During the time frame of the study, South Africa conducted a national census. In 2011, the unemployment rate in the Free State was 32.6%, 2.8% higher than the national average. The unemployment rate for the Mangaung

Municipality was calculated to be 28% [38,39]. Thus, the unemployment rate in our study population was double the national average. Other national and international studies reported that between 38.5% and 59.09% of their study populations were unemployed [4,18]. It is thus possible than financial pressure acted as a risk factor for our study population.

The majority of our study population had partial or completed secondary education. Some researchers have found that suicide by hanging was significantly less common in people with a tertiary degree when compared to those who were less educated [6,9,15], a finding similar to our study.

The most common location where hanging victims were found, was at home, followed by outdoor locations. Other locations included the local prisons and SAPS holding cells. Our findings are supported by the research done internationally [15,17,18,20,21,23,25]. The reasons for choosing the house as the most common location to commit suicide by hanging included familiarity with a beam from which to suspend oneself, concealment, and the lower risk of interference by another person during the act of hanging oneself [18,23].

Double-suicides is a type of dyadic death where two individuals commit suicide simultaneously. Dyadic deaths are rare findings [22]. Our study found that two situations were encountered where the suicides appeared to be double suicides. In each case, a male and a female were found hanging at the same residence and at the same time. The other type of dyadic death is murder-suicide [22]. Our study reports on one case where the police suspected a murder-homicide.

The scarcity of local research on the epidemiological data of hanging cases is worrisome, especially since it is the most commonly used method to commit suicide [1,4,5,7,9,12–14,20–25,29,31–34]. Since there are significant differences among the various countries where research on hanging cases has occurred, epidemiological data cannot just be taken at face value and used locally.

From our study, a sociodemographic profile was constructed to identify those individuals who are at high risk of committing suicide by hanging. This profile indicates that males between the ages of 21 to 40, who are single and unemployed are at the highest risk for committing suicide by hanging. The population at the lowest risk for committing suicide by hanging

appears to be individuals who are older than 60 years of age, people who are married, people who are employed, and those with tertiary education. The most common location that individuals will choose to hang themselves will either be at home or in an isolated open space. This profile can be used in the future to identify those individuals for the highest need for suicide prevention programs.

To our knowledge, this study was the first study conducted in the Free State, which focussed solely on death due to hanging as the method of suicide.

Limitations

The results reported during the study may not be truly representative for various reasons. The data was collected using the mortuary records and case files. The possibility exists that these records and case files may contain some omissions, incorrect recordings, and inaccuracies. Some of the data was entered by administrative personnel using history from the next of kin, which may not be entirely correct.

A major limitation of the current study was that certain information was unavailable to the researchers, and this information was not further explored. This information may include factors such as previous suicidal ideation, previous suicide attempts, and known psychiatric disorders. It is possible that these variables could have been underemphasized in the current study. Interviews with surviving family members may have provided the researchers with the missing data.

Additionally, the eventual manner of death results was not collected from the SAPS files. In South Africa, the decision as to the manner of death is a legal decision made by the Inquest Magistrate. These findings are part of the SAPS docket, which is separate from the Forensic Mortuary Case files. Thus, cases where the manner of death was concluded to be homicide, suicide, or unknown, could be included in the study population. Examination of the SAPS dockets would have provided the researcher with the missing data and may have excluded some cases from the current study population.

A more extensive study with the inclusion of case files of all the Free State mortuaries is recommended in order to corroborate the findings of the current study.

Conclusion

According to international literature, death by hanging is the most common method used to commit suicide. It is regarded as a simple and effective method to employ without the need for access to firearms or a toxic substance. Much of our current knowledge regarding the demographics of high-risk populations are gathered through the retrospective investigations of mortuary records. Our research suggests that there are groups of individuals in our communities who might be at a high risk of committing suicide by hanging. Although there is a complex and poorly understood interplay between various factors, the sociodemographic profile may indicate which individuals might be at risk in a specific population. This information would allow suicide-prevention programs to intervene. The researcher appeals to the local and national Department of Health to respond to the dire need for a National Suicide Prevention Program and preventative treatment for those with significant life stressors.

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Author's contributions

Z.S. (Department of Forensic Medicine, University of the Free State) was responsible for the study design, data collection, and writing of the manuscript.

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Declaration of conflict of interest

There is no conflict of interest to declare.

Ethical approval

Ethical approval for the conduction of the study was granted by the Health Science Research Ethics Committee of the Faculty of Health Sciences of the University of the Free State (UFS-HSD2017/0049), as well as the Free State Department of Health.

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APPENDICES:

A) Letter of approval from the Health Sciences Research Ethics Committee

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA

UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

IRB nr 00006240
REC Reference nr 230408-011
IORG0005187
FWA00012784

14 June 2017

DR Z SMITH
DEPT OF FORENSIC MEDICINE
FACULTY OF HEALTH SCIENCES
UFS

Dear Dr Z Smith

HSREC 01/2017 (UFS-HSD2017/0049)
PROJECT TITLE: DEATH DUE TO HANGING: A RETROSPECTIVE DESCRIPTIVE STUDY OF HANGING VICTIMS IN CENTRAL SOUTH AFRICA.

1. You are hereby kindly informed that the Health Sciences Research Ethics Committee (HSREC) approved this protocol after all conditions were met. This decision will be ratified at the next meeting.
2. The Committee must be informed of any serious adverse event and/or termination of the study.
3. Any amendment, extension or other modifications to the protocol must be submitted to the HSREC for approval.
4. A progress report should be submitted within one year of approval and annually for long term studies.
5. A final report should be submitted at the completion of the study.
6. Kindly use the **HSREC NR** as reference in correspondence to the HSREC Secretariat.
7. The HSREC functions in compliance with, but not limited to, the following documents and guidelines: The SA National Health Act. No. 61 of 2003; Ethics in Health Research: Principles, Structures and Processes (2015); SA GCP(2006); Declaration of Helsinki; The Belmont Report; The US Office of Human Research Protections 45 CFR 461 (for non-exempt research with human participants conducted or supported by the US Department of Health and Human Services-(HHS), 21 CFR 50, 21 CFR 56; CIOMS; ICH-GCP-E6 Sections 1-4; The International Conference on Harmonization and Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH Tripartite), Guidelines of the SA Medicines Control Council as well as Laws and Regulations with regard to the Control of Medicines, Constitution of the HSREC of the Faculty of Health Sciences.

Yours faithfully

DR SM LE GRANGE
CHAIR: HEALTH SCIENCES RESEARCH ETHICS COMMITTEE
cc: SP Jansen Van Vuuren

Health Sciences Research Ethics Committee
Office of the Dean: Health Sciences
T: +27 (0)51 401 7795/7794 | F: +27 (0)51 444 4359 | E: ethicsfhs@ufs.ac.za
Block D, Dean's Division, Room D104 | P.O. Box/Posbus 339 (Internal Post Box G40) | Bloemfontein 9300 | South Africa
www.ufs.ac.za

B) Permission from the Department of Health

health
Department of Health
FREE STATE PROVINCE

21 April 2017

Dr Z Smith
Dept. of Forensic Medicine
Faculty of Health Science
UFS

Dear Dr Z Smith

Subject: Death due to hanging: A retrospective descriptive study of hanging victims in Central South Africa.

- Please ensure that you read the whole document, Permission is hereby granted for the above – mentioned research on the following conditions:
- Serious adverse events to be reported and/or termination of the study.
- Ascertain that your data collection exercise neither interferes with the day to day running of Universal Hospital nor the performance of duties by the respondents or health care workers.
- Confidentiality of information will be ensured and please do not obtain information regarding the identity of the participants.
- Research results and a complete report should be made available to the Free State Department of Health on completion of the study (a hard copy plus a soft copy).
- Progress report must be presented not later than one year after approval of the project to the Ethics Committee of the University of the Free State and to Free State Department of Health.
- Any amendments, extension or other modifications to the protocol or investigators must be submitted to the Ethics Committee of the University of the Free State and to Free State Department of Health.
- **Conditions stated in your Ethical Approval letter should be adhered to and a final copy of the Ethics Clearance Certificate should be submitted to** khusemj@fshealth.gov.za or sebeelats@fshealth.gov.za **before you commence with the study**
- No financial liability will be placed on the Free State Department of Health
- Please discuss your study with the institution managers/CEOs on commencement for logistical arrangements
- Department of Health to be fully indemnified from any harm that participants and staff experiences in the study
- Researchers will be required to enter in to a formal agreement with the Free State department of health regulating and formalizing the research relationship (document will follow)
- You are encouraged to present your study findings/results at the Free State Provincial health research day
- Future research will only be granted permission if correct procedures are followed see http://nhrd.hst.org.za

Trust you find the above in order.

Kind Regards

Dr D Motau
HEAD: HEALTH
Date: 24/04/17

Head : Health
PO Box 227, Bloemfotein, 9300
4th Floor, Executive Suite, Bophelo House, cnr Maitland and, Harvey Road, Bloemfotein
Tel: (051) 408 1527 Fax: (051) 408 1556 e-mail:sebeelats@fshealth.gov.za@fshealth.gov.za/chikobvup@fshealth.gov.za
www.fs.gov.za

C) Permission from the Director of the Free State Forensic Pathology Services

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

[redacted]

Department of Forensic Medicine
Private Bag X 20662
Bloemfontein
9300
(051) 419 9100
072 650 8568
zhaan.smith@gmail.com
7 November 2016

Dr R.J. Khoali
Director of the Forensic Pathology Services: Free State Province
Bloemfontein
9300

Dear Dr Khoali,

PERMISSION TO CONDUCT A STUDY ON CASES ADMITTED TO THE BLOEMFONTEIN MEDICO-LEGAL LABORATORY WHO DIED DUE TO HANGING.

I hereby wish to ask your permission to conduct a study on the number of cases in which the deceased individuals died due to hanging.

The aim of the study will be to record and analyse the socio-demographic parameters of the victims of hanging in Bloemfontein, South Africa for the period 1st January 2008 to 31st December 2015.

The purpose of the study will be to update the current research regarding deaths due to hanging in Bloemfontein, South Africa. A secondary purpose will be to compare the findings with international data.

The Death Register at the Bloemfontein Medico-Legal Laboratory will be used to identify cases where the deceased individuals died due to hanging. The data will be captured from the individual post-mortem dockets onto a data capture sheet. This data will then be transferred to a Microsoft Excel sheet for statistical analysis.

Cases will be identified by their Bloemfontein Death Register number, and no personal data will be transferred to the data capture sheet. The study will not interfere with the daily routine at the Bloemfontein Medico-Legal Laboratory. The data obtained and the statistical analysis thereof might be of help to promote future service delivery at the Bloemfontein Medico-Legal Laboratory and contribute to the development suicide prevention programs for possible intervention in future.

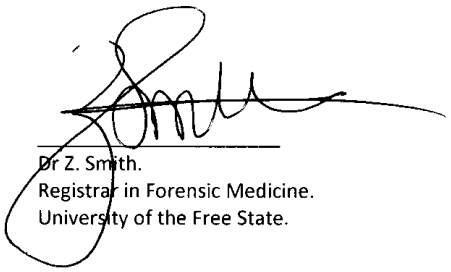
Department of Forensic Medicine
22 James Dick Street, Wilgehof, Bloemfontein 9301, South Africa
Private bag x 20662 (G46), Bloemfontein 9300, South Africa,
T: +27(0)51 412 9138, Fax: +27(0)51 412 9137

I plan to do a retrospective descriptive study for the period of 1st January 2008 – 31st December 2015.

The findings will be presented at relevant congresses and then published in a peer reviewed journal as part of the Master of Medicine in Forensic Pathology at the University of the Free State.

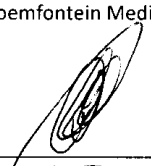
Your favourable consideration would be appreciated

Thank you,



Dr Z. Smith.
Registrar in Forensic Medicine.
University of the Free State.

I hereby give permission to Dr Smith to do the proposed study on cases admitted to the Bloemfontein Medico-Legal Laboratory of individuals who died due to hanging.



Dr R.J. Khoali.
Director of the Forensic Pathology Services: Free State Province
08/11/2016

D) Permission from Head of Department of Forensic Medicine

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

[redacted]

Department of Forensic Medicine
Private Bag X 20662
Bloemfontein
9300
(051) 419 9100
072 650 8568
zhaan.smith@gmail.com
7 November 2016

Dr M.S. Monatisa
Department of Forensic Medicine
University of the Free State
Bloemfontein
9300

Dear Dr Monatisa,

PERMISSION TO CONDUCT A STUDY ON CASES ADMITTED TO THE BLOEMFONTEIN MEDICO-LEGAL LABORATORY WHO DIED DUE TO HANGING.

I hereby wish to ask your permission to conduct a study on the number of cases in which the deceased individuals died due to hanging.

The aim of the study will be to record and analyse the socio-demographic parameters of the victims of hanging in Bloemfontein, South Africa for the period 1st January 2008 to 31st December 2015.

The purpose of the study will be to update the current research regarding deaths due to hanging in Bloemfontein, South Africa. A secondary purpose will be to compare the findings with international data.

The Death Register at the Bloemfontein Medico-Legal Laboratory will be used to identify cases where the deceased individuals died due to hanging. The data will be captured from the individual post-mortem dockets onto a data capture sheet. This data will then be transferred to a Microsoft Excel sheet for statistical analysis.

Cases will be identified by their Bloemfontein Death Register number, and no personal data will be transferred to the data capture sheet. The study will not interfere with the daily routine at the Bloemfontein Medico-Legal Laboratory. The data obtained and the statistical analysis thereof might be of help to promote future service delivery at the Bloemfontein Medico-Legal Laboratory and contribute to the development suicide prevention programs for possible intervention in future.

Department of Forensic Medicine
22 James Dick Street, Wilgehof, Bloemfontein 9301, South Africa
Private bag x 20662 (G46), Bloemfontein 9300, South Africa,
T: +27(0)51 412 9138, Fax: +27(0)51 412 9137

I plan to do a retrospective descriptive study for the period of 1st January 2008 – 31st December 2015.

The findings will be presented at relevant congresses and then published in a peer reviewed journal as part of the Master of Medicine in Forensic Pathology at the University of the Free State.

Your favourable consideration would be appreciated

Thank you,

Dr Z. Smith.
Registrar in Forensic Medicine.
University of the Free State.

I hereby give permission to Dr Smith to do the proposed study on cases admitted to the Bloemfontein Medico-Legal Laboratory of individuals who died due to hanging.

pp. SJ Jansen van Vuuren
2016/11/08

Dr M.S. Monatisa.
The Chief Forensic Pathologist of the Free-State Province.
Head of Department of Forensic Medicine.
University of the Free State.

E) Permission from the Bloemfontein Forensic Mortuary Manager

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
UFS·UV
HEALTH SCIENCES
GESONDHEIDSWETENSKAPPE

[redacted]

Department of Forensic Medicine
Private Bag X 20662
Bloemfontein
9300
(051) 419 9100
072 650 8568
zhaan.smith@gmail.com
7 November 2016

Mr L.E. Lecoko
Facility Manager
Bloemfontein Medico-Legal Laboratory
Bloemfontein
9300

Dear Mr Lecoko,

PERMISSION TO CONDUCT A STUDY ON CASES ADMITTED TO THE BLOEMFONTEIN MEDICO-LEGAL LABORATORY WHO DIED DUE TO HANGING.

I hereby wish to ask your permission to conduct a study on the number of cases in which the deceased individuals died due to hanging.

The aim of the study will be to record and analyse the socio-demographic parameters of the victims of hanging in Bloemfontein, South Africa for the period 1st January 2008 to 31st December 2015.

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Private bag x 20662 (G46), Bloemfontein 9300, South Africa,
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Private Bag X 20662
Bloemfontein
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7 November 2016

Mr L.E. Lecoko
Facility Manager
Bloemfontein Medico-Legal Laboratory
Bloemfontein
9300

Dear Mr Lecoko,

PERMISSION TO CONDUCT A STUDY ON CASES ADMITTED TO THE BLOEMFONTEIN MEDICO-LEGAL LABORATORY WHO DIED DUE TO HANGING.

I hereby wish to ask your permission to conduct a study on the number of cases in which the deceased individuals died due to hanging.

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The purpose of the study will be to update the current research regarding deaths due to hanging in Bloemfontein, South Africa. A secondary purpose will be to compare the findings with international data.

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Cases will be identified by their Bloemfontein Death Register number, and no personal data will be transferred to the data capture sheet. The study will not interfere with the daily routine at the Bloemfontein Medico-Legal Laboratory. The data obtained and the statistical analysis thereof might be of help to promote future service delivery at the Bloemfontein Medico-Legal Laboratory and contribute to the development suicide prevention programs for possible intervention in future.

F) Permission from the Department of Biostatistics

UNIVERSITY OF THE FREE STATE
UNIVERSITEIT VAN DIE VRYSTAAT
YUNIVESITHI YA FREISTATA
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GESONDHEIDSWETENSKAPPE

21 November 2016

For attention: Health Sciences Research Ethics Committee
Faculty of Health Sciences

Title of project:

Death due to hanging: A retrospective descriptive study of hanging victims in Central South Africa.

Researcher:

Dr Z Smith

I have given input regarding the above mentioned project's protocol on the following aspects of the protocol, namely the study design, sample, measurement, measuring instrument and statistical analysis.

The input will be implemented under supervision of the study leader Dr S Janse van Vuuren.

Yours faithfully

M. Nel

Departement Biostatistiek
Department of Biostatistics
T: +27(0)51 401 3114/5/6/7, F: +27(0)51 401 3641
205 Nelson Mandela Drive/Rylaan, Park West/Parkwes, Bloemfontein 9301, South Africa/Suid-Afrika
P.O. Box/Posbus 339 (G31), Bloemfontein 9300, South Africa/Suid-Afrika, www.ufs.ac.za

G) Copy of the research protocol approved by the HSREC

Death due to hanging: A retrospective descriptive study of hanging victims in Central South Africa.

Researcher:
Dr Zandré Smith
Department Forensic Medicine and Pathology
Faculty of Health Sciences
University of the Free-State

Supervisor:
Dr Stefan Jansen van Vuuren
Department Forensic Medicine and Pathology
Faculty of Health Sciences
University of the Free-State

Corresponding researcher:
Dr Zandré Smith
Department Forensic Medicine and Pathology
Faculty of Health Sciences
University of the Free-State

Postal address: Private bag X20662
Bloemfontein
9301
South Africa

Tel: (051) 412 9100
Fax: (051) 412 9137
Email: zhaan.smith@gmail.com

DECLARATION OF CONFIDENTIALITY

I declare that this research is my own unaided work. It is being submitted for the degree of Master of Medicine in Forensic Pathology at the University of the Free State, Bloemfontein. It has not been submitted before for any degree or any examination in any other university. I also declare that all personal and identifying data and subject information obtained during this research project will be anonymized and remain confidential.

Dr Z Smith
Principle researcher

Date: 7 November 2016

1

Contents

Summary in lay terms:

Death due to hanging is a worldwide phenomenon. In 1995, the World Health Organisation declared it a global health crisis. Research has also shown that death due to hanging is very common and increasing.

Several studies have identified specific socio-demographic parameters for deaths due to hanging. Knowledge of the socio-demographic parameters of the victims in specific areas contributes to the development of suicide prevention programs for possible intervention in future. The aim of this research project is to record and investigate the demographic profile of victims that died due to hanging, that were admitted to the Bloemfontein Medico-Legal Laboratory. A similar study was done previously at the same facility and results will be compared to this research project.

Death due to hanging is an unnatural cause of death. In South Africa, all individuals who die due to an unnatural cause of death, must undergo a medico-legal examination which might include an autopsy. Individuals who died due to hanging between the 1st of January 2008 and 31st of December 2015, and were admitted to the Bloemfontein Medico-Legal Laboratory, will be included in the research project. Information on the socio-demographic profile of the deceased will be obtained from the facility case files. Once all the data has been captured it will be statistically analysed. The results will then be interpreted and the findings compiled in an article for publication in a medical journal.

Introduction:

Death due to hanging by the neck, and specifically suicide by hanging, is a global phenomenon. In 1995, the World Health Organisation declared it a global public health crisis[1]. Research has also shown that death due to hanging is very common and increasing[1-19]. In 2009 it was estimated that the global death rate due to suicide was 1 million per annum[2,4], which extrapolated to an estimated global suicide mortality rate of 14.5 deaths per 100,000[3,17]. This calculated to 1 death every 20 seconds and 1 attempted hanging every 1 – 2 seconds. There appeared to be no difference between mortality rates of developing and developed countries[3]. The most common method for committing suicide consistently appeared to be hanging[1,3-7,11-14,16-19], constituting up to 86-90% of all suicide cases[3,5-6].

International research regarding the socio-demographic parameters of victims of hanging are abundant[1-13]. Table 1 shows the high-risk socio-demographic parameters of hanging victims that had been identified by several studies.

However only a few studies have been done to look at the socio-demographic parameters of victims of hanging in South Africa[1,14-19]. One such study had been done at the Bloemfontein Medico-Legal Laboratory between 2003 and 2007. [16]. The study showed that predominantly hanging victims were black Africans males between the ages of 21 – 40. The research project planned will aid to update the current data on victims of hanging in Bloemfontein, South Africa.

According to Bantjies et al[1], accurate suicide statistics in South Africa are hindered by numerous problems, including the lack of reliable mortuary surveillance systems with coverage of all the geographic regions. An example of this is that the Free State did not contribute to the National Injury Mortality Surveillance Survey (NIMSS) reports until 2008[19]. The NIMSS is currently the most detailed source of information on the demographic data of fatal injuries in South Africa[19].

Knowledge of the socio-demographic parameters of the victims that died due to hanging in specific areas contributes to the development suicide prevention programs for possible intervention in future[1,5-6,12].

Gender	According to several studies it appears that males commit suicide by hanging up to 5 times more frequently than females[3,4-6,9-12,14,16-19].
Age groups	Several studies have shown that the highest number of deaths due to hanging occur in the age group of 15-30 years[3,7,11-15]. Another major increase is seen in the older generation between ages of 55-65 years[3,5,7,9]. Two studies specifically indicated that death due to hanging among the elderly is now more common than amid young adults[9-10].
Marital status	Two studies in Europe indicated that widowers, single men, and socially isolated individuals are more inclined to hang themselves[6,12]. A contradictory study done in Israel indicated that the numbers of married victims were higher than in widowers or single indivduals[9].
Level of education	Lower levels of education appeared to be a risk factor for death due to hanging in a study done by Starkuviene et al in Lithuania[6].
Occupation	A large number of individuals who died due to hanging were unemployed or working in specific industries such as agriculture or construction[4].

Table 1: High risk sociodemographic parameters for death due to hanging.

The results of the studies performed in South Africa[14-19] correlate well with the international data:

- There has been an increase in suicide rates from 5.2 deaths per 100,000 of the population in 1993 to 16.2 deaths per 100,000 of the population in 2003[14,17]. The annual rate of death due to hanging was between 6,000 and 10,000[14,16,18-19].
- Males constituted 86.4% of the total number of hangings[14-19].
- Hanging is a common method of suicide[14,16-19], although the prevalence decreases with age. The highest numbers are among the age group 20 – 29 years[14, 16-19].
- One area that South African studies can explore is the incidence of suicide among people from different ethnicities. It appears that Black Africans commit suicide by hanging more often than Caucasians[16-17].
- Single, widowed or divorced individuals more readily commit suicide by hanging[16-17].

It is clear that death due to hanging is a vast public health problem. It appears to be a dynamic entity, with a need to update the data regularly. This research project will assist to update the current data on death due to hanging in Bloemfontein, South Africa.

Aim:

The aim of the study will be to record and analyse the socio-demographic parameters of the victims of hanging in Bloemfontein, South Africa for the period 1st January 2008 to 31st December 2015.

The purpose of the study will be to update the current research regarding deaths due to hanging in Bloemfontein, South Africa. A secondary purpose will be to compare the findings with international data.

Design of the research project:

This research project will be a retrospective descriptive study for the period of 1st January 2008 – 31st December 2015.

Methods:

Inclusion criteria:

The study population will consist of all individuals who were admitted to the Bloemfontein Medico-Legal facility during the period of 1st January 2008 to 31st December 2015. Bloemfontein Forensic facility is classified according to the Code of Guidelines for Forensic Pathology Services as a N6 grade facility and performs between 1500 and 2000 medico-legal post mortem examinations per year[20]. All deaths where the pathologist concluded that the death was due to hanging by the neck will be included into the study.

Exclusion criteria:

Cases will be excluded if socio-demographic data was inadequately recorded in the mortuary files.

Explanation of the procedure to follow:

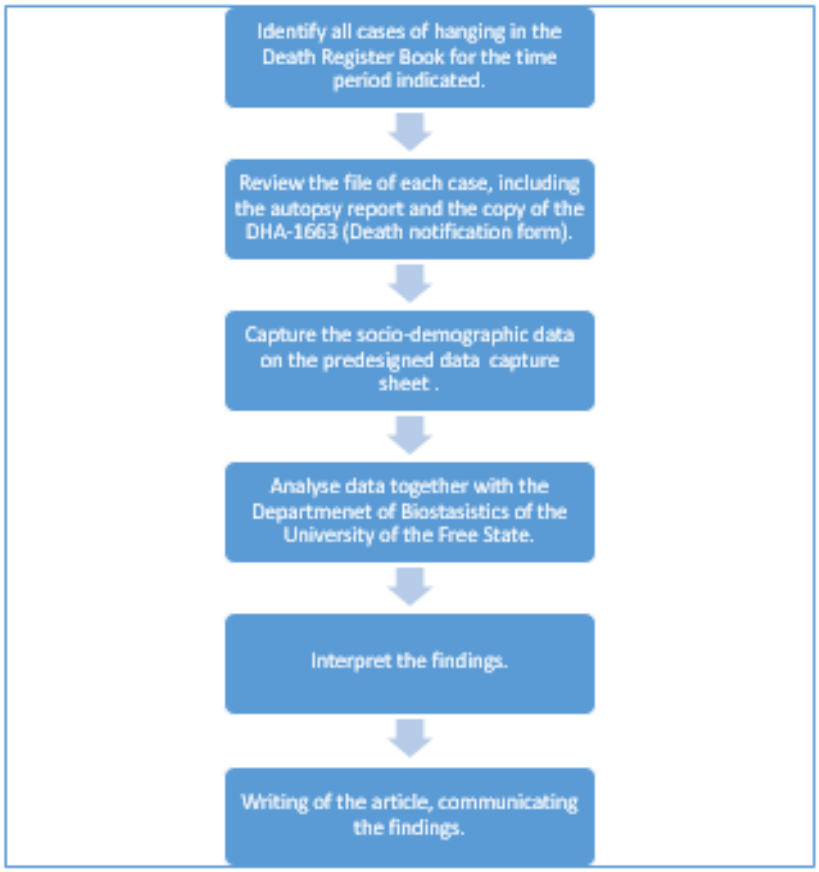

Figure 1: Procedure of the study

Time projections:

	September 2016 - November 2016	January 2017 – May 2018	June 2018 – December 2018	January 2019 – December 2019
Ethics approval	X			
Data collection		X		
Data analysis			X	
Writing of research paper				X

Table 2: Timeline for the research project.

The study will be completed in ±3 years.

Collection of data:

All data will be collected and recorded by the principle researcher. Data will be obtained from the records in the Death Register Book and case files from the Bloemfontein Medico-Legal Laboratory.

Socio-demographic parameters will be captured on a predesigned data-capturing sheet, for example: Gender, Age, and Ethnicity. See annexure A for an example of the data-capturing sheet.

Pilot study:

The first ten cases included in the study will be used as a pilot study, to evaluate the access to data and the ability to complete the data collection forms.

Statistical analysis:

Approval for the bio-statistical analysis of data have been obtained from the Department of Bio-Statistics of the University of the Free-State. The letter will be submitted to the ethics committee.

Ethics committee:

Consent for the conduction of the research will be obtained from:

- The Chief Forensic Pathologist of the Free-State Province.
- The Bloemfontein Medico-Legal Laboratory Facility Manager.
- The Head of the Forensic Directorate of the Free-State Province.
- The Free-state Department of Health.
- The Ethics Committee of the Faculty of Health Sciences, University of the Free-State.

- See annexure B for the consent forms.

Ethical aspects and consent:

The Inquest Act 1959, (Act No 58 of 1959), section 3 (2) states: 'If the body of the person who has allegedly died from other than natural causes is available, it shall be examined by the district surgeon or any other medical practitioner, who may, if he deems it necessary for the purpose of ascertaining with greater certainty the cause of death, make or cause to make an examination of any internal organ or any part or any of the contents of the body, or any other substance or thing'[21].

Informed consent from the family of the subjects included in the project will be negated by the Inquest Act (58 of 1959) and as such will not be a prerequisite.

No identifiable data of the deceased or attending pathologist will be collected.

Consent for the use of the information recorded in the Death Register Book at the Bloemfontein Medico-Legal Laboratory will be obtained from the Chief Forensic Pathologist of the Free-State Province.

Data-capturing sheet:

The data collected will be inserted into pre-designed data-capturing sheet.
The data-capturing sheet will be compiled and filled-in by the first researcher.
See annexure A for a copy of the data-capturing sheet.

Amendments to the protocol:

This protocol will be strictly adhered to. The researcher will inform the Ethics committee, in writing, if any amendment to the research is planned.

Publication of findings:

The findings will be presented at relevant congresses and then published in a peer reviewed journal as part of the Master of Medicine in Forensic Pathology at the UFS.

Financial:

The budget of the proposed project is outlined in table 3 and presented in ZAR.
The cost for the project will be carried by the principle researcher.

Stationary	R 150
Printing and binding	R 150
Internet data	R 200
Transport	R 200
TOTAL:	R 700

Table 3: The research project budget

Signatures of investigators:

Dr Z Smith
Principle researcher

Dr SP Jansen van Vuuren
Research project leader

8

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H) Data capture sheet

Annexure A: Example of the Data-capturing sheet.

Data-capturing sheet: Death due to hanging.

Body number: _____

Date of death: D D / M M / C C Y Y Date of autopsy: D D / M M / C C Y Y

Gender:

Male	Female

Age:

0 – 10	11 – 20	21 – 30	31 – 40	41 – 50	51 – 60	61 – 70
71 – 80	80+					

Ethnicity:

African	Caucasian	Indian	Asian	Coloured
Other				

Marital status:

Single	Married	Divorced/ Estranged	Widowed

Level of highest education:

Uneducated
Primary school
Secondary school (excluding Grade 12)
Grade 12 (Matric)
Higher education (Any type)

Occupation (Please specify):

_____

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