ASSESSING THE EPIDEMIOLOGY OF SHARPS INJURIES AMONGST NURSING STUDENTS: A CASE OF SELECTED NATIONAL HEALTH TRAINING CENTRES

by

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Date: October 2020

DECLARATION

I, *George Ndjitaviua* hereby declare that the work contained in the thesis entitled *Assessing the Epidemiology of Sharps Injuries amongst Nursing Students: A case of selected NHTCs* is my own original work and that I have not previously in its entirety or in part submitted it at any university or other higher education institution for the award of a degree.

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DEDICATION

I wholeheartedly dedicate this to my dear wife Vehonga for her motivation, my lovely mom Angela Ndjitaviua for believing in me. My sons Ngaritangue, Ikuaterua and Rarinovandu; - your existence kept me motivated. Let this be a source of encouragement to you.

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ABSTRACT

Sharps Injuries (SIs) are a major occupational health and safety issue facing health care professionals today. According to Shiao, McLaws, Huang and Guo (2002), nursing staff are at greatest risk, especially nursing students due to their limited clinical knowledge and lack of experience. Literature on sharps injuries amongst HCWs shows extensively varying numbers of 1.4 up to 9.5 per 100 HCWs per year worldwide (Elseviers, Arias-Guillen, Gorke & Arens, 2014). According to the National Health Training Centres (NHTCs) official website, the Enrolled Nurse/Midwifery Training program students are required to acquire theoretical and practical knowledge in the classroom set-up during the training period (National Health Training Centres [NHTCs], 2018). In addition, students are expected to complete practical learning attachments in hospitals where they are expected to perform invasive procedures that put them at risk of experiencing potentially infectious SIs. This study was conducted with the purpose of establishing the epidemiology of sharps injuries amongst the study population. The study adopted a cross-sectional study design using an anonymous structured self-administered questionnaire as a data collection tool within the framework of a survey procedure. The data were investigated and analysed using the Statistical Package for the Social Science (SPSS) software, version 22. The study findings yield that 19.5% of respondents experienced a sharps injury during their training period. The study highlights that the most common reason for injury (6 out of 22 respondents) was the uncapping or recapping needles during injection of patients. This suggests that more emphasis should be accorded to the safety aspects around this procedure. Eighty one percent (18 out of 22) of injuries were self-inflicted while eighteen percent indicated that the needle stick injuries were caused by another person.

The NHTCs nursing curriculum committee should revisit the course content on sharps safety, especially on the injection procedure which account for (50%) of SIs experienced by the study subjects. Emphasis should be placed on the correct use of protective clothing/devices. An evaluation should be done to that effect to ascertain competency.

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LIST OF ABBREVIATIONS/ CLARIFICATION OF TERMS

AIDS	Acquired Immune Deficiency Syndrome
CDC	Centre for Disease Control
MoHSS	Ministry of Health and Social Services
NIOSH	National Institute for Occupational Safety and Health
NSIs	Needle Stick Injuries
NHTCs	National Health Training Centres
HAV	Hepatitis A Virus
HBV	Hepatitis B Virus
HCV	Hepatitis C Virus
HCWs	Health Care Workers
OHS	Occupational Health and Safety
HIV	Human Immunodeficiency Virus
KAP	Knowledge Attitude Practices
SIs	Sharps Injuries
SPSS	Statistical Package for the Social Science
TB	Tuberculosis Bacilli

Epidemiology	The study of the distribution and determinants of health-related states or events in specified populations and the application of this determinants of health-related states or events to control those health problems (Gordis, 2014)
Attitude	A feeling or emotion towards prevention and post-exposure of NSI (Tsing Tsing, 2008)
Blood-borne infections	Infections transmitted by way of direct blood contact from one individual to another (Aiken, Klocinski &, Sloane, 1997)

Blood-borne diseases	Diseases caused by pathogenic microorganisms transmitted via human blood
Knowledge	Knowledge is defined as, a fluid mix of framed experience, contextual information, values and expert insight that provides a framework for evaluating and incorporating new experiences and information
Practices	The continuous exercise of a profession towards NSIs (Tsing Tsing, 2008)
Human Body Fluids	In the proposed study, human body fluids will refer to plasma/serum, urine, cerebrospinal fluid, blood and saliva
Registered Nurse	A nurse registered with the Namibia Health Professions Council, with a four year nursing/midwifery degree or equivalent qualification
Medical Sharps Injury	An injury resulting from a penetration of the skin by a used needle or any other sharp instrument, such as a lancet, that is potentially contaminated with another individual's blood or body fluids (Hanrahan, 1996)
Recapping	The act of replacing a protective sheath on a needle
Needle stick injury	Penetrating stab wounds caused by needles
Sharps Injury	A skin puncture wound with a contaminated medical sharp object, including a needle
Risk	A combination of the likelihood of an occurrence of a hazardous event and the severity of the injury or damage that the event causes to the health of people or to property
Safety device	A non-needle sharp or a needle device used for withdrawing body fluids, accessing a vein or artery, or administering medications or other fluids, with a built-in safety feature or mechanism that effectively reduces the risk of an exposure incident

Personal protective equipment (PPE)	Equipment designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, PPE includes a variety of devices and gears such as goggles, coveralls, gloves, vests, earplugs and respirators
Exposure	A percutaneous injury (e.g. a needle stick or cut with a sharp object) or the contact of mucous membrane or non-intact skin (e.g. exposed skin that is chapped, abraded or afflicted with dermatitis) with blood, tissue or other body fluids that are potentially infectious.
Post-exposure prophylaxis	The immediate provision of medication following an exposure to potentially infected blood or other body fluids in order to minimize the risk of acquiring infection

CHAPTER ONE : ORIENTATION OF THE STUDY

1.1. Introduction

The problem of Sharps Injuries (SIs) was in one case addressed by McCormick and Maki in 1981, and thereafter many efforts have been made in an attempt to prevent and reduce these injuries (Center for Disease Control and Prevention [CDCP], 2015). Despite these efforts that involve large amounts of money and research efforts, the high prevalence of SIs remains a cause for concern. Many studies have demonstrated that nurses are frequently at risk of sustaining a sharp injury (Aynalem & Habtewold, 2014; Lachowicz & Matthews, 2009; Shiao et al., 2002; Bowden, Pollet, Birrell, & Dax, 1993; Ruben et al., 1983). Over the past decades, the concern for health and safety of workers was not a priority in state health facilities, with the primary focus rather on the patient (Small, Pretorious, Walters, & Ackerman, 2011). Limited funds were budgeted towards the provision of safe mechanisms for sharps equipment and personal protective equipment for HCWs (Small et al., 2011). Similarly, the occurrence of sharps injuries amongst nursing trainees in practice implies a risk for occupationally-acquired infections and may carry legal and financial implications for training institutions.

A sharps injury is defined as an incident where a contaminated medical sharp object penetrate the skin of a Health Care Worker (HCW) or any other person. Sharps injuries are caused by different types of needles, surgical, lancet, scalpel, trocar puncture needle, broken vial preparation, vacuum tube blood collection needle, razors, scissors, during patient care (Feleke, 2013).

Sharps Injuries (SIs) can result in infections that pose life threatening health effects to Health Care Workers (HCWs) (Ruhi, Battal, Ozturk, & Akcin., 2011). Due to their limited clinical experience and the complexity of activities surrounding patient care, nursing students are even at a greater risk of experiencing SIs in relation to other groups of HCW's. As stated in Hakwenye and Aku-Akai (2016), more than 35 million HCWs face the risk of sustaining a percutaneous injury with a contaminated sharp object every year in the world (Wilburn & Eijkemans, 2004). In support of the former sentiment, Pathak et al. (2012) maintained that an estimated two million potentially infectious SIs are reported annually in the world. Similarly the Center for Disease Control and Prevention (CDCP) estimates that approximately 385 000 needle stick injuries occur every year to HCWs in the United States of America (Diesenhammer, Radon & Nowak, 2006). Africa's high rates of generalised disease and inadequate medical facilities combine to accelerate the risks of SIs. Two studies carried out on HCWs who were directly involved in

patient care in neighbouring South Africa recorded needle stick/sharps injuries of 18.8% and 46.7%, respectively (Kruger, Oluwatosi, & Joubert., 2012; Lachowicz & Matthews, 2009).

The exposure to biological hazards like viruses is known to be the most common and more persistent hazards amongst HCWs, and they are easily transmitted through an injury with a contagious sharp object in health settings (Ministry of Health and Social Services [MoHSS], 2016). These infections include, but are not limited to HIV/AIDS, Syphilis, and Hepatitis B and C (Jayanth et al., 2009). Another study contacted amongst nurses and midwifes in Uganda yielded a high rate of needle pricks (Nsubuga & Jaakkola, 2004). Amongst the 526 nurses and midwifes who took part in that study, 57% of them experienced a needle stick injury during the year before the study was conducted. A similar study carried out in Ethopia by Aynalem and Habtewold (2014) also yielded a high prevalence of occupational exposure of the health care workers to sharps injuries. The study found an overall prevalence of 88.6% of exposure in the past 12 months. Contact to potentially infectious body fluids accounted for the largest proportion 56.7% followed by NSIs at 31.5% and glove breakage at 28.8%. Thus, it is clear that the issue of sharps injuries is indeed a global concern, as it affects a great part of the globe.

Although no steadfast data exist in Namibia on sharps injuries, it is generalised that there are about 180,000 HIV infected adults and children in Namibia (MoHSS, 2012). As a result of their condition, these people often spend more time in hospitals seeking medical care, thus increasing the risk of exposure of healthcare workers to HIV and other blood-borne pathogens when performing invasive medical procedures. When it comes to prevalence of hepatitis C virus (HCV) and Hepatitis B virus in Namibia, amongst 143 076 blood samples received from all asymptomatic, first-time blood donors between February 1 and July 31, 1997 was found to be 6 and 12% respectively (Vardas, Sitas, Seidel, Casteling, & Sim, 1999). This implies that those patients, who attend healthcare settings for various other procedures like contraceptive, flu injections, etc., may pose a risk to HCWs as they might not deem it necessary to take precautionary measures after such injury, due to the assumed state of health of the patient.

A survey done at the University of Namibia found that, during year 2008 alone, 17% of student nurses sustained needle-stick injuries (Small et al., 2011). Unfortunately, only 55% of those cases were reported. A study consistent with the former found a needle stick prevalence of 38% amongst a study group of 204 HCWs in Windhoek (Aku-Akai & Hakwenye, 2016). This study also covered other groups of HCWs, including, laboratory technologists, cleaners and doctors. They too experienced sharps injuries, thus providing evidence that all HCWs are at risk. However, the current study focuses on enrolled nurse/midwifery students only.

From the literature it was revealed that the quality of training, lack of supervision during training, lack of job satisfaction, improper medical waste segregation, over-loading of health workers, in-adequate facilities/staff, attitude and lack of knowledge are contributing factors towards sharps injuries (Aiken et al., 1997; Small et al., 2011; Salelkar et al., 2010). Liese (2004) maintains that inadequate staffing of health care workers results in un-necessary pressure on health care workers, and this can result in hospitals using un-skilled or less skilled workers (e.g. students) to perform risky activities un-supervised. Therefore, an epidemiological assessment of sharps injuries is needed in order to inform policy formulation and curriculum development in a manner that improves sharps safety in health care operations in Namibia. The research will employ a survey research methodology, using a structured questionnaire to collect quantitative data from all the participating students registered at the National Health Training Centres in Namibia.

1.2. Statement of the problem

Effective occupational health and safety is essential to all stakeholders involved. More often nurses prefer to join the private sector to seek for better working conditions (compensation, nonfinancial incentives, and occupational health and safety). Like many other developing countries, Namibia's workforce is susceptible to a high level of work- related hazards and risks, more especially HCWs.
Sharps injuries are a major occupational health and safety issue facing health care professionals in modern health care. A survey study in Mauritius found that sharps injuries were the most common type of injury sustained by nurses (Subratty & Moussa, 2007). Similarly, a five years surveillance study in Saudi Arabia found that most reported sharps injuries involved nursing staff, followed by medical doctors (El-Hazmi & Al-Majid, 2008). A recent study by Hakwenye and Aku-Akai (2016) highlighted a prevalence of 38% NSIs among the respondents of a study carried out on 204 health workers including doctors, nurses, laboratory technologists, cleaners and auxiliary health workers, from three general hospitals in Windhoek, Namibia. This is evidence that Namibian HCWs are not safe from this worldwide issue of sharps injuries.

In NHTC's nursing training program students are required to acquire theoretical and practical knowledge in the classroom set-up during the training period (NHTC, 2018). In addition, students are expected to complete practical learning attachments in hospitals where they are expected to perform invasive procedures that put them at risk of experiencing potentially contagious sharps injuries. In

response to these concerns, the research intended to assess the epidemiology of sharps injuries and recommend interventions based on factual implications.

1.3. Study objectives

1.3.1. General objective

The general objective of the study was to assess the epidemiology of sharps injuries amongst nursing students at the NHTC's and recommend occupational health and safety interventions to curriculum committees. Epidemiology is a study of the distribution and determinants of health-related states or events in specified populations and the application of this determinants of health related states or events study to control those health problems (Gordis, 2014).

1.3.2. Specific objectives

1.3.2.1. To determine the prevalence of sharps injuries amongst the study group

1.3.2.2. To identify the determinants/causal factors of the recorded and un-recorded sharps injuries

1.3.2.3. To recommend occupational health and safety interventions to curriculum committees for the experimental learning of nursing students at the NHTCs

1.4. Significance of the research

Research in the field of sharps injuries in Namibia is generally lacking and the little research done has focused on skilled Health Care professionals. Due to the general increase in disease prevalence, the delivery of services provided in health care settings keeps on growing and also such services are characterised with complexity. Health care workers form an important part of any country's workforce, particularly, a third world country like Namibia where the study was conducted. This implies that there is a need to establish the prevalence and causes of sharps injuries because diseases are considered to be rampant in developing countries. Student nurses deal directly with patient's human body fluids during their experiential learning. Thus, the significance of this study is the validation once again of the complimentary role that occupational health and safety practitioners and nursing trainers play in crafting nursing students. Both groups are needed to assist student nurses how to safely practice medical procedures involving sharps.

It is expected that creating awareness on the dangers of sharps injuries and safe practices will eliminate the hazards of sharps injuries and person-to-person disease transmission in healthcare settings.

Another expectation is that the findings and recommendations of the study will inform policy makers and curriculum developers in health care training (both private and public) in Namibia to be more informed about occupational health and safety aspects in the workplace.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

"A literature review is an information analysis and synthesis, focusing on fin dings and not simply bibliographic citations, summarizing the substance of the literature and drawing conclusions from it" (Randolph, 2009:2). Therefore, the literature review of this study provided in-depth information about sharps injuries in health care environments, as well as an overview of the extent (prevalence) and the consequences of sharps injuries in developed and developing countries. Post-exposure management of sharps injuries was also assessed, especially with regards to established Infection Control Guidelines and Universal Precautions. Studies around sharps epidemiology and nurses and nursing student's knowledge, practices, and attitude around sharps injuries formed a major section of this literature review. Haddon's Matrix has been adopted as the theoretical framework for the study (Runyan, W.C. 2008). The model is a commonly used in the field of injury prevention and focusses on three injury phases, namely; pre-injury, injury and post injury. A majority of the questions in the data collection tool were informed by elements derived from the Haddon's Matrix.

The following key words were used to search for literature around the topic; nursing students, occupational health and safety, medical sharps injuries, healthcare provision, survey studies, sharps injury protocols, healthcare workers, quantitative studies, cross sectional studies. The reviewed documents were sourced from the following data bases; NUST Library Discovery, Academic Source Premier (Ebsco), Proques Science & Technology, Science direct, Taylor & Francis, and Proquest Thesis & Dissertation.

2.2. Prevalence of sharps injuries

Nursing students have a high prevalence rate of needle sticks/sharps injuries. Studies across the world demonstrate prevalence rates of between 13% and 85%. For instance, Fereidouni, Morandini, Dehghan, Jamshidi and Kalyani (2018) completed a systematically review of previous studies on the prevalence of sharps injuries and exposure to blood and body fluids by health care workers, inclusive of nursing students. The review exposed that close to half of the Iranian healthcare workers during their daily work are at risk for needle stick injury and exposure to blood and body fluids. According to Fereidouni et al. (2018), the prevalence of injuries caused by sharps objects such as needles ranged from 10% to 84% while the prevalence of exposure to blood and body fluids ranged from 13% to 79%.

Baghcheghi, Koohestani, Rezaei, Seraji and Abedi (2011) uncovered that 70% of the nursing students had experienced at least one contaminated Needle Sticks/Sharps Injuries (NSIs) during their studies.

Additionally, 43% of the NSIs were recorded within a period of 12 months at a medical school in Iran. Similarly, a study by Yeshitila, Mengistie, Demessie and Godana (2015) exposed that within a period of 12 months, the prevalence of one or more NSIs was at 63% among nursing and midwifery students at the Haramaya and Jigjiga University in Ethiopia. In other studies (Zhang, Chen, Li, Hu, Zhang, Li, Stallones & Xiang., 2018; Rn, Siu, Ching, Ka & Chang, 2012) on the prevalence of and risk factors for NSIs among Chinese nursing students, it was revealed that more than 60% of the students indicated that they experienced NSIs. According to Arli and Bakan (2018), 57% of the nursing students are usually exposed to NSIs during their training.

In contrast, nursing students in some other studies had lower rates of NSIs. For example, Li and Hons (2008) revealed that, only 16% of South African nursing students experienced NSIs during their clinical training. Ghasemzadeh, Kazerooni, Davoodian, Hamedi and Sadeghi (2015), reported a 39% of sharp injuries prevalence rate among the medical, nursing, midwifery, operating room technician, and medical laboratory students at the Hormozgan University of Medical Sciences. Likewise, a study by Khoshnood, Nouhi and Mahdi (2015) involving nursing and midwifery students at the Kerman Medical Science University revealed that only thirty percent of the students experienced sharps injuries within a period of 12 months. Notably, 42% of those students experienced the injury during their university studies clinical practices. Equally, Nawafleh, Abozead, Mohamed, Ahmed, Altaif and Muhbes (2019) revealed a 40% SIs prevalence rate among Arab nursing students.

According to Bijani, Azimian, Soleimany and Mohammadi (2013), SIs were reported in 77 nurses out of 246 in different positions. A study by Rais and Jamil (2013) revealed that full time health care providers at the Civil Hospital Karachi (CHK) in Pakistan had a 77% NSIs prevalence rate. Also, Mekonnen, Yosef, Teklegiorgis, Tesfaye and Dagne (2018) uncovered that, NSIs prevalence rates among Health Care Workers in Dire Dawa in Ethiopia was at 53% and 26.6% for the life time and for the last 12 months respectively. NSI prevalence rates in Egypt, Jordan, and Kingdom of Saudi Arabia (KSA) were recorded at 68%; 76%; and 47%, respectively (Nawafleh et al., 2019). Overall, the literature has shown that SIs occur among all nurses and nursing students at reasonably high rates internationally, with no significant difference between developed and developing countries.

2.3. The determinants/causal factors of sharps injuries

Syringe needles (which account for more than 70% of injuries) are the most common sort of objects which caused injuries to nursing and midwife staff and students during their clinical duties (Khoshnood et al., 2015; Care, 2016; Nawafleh et al., 2019). Furthermore, Nawafleh et al. (2019) state that, NSIs are

considered the second most common cause of work-related injury globally. Zhang et al. (2018) established that the common cause of sharps injuries among Chinese nursing students at 60% were syringe needles, 22% by glass items, and 3% by scissors. Furthermore, when sharp injuries occurred, 36% of sharp objects (mainly needles) had been used on patients while 41% were unused. Irmak and Baybuga (as cited in Arli & Bakan, 2018) also revealed that the most common cause of sharps injuries to nursing students are needle sticks (at 54%). In another study by Bijani et al. (2013), independent risk factors for NSIs were habitual recapping of used needles and consecutive shift works. Hospitals rate the highest with improved patient outcomes when the nursing hours are sufficient to meet the needs of the patients (Timothy, 2020).

According to Rn et al. (2012), the procedures involved in the most SIs are removing a needle cap and recapping (at 27.8% and 9.3% respectively), preparing normal saline for injection (20%), and administrating intravenous (IV) medication (20%). Rais and Jamil (2013) established that 40% of NSIs occur during the use of needles, while 58% of sharp injuries can be experienced during the disposing of used needle syringes. Care (2016) uncovered that 44% of the experienced injuries by nurses occurred while trying to recap the needle-sticks. Similarly, Arli and Bakan (2018) discovered that, the majority of sharps injuries experienced by nursing students occurs during the closing of the needle cover after the treatment or while taking the needle from the injector. Arli and Bakan (2018) state that, more than half (60%) of the nursing students are more likely to experience sharps injuries during IV/IM injection interventions or procedures.

According to Li and Hons (2008), the majority (56%) of nursing students regards cleaning sharp instruments, needle recapping (at 56%), disposing used needles (28%) as extremely high-risk procedures which highly contributes to the increase in the frequency of NSIs. Furthermore, 36% of students indicated that blood transfusion, blood taking (33%), suturing (30%), and administering injections (25%) were also very high-risk procedures associated with NSIs. According to Lukianskyte et al. (2011), 51% of the nursing students sustained injuries when putting a case on used needles (recapping). Furthermore, 49% of the nursing students experienced an injury when breaking an ampoule. In another study, Ghasemzadeh, Kazerooni, Davoodiah, Hamedi and Sadeghi (2015:322-343), discovered that, the common cause of student sharps injuries in terms of performing medical procedures was during vein puncture (at 24%). The other causes were as follows; drawing arterial blood at 20.3%, injections at 7.4%, replacing the IV line at 4.7%, suturing at 36.5%, and other causes at 6.1%. These incidents are attributed to the following aspects: 55.4% due to distractions, 16.2% due to a busy shift, 14.2% due to forgetting, 6.8% due to the restlessness of the patient, and 6.8% due to excessive fatigue and lack of education. The timing of the accidents was as follows: 79.9% cases, during work; 7.4% cases, when disposing of the sharp instruments;

2.7% cases, when putting the cap on the sharp instruments; 6.8% cases, when disposing of the sharp instruments into the special bin; and 3.4% cases, when separating parts of a sharp instrument.

According to Zhang et al. (2018), female students are more likely to experience NSIs than male nursing students. On the other hand, Yeshitila et al. (2015) revealed that exposure to NSIs was significantly associated with being male. Additionally, younger students with low level of clinical experience and those who works frequent night shifts are more likely to experience sharp injuries (Zhang et al., 2018; Al Tawil, 2013). This concur with a study conducted by Yang, Wu, Ho, Chuang and Chen (1999) where it was concluded that the NSIs prevalence rates of nursing students were higher than those for experienced nurses. Similarly, according to Lukianskyte, Gataeva and Radziunaite (2011), in a 12-month period, NSIs were experienced by 39% of staff nurses and 78% of nursing students. Care (2016) discovered that, 73.3% of nurses at Imam Reza Hospital were exposed to sharp injuries, of which 41.8% of injuries occurred during the first year of nursing. In contrast, Khoshnood et al. (2015) discovered that even though students are more likely to experience the most injuries in their second year of study, there are no significant difference between students in their internship and students in their earlier clinical trainings when it comes to frequency of sharp injuries. Also, according to Rn et al. (2012), fourth-year student are more likely to experienced NSIs than first year students. This is likely attributed to the level of exposure, as first year students are not working in high risk wards compared to fourth year students.

Nursing students without safety training, and students who do not use Personal Protective Equipment (PPE) are likely to experience sharp injuries (Zhang et al., 2018). This concurs with Mekonnen et al. (2018) where it was established that not using appropriate PPE can lead to a higher frequency of NSIs. According to Mekonnen et al. (2018), 8% HCWs never uses PPE and 52% of HCWs sometimes use PPE when performing their work tasks. Similarly Li and Hons (2008) established that 75% of nursing students are more likely to experience SIs due to the lack of adequate containers for sharps disposal. Correspondingly, Rn, Siu, Ching, Ka, & Chang (2012) established that, the use of a kidney dish to contain used needles/sharps and immediate disposal of used needles into a sharps box are associated with a decrease in the prevalence of NSIs.

Nursing students are usually prepared for the clinical real environment by using simulations in a learning or skills laboratory before caring for patients at hospitals (Al tawil, 2013). Rn et al. (2012) revealed that nursing students indicated that they received SIs prevention training and their recommendations for the prevention of SIs. Moreover, 97% of students reported receiving the training, mostly from their university lecturers. Rn et al. (2012) revealed that, receiving clinical training on SIs is associated with a decrease in the prevalence of NSIs. However, when nursing students performs clinical tasks while under stress it can lead to occurrence of high frequency of sharp injuries, as they are likely to lack concentration when

undergoing stress (Ghasemzadeh et al., 2015). Also, work pressure, time constraint and poor compliance to universal precautions can lead to sharps injuries experienced by health care workers (Rais & Jamil, 2013). Nawafleh et al. (2019) argues that, the lack of knowledge toward needle sticks among university nursing students can results into high incidents of SIs and vulnerability to contracting infections. This is supported by Mekonnen et al. (2018) who discovered that absence of trainings and safety guidelines that advocate for proper patient and self-care is associated with a high rate of SIs.

Al Tawil (2013) established that the knowledge for both students from first and last clinical courses is likely to be the same, thus cannot significantly influence the chances to experience NSIs of first year and final year nursing students differently. Arli and Bakan (2018) also contends that in cases where nursing students are given inadequate training on the safely use of needlestick and sharp medical objects. Such trainings are likely to have no effects on students' attitudes towards the safe use of needlestick and sharps, consequently contributing to high prevalence of NSIs among nursing students. This line of thought is supported by Li and Hons (2008) who discovered that, a significant percentage of nursing students are likely to experience SIs due to the lack of quality in-service training aimed at effectively preparing students to be able to perform clinical procedures at minimum risk of NSIs.

2.4. Attitude and practices towards sharps injuries

Exposure to contaminated needle sticks and other sharp objects is an occupational hazard to health care workers, in particular medical and nursing students. This is because such exposure can cause illness and mortality from infections with blood borne pathogens (Rais & Jamil, 2013; Yeshitila, Mengistie, Demessie, & Godan, 2015; Al tawil, 2013). Additionally, Li and Hons (2008) state that, nursing students are at high risk of acquiring blood-borne infections when they do not follow all the standard precautionary measures following SIs. What is more worrisome is that some of the nursing students do not follow sharps injury safety measures due to the lack of adequate knowledge about the consequences of sharps injuries (Timothy, D. 2020). Hence, reporting the occurrences of sharp injury incidents by nursing staff and students is very important in determining the level of exposure to risks such as contracting infections like Human Immuno-deficiency Virus (HIV), Hepatitis B Virus (HBV), and Hepatitis C Virus (HCV) which can be transferred by contaminated needles and other sharps.

Despite these risks, there is still a high proportion of students with negative attitudes when it comes to reporting sharps injuries (Subratty & Moussa. 2007). Sharps injuries are avoidable, and more emphasis should be placed on changing the attitudes of HCWs towards SIs. Only with a change in mind-set will we be able to reduce and/or eliminate the incidences of SIs. Zhang et al. (2018) revealed that, 86.9% of SIs

are in many cases not reported to hospital infection control offices. Also, Rn et al. (2012) discovered that, between 76.5% and 50% of the nursing students who experienced NSIs respectively did not report the incidents as they considered the device which injured them to be clean/uncontaminated or the injury posed a very low risk for blood borne pathogen transmission.

Additionally, 14.7% of students do not report injury because they feel that the reporting procedure is complicated while 11.8% do not report for fear of punishment, 2.9% of students reported that they did not know how to report, or had no time to report the NSIs due to work overload. Lukianskyte et al. (2011), established that among nursing staff, 45.9% of the occurrences were unreported while for nursing students 92.0% were unreported. Similarly, Mekonnen et al. (2018) uncovered that, 65.3% of health care workers are likely not to report a SI due to absence of reporting protocol (53.1%), fear of isolation and/or discrimination (20.4%), too busy to report (16.3%). Also, Nawafleh et al. (2019) established that half of Arab nursing students did not report their NSI experiences to relevant offices. Likewise, Baghcheghi et al. (2011) exposed that, more than one-third (40%) of nursing students are more likely not to report experienced NSIs to their supervisors or responsible offices.

There are a variety of reasons why students and health care workers do not report the occurrence of sharp injuries to their supervisors. For instance, a health care worker might not report the occurrence of a NSI as he/she is confident that the patient does not have any serious infection in his/her blood or it is not important to report the incident (Khoshnood et al., 2015; Mekonnen et al., 2018). This poor reasoning from health care workers especially students contributes to a high percentage at between 40-70% of unreported cases of needle stick injuries especially in the developing countries (Habib as cited in Rais & Jamil, 2013; Mekonnen et al., 2018). This coincides with Yeshitila et al. (2015) where it was established that, in developing countries, the risk of having sharp injury is 10 to 20 times higher than that of developed countries. Similarly, Al tawil (2013:467) state that;

> The US Centers for Disease Control and Prevention (CDC) estimates that about 600,000–1,000,000 needle stick injuries occur annually. It is further estimated that about half of these needle stick injuries were unreported. Nursing students are particularly susceptible to occupational needle stick injuries due to limited clinical experience. Almost 90% of all the needle stick injuries occurred in nurses of third world countries where there is lack of knowledge, resources and training.

According to Lukianskyte et al. (2011), more of the staff nurses (97%) than the nursing students (40%) were familiar with the rules of NSIs notification, registration, observation and prevention. Thus, there is a need to promote the awareness of and educate students about the dangers and prevention NSIs. This is because in many cases, nursing students lack of knowledge about NSI (policies and protocols) at

institutions of clinical services contributes to high number of unreported cases (Li & Hons, 2008). In some studies the majority of students are likely to report experienced NSIs. For instance, Yeshitila et al. (2015) and Li and Hons (2008) revealed that more than half of the nursing students who experience NSIs are more likely to report those incidents to the responsible offices. Likewise, Bijani, Azimian, Soleimany and Mohammadi (2013) revealed that 55% of NSI incidents were reported to hospital infection control facilities. Male and younger age nursing students had significant statistical association with lower likelihood of reporting of needle stick injuries.

Baghcheghi et al. (2011) state that, more than half (52%) of nursing students, when they experience NSIs, the first safety measure they do is squeezing the wound, followed by tracking the patients' tests for blood-borne pathogens (this is done by 64% of students). Safety measures when sharps injuries are experienced can also involve vaccinating students or health care workers against diseases such as hepatitis B. This is supported by Lukianskyte et al. (2011) who established that, only 17% of staff nurses and 11% of nursing students were vaccinated with three doses of HBV vaccine. As a result immunization of staff nurses and nursing students with hepatitis B vaccine should also be encouraged and recommended as one of the safety measures to reduce the rate of infections as a result of NSIs.

Khoshnood et al. (2015) and Yeshitila et al. (2015) discovered that 10% and 13% of the nursing students respectively does not perform any action (safety measure) following NSIs. This might be due some of the nursing students who mainly blamed themselves for the NSIs, citing such reasons as carelessness (at 62.5%), lack of practice (21.4%), and removing needle caps too forcefully (17.9%). Also, prevailing reasons for injuries were inattentiveness, being in a hurry and work overload, stress was also cited as a factor in more than one-fifth of NSIs (Lukianskyte et al., 2011; Rn et al., 2012). Other safety measures taken by students after NSIs includes;

> Washing with water and soap (19.1%), washing with alcohol or chlorine solution (29.3%), pressing immediately the injured site to stop bleeding (3.7%), squeezing to make it bleed more and evacuate (4.7%), counselling and testing for HIV (22.3%), taking post exposure prophylaxis (0.4%) (Yeshitila et al., 2015:3).

Similarly, Care (2016) discovered that, the first action taken by nurses after experiencing a NSI was washing the hands with soap and water and normal saline in cases of mucosal contact with the patients. On the other hand, 48% of NSIs were not handled using any safety measure such as washing the wound site.

2.5. Conclusion

It is evident that sharps injuries are the most effective means of transmitting blood-borne pathogens between HCWs and patients. While nurses are known to be a high-risk group for SIs incidents, nursing students appear to be at even greater risk owing to their limited clinical knowledge. Despite this fact, the epidemiology of sharps injuries among nursing students has not been clearly evaluated in Namibia.

From the literature reviewed it is evident that the concern for worker health and safety was not a priority in state health facilities, as such; the focus was on the patient rather (Small et al. 2008: 122). Limited funds were budgeted towards the provision of safe equipment for HCWs. Only in recent times, however, have the concern been shifted to ensure employees are equally protected, and their health and safety is safe guarded.

It is therefore important to create an evidence base through research, on which common mistakes regarding medical sharps practices will be addressed in the Namibian context and beyond.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

A cross-sectional study was undertaken using an anonymous structured self-administered questionnaire within the framework of a survey procedure. A cross-sectional study, also known as the "prevalence study design" is the best study design to yield results concerning the occurrence of certain cases of a condition in a population at risk (Mann, 1995). Hence, it was deemed be the appropriate study design to adopt for the current study. According to Schutte (2012) the survey procedure has been effective in the collection of data types concerning the following:

- Demographic characteristics of a certain group
- The environment in which the people work
- The activities/behaviour of people
- People's opinions and attitudes concerning certain matters

The anonymous questionnaire utilized questions and items drawn from other international investigations, adapted and included as appropriate for the local population to be studied (Pathak et al., 2012; Puro et al., 2001; Shiao et al., 2002; Wang et al., 2003).

3.2. Population and sampling strategy

3.2.1. Sample selection method

The sample was purposefully selected (purposive sampling), and consists of full-time midwifery/nursing students at the four selected NHTC's in Namibia. The main goal of purposive sampling was to focus on particular characteristics of the population that are of interest, which best enabled the researcher to reach the research objectives. The study's unit of analysis were the individual students' responses to the questionnaire.

The study population in this case was nursing/midwife students at four NHTCs who met the criteria for inclusion in this study. The study population composition and size include full-time nursing/midwifery students 14 Windhoek, 37 Keetmanshoop, 38 Rundu, and 24 Otjiwarongo, who totalled 113 respondents. A statistically representative sample was drawn out of the study population.

3.2.2. Sample Calculation

The researcher's most obvious strategy was simply to sample more of the population to increase the study's statistical power.

A formula to get the right representative sample size of the population was adopted from Smith (2013) as highlighted below:

Sample Size = Necessary Sample Size = (Z-score)² * StdDev*(1-StdDev) / (margin of error)²

StdDev = Standard Deviation = 0.5, so as to be 93% confident in the research findings, the margin of error is 7% (0.07) and the Z-score = 1.81

Sample size = ((1.81)² x 0.5(0.5)) / (0.07)²

= 0.819025/0.0049

= 167.1479592

167 respondents are needed

According to Team (2020), calculating the right sample size is crucial in order to avoid under and over sampling. Under sampling leads to poor survey results while over sampling tends to make survey undertaking too costly. Thus, a finite correction formula is needed to adjust the calculated sample size above in order to align it to the study population size since the study population size is known.

The following finite population correction formula adopted from Qualtrics (2020) was applied to get the true sample size which take into account the current study population size.

True Sample Size = (Sample Size * Population) / (Sample Size + Population – 1)

n = (no * N) / (no + N- 1). Where n = sample size,

no = is the sample size without considering the finite population correlation factor

N = is the population.

True sample size = ((167 * 240) / (167 + 240 – 1) = 98.7 = 99

3.3. Data collection and instrument

Self-reporting, structured and anonymous questionnaires was used to collect the primary data. As stated in Tuvadimbwa (2005), a self-reporting questionnaire refers to an instrument where study subjects write their own answers in response to printed questions on a document (Brink, 2002). Therefore, self-reported questionnaires are advantageous in that the respondents are likely to be more motivated to talk about themselves, and they identify with the questions in ways that others do not. "It seems that the most accurate information is that which comes straight from the horse's mouth, so to speak"- (Paulhus & Vazire, 2007). Therefore, it appears that one valid way to shed light on the personality traits (attitude, practices and knowledge) of individual is to measure them through self-reporting structured anonymous questionnaires.

The questionnaire consist of both close-ended and open-ended questions to be able to extract both quantitative and qualitative data from the study subjects. The questionnaires were directly distributed to the respondents and was collected thereafter.

3.4. Data treatment and analysis

Data was entered into an excel sheet as the study continues. Simple tabulation and cross-tabulation were utilised to arrange the crude data in an orderly manner. Data were anonymously coded and entered into a standard spreadsheet before being analysed by statistical software, version 22.

3.5. Delimitations of the research

The study was limited to the midwifery/nursing students at four National Health Training Centres in Namibia; these include: Otjiwarongo, Windhoek, Keetmanshoop and Rundu National Health Training Centres. The study included full-time students from 1st to 3rd year (final year) as students at the NHTCs are expected to commence with clinical practical starting from the first year, hence it was primarily assumed that they have been exposed to SIs already at that stage of their training.

3.6. Data validity and reliability

Due to the nature of the study's data collection tool (self-reporting questionnaire), the Cronbach's Alpha coefficient was applied to enhance reliability of the structured self-administered questionnaire, using alpha coefficient 0.60 as the design threshold. The Cronbach's Alpha coefficient was reported at

68% (0.68), please see Table 1 below. The validity of each questionnaire construct were ensured by incorporating inputs from field experts (e.g. study supervisor) to provide input on the questionnaire to derive valid results.

Table 1. Questionnaire Reliability

Scale: ALL VARIABLES: Case Processing Summary			
		N	%
Cases	Valid	18	15.9
	Excluded[a]	95	84.1
	Total	113	100.0
a. Listwise deletion based on all variables in the procedure.			

Reliability Statistics	
Cronbach's Alpha	N of Items
.682	13

3.7. Ethical considerations of the research

Ethical approval was obtained from the Ministry of Health and Social Services ethics committee as well as the NUST Faculty of Health and Applied Sciences Research Ethics Committee. Permission to conduct the study was also obtained from the National Commission on Research Science and Technology as well as the NHTCs management. All study subjects were briefed about the study prior the completion of questionnaires. With regard to confidentiality, anonymous structured self-administered questionnaire were used. Additionally, the data analysis process only used codes to identify subjects. Written consent to partake in the study were obtained from all participants.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Introduction

This chapter discusses the data findings and conclusions of the study. The chapter begins by presenting the demographic characteristics of the respondents. This is followed by the presentation and discussion of the analysed data as they appear in the questions addressed in the research questionnaire. The data analysis is based on both quantitative data analysis and interpretation. Of the 150 nursing students invited to participate in the study, 113 returned completed survey questionnaires, resulting in an overall response rate of 75%. The study results have been presented using descriptive statistics below.

4.2. Findings Presentation and Discussion

4.2.1. Gender of respondents

Figure 1 below indicates that the majority of nursing students who participated in the study at 75% (84 out of 113) are females. This finding was expected as the majorly of the students in Namibia who enrolls for nursing programmes are usually females. Similarly, a study by Kamenye, Iipinge and Plessis (2016) on nursing students at Welwitchia University in Namibia revealed that 49 out 55 of their nursing students were females. This is evident that the nursing profession in Namibia is female dominated.

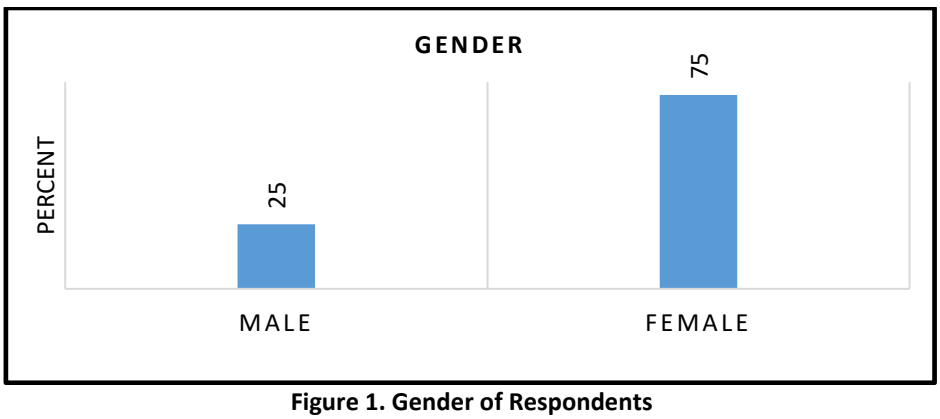

Figure 1. Gender of Respondents

4.2.2. Age of respondents

Figure 2 below highlight that, the majority of students at 65.5% (72 out of 110) are aged between 20 and 30 years old. Three students did not indicate to which age group they belong. This finding was expected as in many cases students who qualifies for tertiary education in Namibia are expected to have completed secondary education first with age(s) falling between 18 and 19 years old. This is in line with results from Kamenye et al. (2016) where it was revealed that most of the nursing students who participated in their study were aged between 21 to 29 years old.

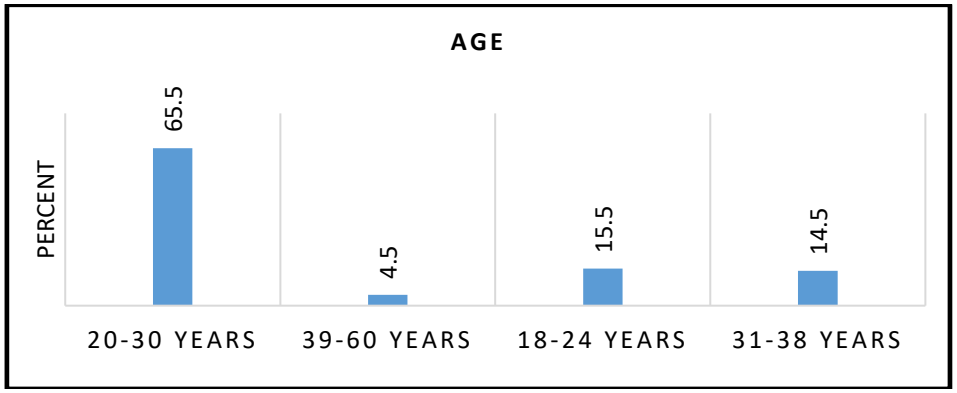

Figure 2. Age of Respondents

4.2.3. Marital status of respondents

Figure 3 below, indicates that the majority of students at 93.7% (104 out of 111) are single (never married). Similarly, Amukugo, Kapofi and Nuuyoma's (2017) study discovered that most of the nursing students at the University of Namibia were aged between 20 and 30 years old who in many cases did not yet reach marriage age (estimated to be above 30 years in many cases).

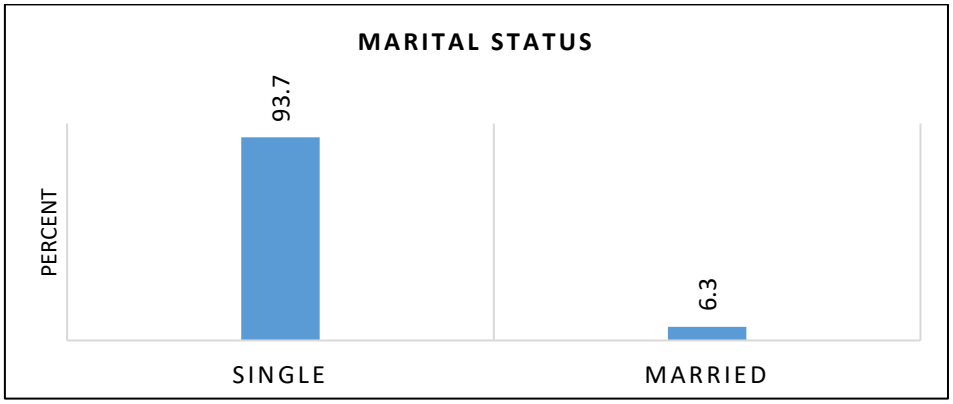

Figure 3. Marital status of Respondents

4.2.4. Ethnicity of respondents

Figure 4 reveals that, the majority of the students at 94.6% (106 out of 112) are black (African). This finding is in line with results from the World Population Review (2020) report, which estimates that more than 93% of Namibian are Black (African).

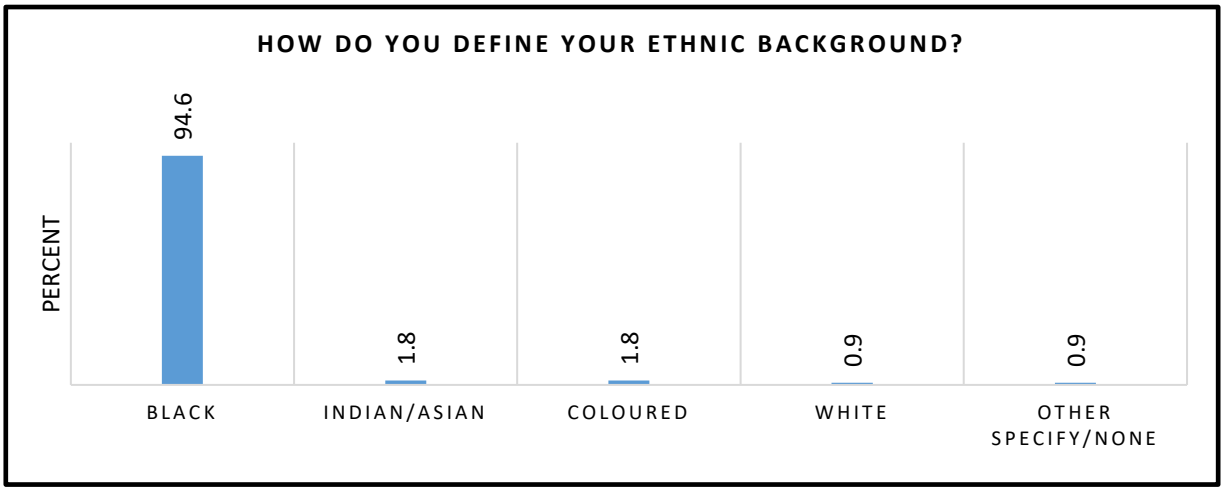

Figure 4. Ethnicity of Respondents

4.3. Closed-ended and Open-ended Questions

4.3.1. Training Centre

Figure 5 below reveals that, most of the students at 33.6% (38 out of 113) did their nursing practical at the Rundu State Hospital. This could be because most students who participated in the study were able to easily get nursing practical opportunities at remote state hospitals in remote towns such as Rundu and Keetmanshoop. This may be because hospitals in Windhoek are usually preferred by students without accommodation outside Windhoek. Also, students who still have outstanding/carrying modules which requires contact classes may prefer Windhoek hospitals, thus hospitals in the capital city (Windhoek) are in many cases likely to be overcrowded with nursing students.

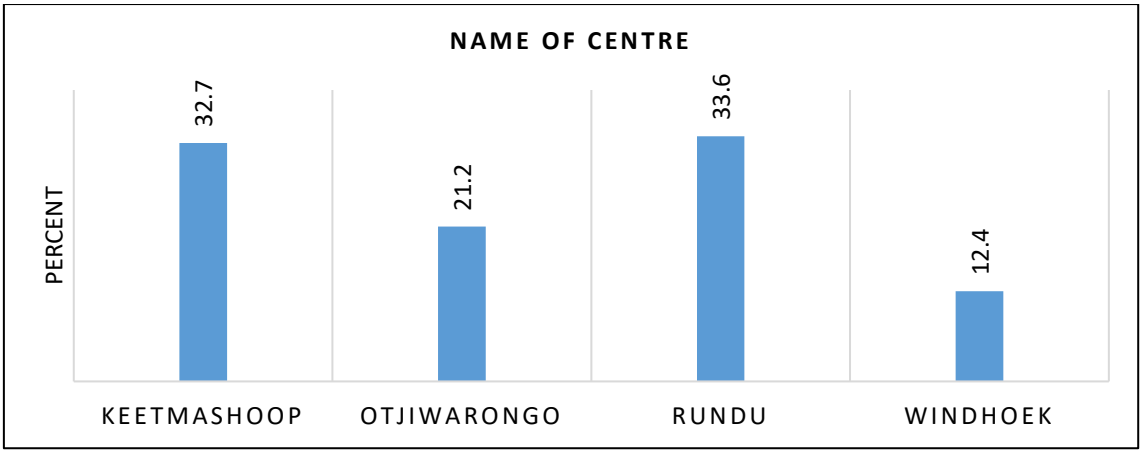

Figure 5. Name of Training Centre

4.3.2. Hospital section

Figure 6 discloses that, most of the students at 31.5% (34 out of 108) did their clinical and practical on a rotational basis, by working in different hospital sections (e.g. theatre, casualty, normal ward, maternity or clinic). This could be influenced by the requirement of their general nursing qualification which mandate or requires them to be multi-skilled in performing tasks as required in all section of the hospital.

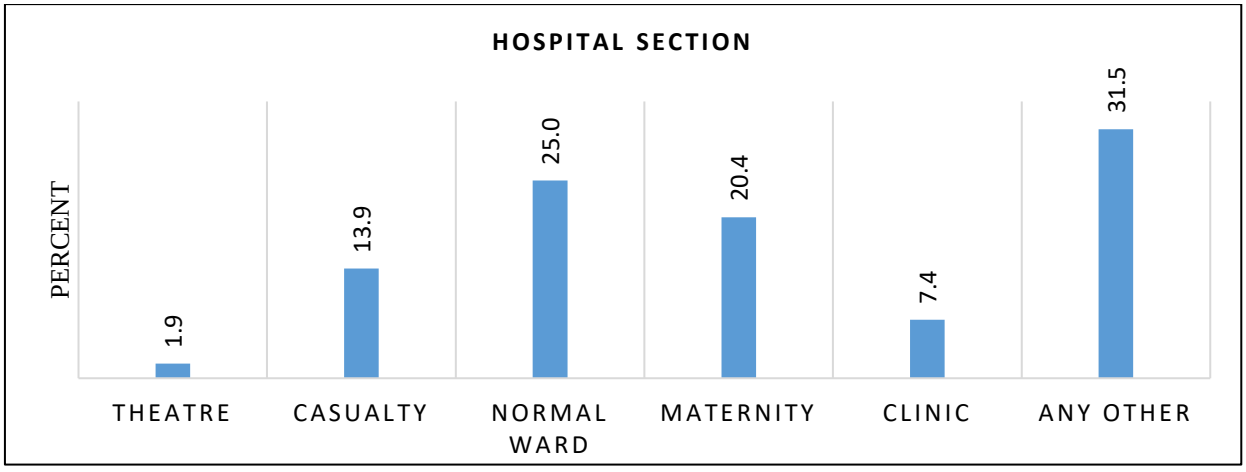

Figure 6. Hospital section

4.3.3. Hours of work per shift

Figure 7, highlight that the majority (82.9%, 87 out of 105) of students worked 40 hours per work shift during their practical learning work. This means they performed normal work shifts for the whole week. This is an illustration that there is compliance to national labour regulations around student practical

work shifts. Employee burn-out is therefore not expected. Only, 1.9% (2) of students performed 8 hours of practical learning work per week.

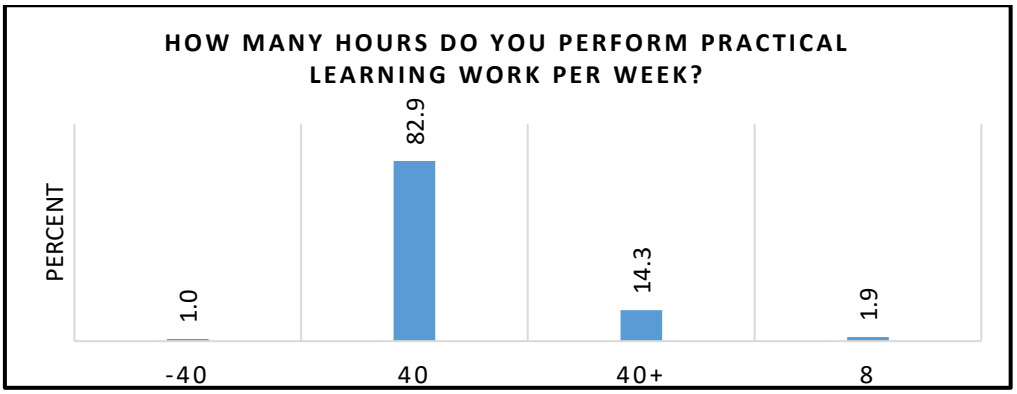

Figure 7. Hours of work per work

4.3.4. Staff members per shift

Most of the students (30.2%, 29 out of 96) worked on shifts consisting on average 5 staff members during their clinical and practical training, as per results in Table 2 below. This implies that, across hospitals, 5 staff numbers per shift can be recommended as a standard number of required staff for a shift to be regarded as adequately equipped with medical personnel.

Table 2. During practical's, how many staff members do you work with on the shift?

Number of staff		Frequency	Percent
Valid	2	3	3.1
	3	9	9.4
	4	25	26.0
	5	29	30.2
	6	15	15.6
	7	6	6.3
	8	6	6.3
	10	3	3.1
Total		**96**	**100.0**

4.3.5. Number of staff members worked with during practical is adequate

Figure 8 below highlight that more than half (56.7%, 51 out of 90) of students highlight that, the number of staff members they work with during their practical is adequate or sufficient to execute their duties effectively and safely. This results corresponds with results in Table 1 where more than half of the nursing

students indicated that they worked with 5 or more staff members during their training, as adequacy of staff is positively influenced by the number of staff worked with during the shift.

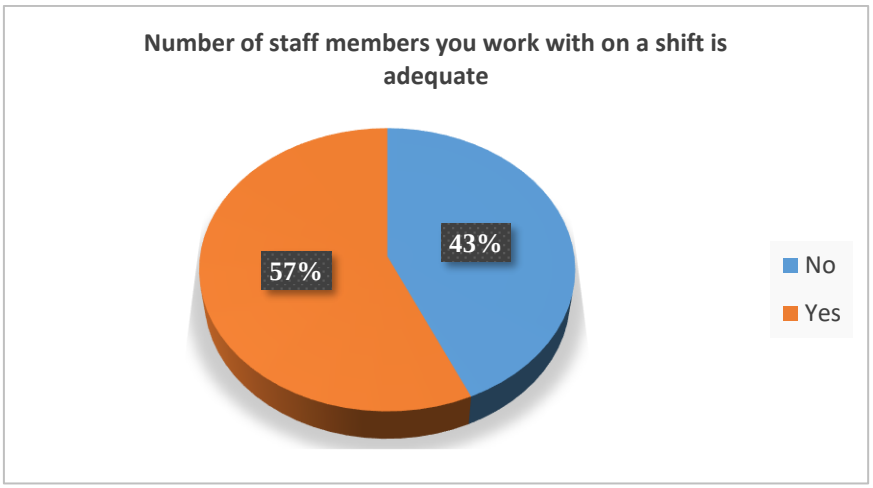

Figure 8. Number of staff members you work with is adequate

4.3.6. Prevalence of sharps injuries

Figure 9 below reveal that 19.5% (22 out of 113) of students did experience a sharps injury during their clinical and practical training. Thus, the prevalence of sharp injuries among nursing students in this group is 19.5%. This is a higher SIs prevalence rate when compared to 16% of SIs prevalence reported among South African nursing students (Li & Hons, 2008). At the same time the recorded SIs prevalence of 19.5% of the current study's nursing students is much lower to the reported 39% of sharp injuries prevalence rate among the nursing students in Iran (Ghasemzadeh, Kazerooni, Davoodian, Hamedi & Sadeghi, 2015).

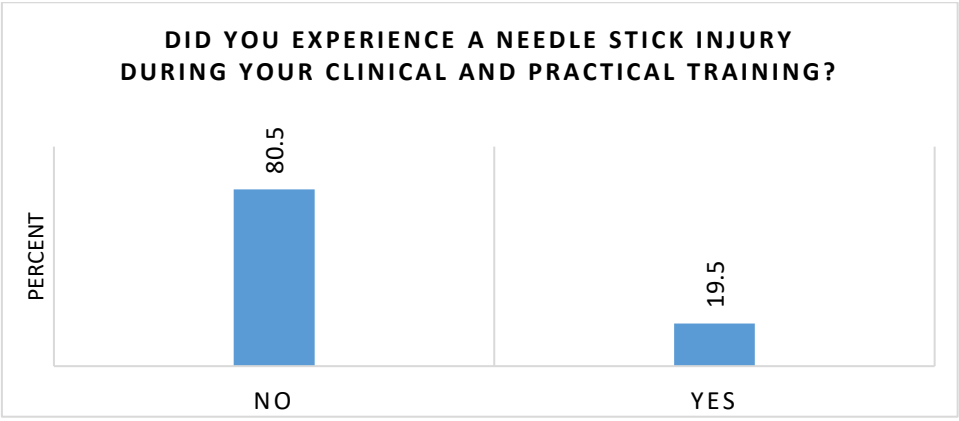

Figure 9. Prevalence rate of sharp injuries

4.3.7. Frequency of sharp injuries

Figure 10 below indicates that the majority (86.4%, 19 out of 22) of students experienced needle stick injury only once. This is much lower occurrence of sharps injury per nursing student when considering that NHTCs nursing student SIs prevalence rate was recorded at 19.5%, as compared to a study by Baghcheghi et al. (2011). This latter study established that 70% of the nursing students had experienced at least one contaminated Needle Sticks/Sharps Injuries (NSIs) during their studies.

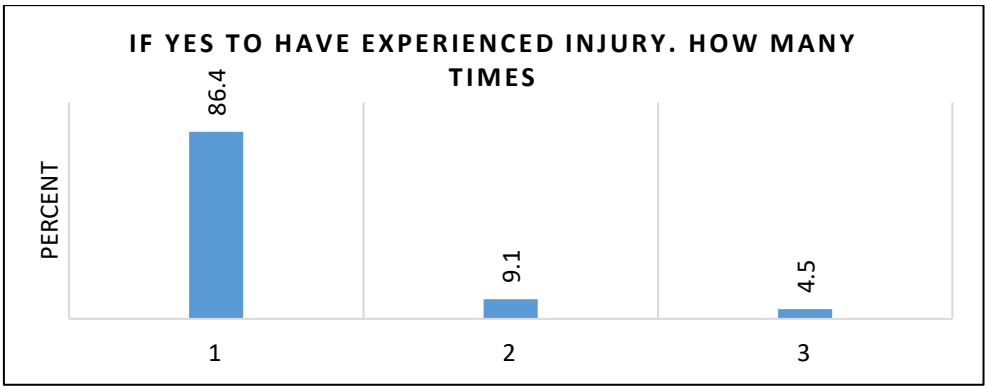

Figure 10. Frequency of sharp injuries

4.3.8. Injury inflicted by self

Figure 11 below, highlight that the majority of students at 81.8% (18 out of 22) inflicted injuries on themselves while 18.2% indicated that the needle stick injuries were caused by another person. This concur with Khoshnood et al. (2015) and Yeshitila et al. (2015) where it was discovered that, more than half of recorded SIs are a result of self-infliction, as in many cases nursing students mainly blames themselves for the SIs, citing reasons such as carelessness (at 62.5%), lack of practice (21.4%), and removing needle caps too forcefully (17.9%).

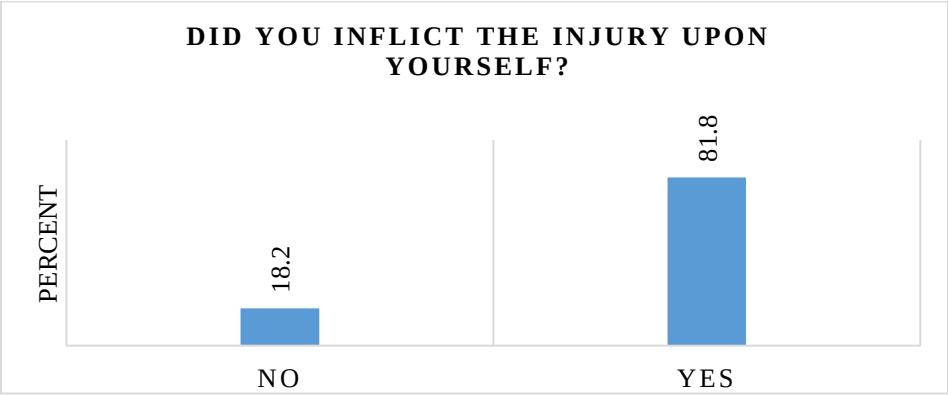

Figure 11. Injury inflicted by self

4.3.9. Training stage when injury occurred

Table 3, highlight that, the majority of students at 59.1% (13 out of 22) experienced needle stick injuries during their second year of study. This could be due to the structure of their study programme which requires them to do more intense practical work during their second year of study. However, the latter statement controverts findings from Care (2016) who discovered that, 73.3% of nurses at Imam Reza Hospital were exposed to sharp injuries, of which 41.8% of injuries occurred during the first year of nursing. As a result a higher SI prevalence rate among Namibian nursing students was expected to occur during the first year of their studies.

Table 3. After how long into the training did it happen? E.g. 1st, 2nd 3rd year

Study period		Frequency	Percent
Valid	1st	4	18.2
	1st and 2nd	1	4.5
	2nd	13	59.1
	3rd	4	18.2
Total		**22**	**100.0**

4.4. Determinants/causal factors of the recorded and un-recorded sharps injuries

4.4.1. Procedure performed as cause of injury

Table 4 below highlight that, half of the students (50%, 11 out of 22) experienced a needle stick injury when they were performing or administering injections and immunizations to patients. The second common cause of sharp injury to students was during HGT and Hb testing at 9% (2 out of 22). Only 4.5% (1 out of 22) of the sharp injuries was caused during the evaluation of patient procedure (inflicted by another person on the student). This contradicts findings from Li and Hons (2008) and Ghasemzadeh et al. (2015) where it was established that injection procedure only accounts for 25% and 7.4% to SIs respectively. However, the finding on the current nursing students study corresponds with findings by Lukianskyte et al. (2011), who discovered that 51% of the nursing students sustains injuries when putting a case on used needles (recapping) after injecting or immunising patients.

Table 4. What procedure where you performing when you got injured?

Procedure		Frequency	Percent
Valid	Drawing of blood specimen	1	4.5
	Evaluating	1	4.5
	HGT and Hb testing	2	9.0
	Withdrawing medicine with a pink needle	1	4.5
	Injection, immunization	11	50
	Insertion of IV cannula	1	4.5
	Withdrawing water for injection	1	4.5
	Preparing a patient for emergency operation	1	4.5
	Suturing of a minor wound	1	4.5
	Venipuncture	1	4.5
	Others responses stated were not procedures (e.g. Just let water running where is injured,	1	4.5
Total		**22**	**100.0**

4.4.2. Circumstances under which the needle stick injury occurred

Table 5 below highlight that one of the common circumstances under which the needle stick injury occurred was mainly due to uncapping or recapping of the needles with 28% (6 out of 22). This concur with studies by Bijani et al. (2013) and Aiken et al., (1997), where it was revealed that independent risk factors for SIs were habitual recapping of used needles and consecutive shift works. Additionally, patient injections while working under pressure in some cases lead to lack of concentration and working with inappropriate work attire (e.g. “the sterile gloves were too big”), also resulted in significant injuries at 28%. Still in Table 5, a high percentage of 28% of SIs occurred during patient injection, lack of concentration and work pressure and inappropriate use of safety gear. This corresponds with Zhang et al. (2018), who discovered that nursing students without safety training, and students who do not use Personal Protective Equipment (PPE) are likely to suffer SIs.

Table 5. Circumstances under which the needle stick injury occurred

Circumstances under which the needle stick injury occurred		Frequency	Percent
	During the handing over of used (un-recapped)/patient evaluation.	2	10%
	During patient injection, lack of concentration and work pressure and due to inappropriate work attire.	6	28%
	Accidentally pricked during vaccine, immunization administration, due to student mistake/movements.	4	18%
	Sharp box absent or not conveniently located. Due to colleagues’ movements	4	18%
	Capping/uncapping, patient movement/interference	6	28%
Total		**22**	**100%**

4.4.3. Needle stick injury experienced and student handled a number of patients with ease

Table 6 below, shows that there is a slight higher percentage of students at 23.6% (21 out of 89) of students who strongly agree and did not experience a needle stick injury compared to 22.7% (5 out of 22) of students who experienced needle stick injuries and also strongly agree that they handled a number of patients that they attended to during their shift with ease. The Chi-Square Test results in Table 6 reveals that, statistically this differences on how patients were handled is insignificant at 0.05 alpha (p-value (Asymptotic Significance (2-sided)) is greater than 0.05 in Table 6). Thus, there is not a significant difference regarding how patients were handled which could lead to students experiencing sharp injuries as those injuries experienced by students did not occur due to how patients were handled. Injuries experienced were due to chance or due other factors not considered in this Chi-Square Test.

Table 6. Crosstab of Did you experience a needle stick injury during your clinical and practical training? * Your mentor/supervisor is always present when you attend to patients.

			You handle the number of patients that you attend to per shift, with ease.					
			Strongly disagree	**Disagree**	**Neither Agree/Disgree**	**Agree**	**Strongly Agree**	**Total**
Did you experience a needle stick injury during your clinical and practical training?	No	Count	1	9	4	54	21	89
		% within Did you….	1.1%	10.1%	4.5%	60.7%	23.6%	100.0%
	Yes	Count	0	0	1	16	5	22
		% within Did you….	0.0%	0.0%	4.5%	72.7%	22.7%	100.0%
Total		**Count**	**1**	**9**	**5**	**70**	**26**	**111**
				8.1%	**4.5%**	**63.1%**	**23.4%**	**100%**

Chi-Square Tests			
	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.884[a]	4	.577
N of Valid Cases	111		

4.4.4. Needle stick injury and whether mentor/supervisor is always present when student attend to patients.

Table 7 below, shows that 28.9% (26 out of 90) of students did not experience a needle stick injury and agree that their mentor/supervisor are always present when they attend to patients. Similarly, 27.3% (6 out of 22) of students who experienced needle stick injuries also indicated that they also agree that their

mentor/supervisor are always present when they attend to patients. The Chi-Square Test results in Table 7 reveals that, statistically there is no significant differences at 0.05 alpha (as Table 7, p-value (Asymptotic Significance (2-sided)) is greater than 0.05) on the presence or absence of supervisors when injuries occurs. Thus, concluding that whether supervisors were present or not sharp injury could still prevail at the same rate and sharp injuries are not a result of lack of student supervision. Injuries experienced were due to chance or due other factors not considered in this Chi-Square Test. As result this finding contradicts findings from Aiken et al. (1997) and Small et al. (2011) where it was revealed that lack of supervision during training and over-loading of health workers are contributing factors towards sharps injuries.

Table 7. Crosstab of Did you experience a needle stick injury during your clinical and practical training? * Your mentor/supervisor is always present when you attend to patients.

			Your mentor/supervisor is always present when you attend to patients.					
			Strongly disagree	**Disagree**	**Neither Agree/ Disgree**	**Agree**	**Strongly Agree**	**Total**
Did you experience a needle stick injury during your clinical and practical training?	No	Count	14	28	14	26	8	90
		% within 1. Did you….	15.6%	31.1%	15.6%	28.9%	8.9%	100.0%
	Yes	Count	2	10	4	6	0	22
		% within 1. Did you….	9.1%	45.5%	18.2%	27.3%	0.0%	100.0%
Total		**Count**	**16**	**38**	**18**	**32**	**8**	**112**
		% within 1. Did you….	**14.3%**	**33.9%**	**16.1%**	**28.6%**	**7.1%**	**100.0%**

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.637[a]	4	.457
N of Valid Cases	112		

4.5. To assess the attitude and practices of the nursing students towards sharps injuries

4.5.1. Injury reporting

Table 8 below indicates that, the majority at 72.7% (16 out of 22) of students who experienced sharp injuries reported the incidents immediately or within an hour of the occurrence to their supervisors. 6, (27.3%) of the students stated that they did not report their injuries to their supervisors. This contrasts with Zhang et al. (2018) and Rn et al. (2012) were it was established that 86.9% and 76.5% of SIs are in many cases not reported to hospital infection control offices. In agreement with the current study results, Lukianskyte et al. (2011) and Small et al. (2011) revealed that more than 50% of occurrence of SIs are reported to hospital infection control offices.

Table 8. When was the injury reported?

When injury reported		Frequency	Percent
Valid	Immediately	15	68.2
	Never	6	27.3
	Within an hour	1	4.5
Total		**22**	**100.0**

4.5.2. Steps taken after experiencing a sharp injury

Table 9, reveals that, the majority of students at 12 out of 22 students washed their hands with soup under running water. This was the common step taken among nursing students who experienced sharp injuries. This is consistent with Rn et al. (2012) who argues that only 19.1% of nursing students wash their hands as a safety measure after experiencing SIs. The least common steps were checking depth of prick and confirming patient(s)'s HIV status using the health passport.

Table 9. Steps taken after experiencing a sharp injury

Step taken	Frequency (number of students who implemented the step)
Washed hands with soup under running water	12
Tested for HIV(student)	8
Reported to supervisor	7
Put on PEP as patient was HIV positive	6
Tested patient for HIV	4
Put plaster on injury	4
No steps taken, needle was not a used on anyone/it was a small prick	4
Disposed of the needle in sharp box	2
Not put on PEP as patient was HIV negative	2
Checked depth of prick	1
Confirmed patient's HIV status using health passport	1

4.5.3. Students' handling of sharp injuries

Table 10, indicates that a high percentage at 41% (9 out of 22) of students who experienced sharp injuries were tested for HIV and followed their hospital infection control procedures to receive PEP to minimise their chances of contracting HIV. However, the students were still exposed to other diseases such as syphilis which could still be transmitted in blood fluids. This is in line with Baghcheghi et al. (2011) who revealed that more than half of nursing students, when they experience NSIs, the first safety measure they do is squeezing the wound, followed by tracking the patients' tests for blood-borne pathogens. However, safety measures when sharp injuries are experienced by Namibian nursing students can also involve vaccinating students against diseases such as hepatitis B.

Table 10. Sharp injury accidence handling

Accidence handling	Received PEP		Reason for not taking PEP	Frequency	Percent
Reported incident, washed and sucked the finger	No		Wound was not deep, it did not contaminate with my blood and not actively bleeding	3	13.6%
Tested the student and patient for HIV Was tested, followed the policy, to be retested again after 3months	Yes (7)	No (2)	Patient who contaminated the needle was negative	9	41%
I just washed the area with running water, plastered the wound	No			3	13.6%
Managed the bleeding by dressing the wound to prevent cross infection and plastered the prick. Received tetanus injection	No		Needle was not contaminated/used on patient	5	22.7%
Incident not reported	No		Refused to take PEP because of its side effects	2	9.1%
Total				**22**	**100%**

4.5.4. Experienced a needle stick injury and students view whether they regard a contaminated sharps injury to be life threatening

There is an insignificant difference at 0.05 alpha (as p-value in Table 11 is greater than 0.05) between students who did and those who did not experienced needle stick injuries when it comes to regarding a contaminated sharps injury a life threatening situation. For instance, 54.4% (49 out of 90) and 54.5% (12 out of 22) of students who did not experience and those who experienced a sharp injury respectively strongly agree that a contaminated sharps injury is life threatening. Thus, concluding that whether a student regard a contaminated sharps injury to be life threatening does not influence his/her changes of experiencing an injury.

Table 11. Crosstab of Did you experience a needle stick injury during your clinical and practical training? * A contaminated sharps injury is life threatening?

			A contaminated sharps injury is life threatening?				
			Disagree	Neither Agree/Disgree	Agree	Strongly Agree	Total
1. Did you experience a needle stick injury during your clinical and practical training?	No	Count	6	7	28	49	90
		% within 1. Did you….	6.7%	7.8%	31.1%	54.4%	100.0%
	Yes	Count	4	1	5	12	22
		% within 1. Did you….	18.2%	4.5%	22.7%	54.5%	100.0%
Total		Count	10	8	33	61	112
		% within 1. Did you….	8.9%	7.1%	29.5%	54.5%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3.306[a]	3	.347
N of Valid Cases	112		

4.5.5. Needle stick injury and injection safety equipment are adequately provided

Table 12 below highlight that, there is an insignificant difference at 0.05 alpha (as p-value in Table 12 is greater than 0.05) between students who did and those who did not experienced needle stick injuries when it comes to their views that injection safety equipment are adequately provided in the hospital. For example, 44.4% (40 out of 90) and 59.1% (13 out of 22) of students who did not experience and those who experienced a sharp injury respectively agree that injection safety equipment are adequately provided in the hospital. Thus, concluding that whether a student regard that injection safety equipment are adequately provided in the hospital does not influence his/her chances of experiencing an injury. This is in contrary with Rais and Jamil (2013) where it was established that 58% of sharp injuries can be experienced during the disposing of used needle syringes due to lack of safety equipment.

Table 12. Crosstab of Did you experience a needle stick injury during your clinical and practical training? * Injection safety equipment are adequately provided in your hospital?

			Injection safety equipment are adequately provided in your hospital?				
			Strongly disagree	**Disagree**	**Agree**	**Strongly Agree**	**Total**
Did you experience a needle stick injury during your clinical and practical training?	No	Count	2	6	40	42	90
		% within 1. Did you….	2.2%	6.7%	44.4 %	46.7%	100.0 %
	Yes	Count	0	2	13	7	22
		% within 1. Did you….	0.0%	9.1%	59.1 %	31.8%	100.0 %
Total		Count	2	8	53	49	112
		% within 1. Did you….	1.8%	7.1%	47.3 %	43.8%	100.0 %
Chi-Square Tests							
		Value	Df	Asymptotic Significance (2-sided)			
Pearson Chi-Square		2.327[a]	3	.507			
N of Valid Cases		112					

4.5.6. Analysis of experiencing injury and study program curriculum

There is an insignificant difference at 0.05 alpha (as p-value in Table 13 is greater than 0.05) between students who did and those who did not experienced needle stick injuries when it comes to their views whether standard precautions on needle and other sharps injuries has been adequately covered during their studies. For instance, 35.6% (32 out of 90) and 36.4% (8 out of 22) of students who did not experience and those who experienced a sharp injury respectively strongly agree that standard precautions on needle and other sharps injuries has been adequately covered during their studies. Thus, concluding that whether a student agree or does not agree that standard precautions on needle and other sharps injuries has been adequately covered during their studies does not influence his/her chances of experiencing an injury. In this case, this contradicts Salelkar et al. (2010) findings that attitude and lack of knowledge are contributing factors towards sharps injuries.

Table 13. Crosstab of Did you experience a needle stick injury during your clinical and practical training? * 16. Standard Precautions on needle and other sharps injuries has been adequately covered in your studies.

			Standard Precautions on needle and other sharps injuries has been adequately covered in your studies.			
			Disagree	**Agree**	**Strongly Agree**	**Total**
Did you experience a needle stick injury during your clinical and practical training?	No	Count	0	32	58	90
		% within 1. Did you….	0.0%	35.6%	64.4%	100.0%
	Yes	Count	1	8	13	22
		% within 1. Did you….	4.5%	36.4%	59.1%	100.0%
Total	**Count**		**1**	**40**	**71**	**112**
	% within 1. Did you….		**0.9%**	**35.7%**	**63.4%**	**100.0%**

Chi-Square Tests

	Value	Df	Asymptotic Significance (2-sided)
Pearson Chi-Square	4.174[a]	2	.124
N of Valid Cases	112		

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

This section summarises main findings of the research to reach the conclusion and recommendations of the study. The conclusion and recommendations are arranged per the study research objectives.

5.1. Conclusion

NHTC's Enrolled Nurse/Midwifery Training program students are required to complete practical learning attachments in hospitals where they are expected to perform invasive procedures early into their training program. These procedures put them at risk of experiencing potentially contagious sharps injuries. To the dismay of the researcher, the incidence of sharps injuries among the study subjects is considerably high, with a prevalence rate of 19.5% (22 out of 113), whilst the incidence rate of SIs amongst the study group is also notably high (22%). This results are however lower than a previous local study done on qualified HCWs at Windhoek Hospitals with a prevalence of 38% (Hakwenye & Aku-Akai, 2016) and a surveillance study of needle-stick injuries amongst student nurses done at the University of Namibia, with a prevalence of 17% among student nurses (Small et al., 2011).

The study findings exposed that, the majority of nursing students are females and most of the students have never been married and are aged between 20 and 30 years old. Also, most students commonly worked on shifts consisting of 5 staff members in different hospital sections on rotational basis. This is because, the majority of students were required to perform tasks in all section of the hospital, inferring that their training programme required them to become multi-skilled when working in a hospital environment. Additionally, it can be concluded that the number of staff members students worked with during their practical is adequate, as they majority of them indicated that they executed their duties effectively.

The sharps injury prevalence rate among NHTCs nursing students is much higher compared to other Southern African Development Community (SADC) countries like South Africa. However, NHTCs nursing students' SIs prevalence rate is much lower when compared to Middle East countries like Iran. In Namibia and in countries such as Iran, nursing students are more likely to experience only 1 needle or sharps injury, in many cases such an injury is self-inflicted. Additionally, NHTCs nursing students are more likely

to experience SIs during their second year of study than in their 1st or 3rd year of study. This is the year in which the students are engaged more independently with reduced supervision.

A common medical procedure which is highly associated with SIs, and a common causal factors of the sharps injuries among the studied nursing students is during the process of administering injections and immunizations to patients. The common circumstances under which the needle stick injury occurred is mainly due to uncapping or recapping of the needles. Also, during patient injection, lack of concentration and work pressure and due to inappropriate use of protective gear increased student's chances to experience SIs. Handling patients with ease/care and the presence or absence of supervisors is not associated with SIs among the study population.

The majority of the study subjects (more than two-third) articulates a positive attitude when it comes to reporting the occurrence of SIs. Still a significant number of them (one-third) are more likely not to report experienced SIs, exposing themselves to diseases such as HIV which can be transferred when injured by a contaminated sharp medical object like a needle. The common step taken by nursing students when they experience SIs is washing hands with soup under running water. Also, when SIs are experienced, HIV testing on both the patient(s) involved and students are done before determining if they are eligible to access Post Exposure Prophylaxis.

Whether students regard a contaminated sharps injury to be life threatening or that injection safety equipment are adequately provided in the hospital it does not influence their changes of experiencing injuries. Also, whether a student regard that injection safety equipment is adequately provided in the hospital does not influence his/her chances of experiencing an injury. Similarly, there is no relationship between SIs and whether students agree or does not agree that standard precautions on needle and other sharps injuries has been adequately covered during their studies.

Overall findings of this study demonstrate a need for training in sharps safety and universal precautions around sharps injuries, as well as provision of materials and equipment to ensure compliance with international adopted standards. In conclusion, this study revealed that nursing students from the NHTCs were at high risk of sharps injuries during their clinical training. This puts them at risk of acquiring blood borne infections.

5.2. Recommendations

The NHTCs nursing curriculum committee should revisit the course content on sharps safety, especially on the injection procedure which account for (50%) of SIs experienced by the study subjects. Injury preventions Interventions should be strengthened and be focused on the pre-injury, injury and post injury

phases. The occupational health and safety fraternity in whose context the proposed study is located is indeed a broad field, with many branches. Sharps safety is one of those branches. Just like any other occupational health and safety issue, the issue of sharps safety is evolving. Hence continuous research at global level is required concerning this issue.

Additionally, healthcare provision centers used for nursing practical/experimental learning should be adequately resourced with the required skilled human resource. It should be ensured that each student is allocated a skilled mentor at all times. Students who report SIs should undergo a full post exposure program, involving; testing, counselling, and also undergo a process of evaluation involving a review of their practices/techniques of handling sharps and protection against Sis.

There is recommendation for NHTCs nursing students to be put on induction programmes at the Healthcare centres where they will be performing clinical practical learning. Such an induction programme shall be provided by the infection control nurses and need to aim at educating students on the importance of reporting of experienced SIs to responsible offices in order to reduce health risks associated with SIs. Additionally, this would be regarded as a way to increase students' awareness of surroundings 'at the host healthcare centres. A detailed guideline on how to handle SIs at hospitals need to be developed and enforced, so that all students have a standard way to respond, when they experience a SI, as well as, on the storage, usage and disposal of medical sharps.

Students who experience a sharps injury undergoes inherent fear leading to a situation of non-reporting, non-treatment and failure to seek post exposure support. Therefore, a counsellor independent to the NHTCs or the student's practical environment should be designated to provide counselling to affected students. This is due to the fact that student nurses may feel more at ease with a person with whom they have no interaction in the classroom or the clinical environment.

Finally, and as a last resort, all new, particularly the young and inexperienced, nursing students should be taught the correct way of using protective clothing/devices. An evaluation should be done to that effect to ascertain competency.

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APPENDICES

APPENDIX 1 – Informed Consent

Dear Respondent,

Please read and understand before signing the consent form below.

Title: Assessing the Epidemiology of Sharps Injuries amongst nursing students: A case of selected NHTCs.

By: George Ndjitaviua (Msc Health Sciences), Namibia University of Science and Technology, Windhoek, Namibia)

This cross-sectional study aims at assessing the epidemiology of sharps injuries among the study group consisting of final year NHTC midwifery/nursing students. The study specifically aims at; finding out the factors that contribute to occurrence of injury by healthcare sharps, assessing the risk factors due to exposure to healthcare sharps at the hospital, determining the frequency and severity of injuries from healthcare sharps and assessing the measure in place to report, document, prevent, control or manage injuries from healthcare sharps among the study group.

The research will also enhance the current assessment of the prevalence of sharps injuries among the study population, even those that went un-reported, by exploring anonymous self-report of sharps injuries. The results of this research might assist the training staff to identify gaps and provide a basis for the inclusion and assessment of students on aspects related to safety before being deployed for experiential learning in healthcare set-ups. It may also be useful in assessing the efficacy of existing infection control measures and routine preventive measures taken by the various training hospitals.

This study and its procedures have been approved by the Namibia University of Science and Technology's Faculty of Health and Applied Sciences ethics screening committee, the MoHSS ethics and research committee as well as the National Commission on Research Science and Technology.

The procedure includes voluntary participation and responding honestly and accurately. All information given will be confidential and anonymous. Structured questionnaires which comprise closed, open-ended and linear scaled questions, and focus group discussions shall be used to collect primary data. Perusal of injury records and relevant secondary data shall also be done. The study data will be analyzed by the researchers and the results will be presented to the Namibia University of Science and Technology as part of the requirement for the degree of Master of Science in Health Sciences.

Consent: I have read, understood and voluntarily consent to participate in this study. I have understood the nature and purpose of this study and that my identity will not be revealed in the study.

Subject's signature:……..Date:……..

I have explained the nature and purpose of this study to the above subject in writing and have sought his/her understanding for informed consent.

Researchers Signature:……..Date:……..

APPENDIX 2 - Sharps Injury Study Survey Questionnaire

Annexure 2 - Sharps Injury Study Survey Questionnaire

Closed/Open-Ended Questions

1. Did you experience a sharps injury during your clinical and practical training?

2. If yes to Question 1. How many times……

3. Did you inflict the injury upon yourself, or were you injured by someone else?

……..

4. Well since experiencing a sharp injury, can you explain step by step what you did? Explain to from the initial injury what your steps that you took
was……
……
……
……
……
……

5. After how long into the training did it happen? E.g. 1st, 2nd 3rd year ……..

6. When did you report it? ……

4. What procedure where you performing when it happened?

……..

5. In short describe the circumstances under which the needle stick injury occurred.

……
……..

6. In short. Explain how did you handle the accident? Did you received PEP?

……
……

7. How many hours do you perform practical learning work per week? ……..

8. During practical's, how many staff members do you work with on the shift? And do you think they are adequate?

……
……

Linear Scaled Questions

Please tell me to what extent you agree or disagree with the following statements: Circle the statement you most agree/disagree with.

9. You handle the number of patients that you attend to per shift, with ease.

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

10. Your mentor/supervisor is always present when you attend to patients.

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

11. A contaminated sharps injury is life threatening?

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

12. Injection safety equipment are adequately provided in your hospital?

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

13. Standard Precautions on needle and other sharps injuries has been adequately covered in your studies.

Strongly Agree	Agree	Neither Agree/Disagree	Disagree	Strongly Disagree

Demographic Questions

14. Gender:

Male	Female

15. How do you define your ethnic background?

Black	Indian/Asian	Coloured	White

Other specify……

16. Age:

20- 30 years	39-60 years	18-24 years	31-38 years

17. Hospital Section:

Theatre	Casualty	Normal Ward	Maternity	Orthopaedic	Clinic	Other

18. Marital Status

Married	Single

Thank you for taking part in this survey.

APPENDIX 3 – MoHSS Ethics Clearance Letter

REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2537
Fax: 061 – 222558
E-mail: btjivambi@mhss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3 GN
Enquiries: Mr. B. Tjivambi

Date: 06 November 2018

Mr. George Ndjitaviua
PO Box 24649
Windhoek

Dear Mr. Ndjitaviua

Re: Assessing the Epidemiolgy of sharps injuries amongst nursing students: A case of selected NHTC's

1. Reference is made to your application to conduct the above-mentioned study.

2. The proposal has been evaluated and found to have merit.

3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**

3,1 The data to be collected must only be used for academic purpose;

3.2 No other data should be collected other than the data stated in the proposal;

3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

3.4 A quarterly report to be submitted to the Ministry's Research Unit;

3.5 Preliminary findings to be submitted upon completion of the study;

3.6 Final report to be submitted upon completion of the study;

3.7 Separate permission should be sought from the Ministry for the publication of the findings.

4. All the cost implications that will result from this study will be the responsibility of the applicant and not of the MoHSS.

Yours sincerely,

PERMANENT SECRETARY
MINISTRY OF HEALTH & SOCIAL SERVICES

MR. B.T. NANGOMBE
PERMANENT SECRETARY

"Health for All"

APPENDIX 4 – NHTCs Data Collection – Permission Letter

REPUBLIC OF NAMIBIA

MINISTRY OF HEALTH AND SOCIAL SERVICES

NATIONAL HEALTH TRAINING CENTRE

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 2032930
Fax: 061 232830

LETTER FROM THE NATIONAL HEALTH TRAINING CENTRES GRANTING PERMISSION

21 April 2019

The Chairperson
Higher Degree Committee
Namibia University of Science and Technology (NUST)
Faculty of Health Sciences
Private Bag 13388
WINDHOEK

Dear Sir/Madam,

RE: MASTER OF HEALTH SCIENCES DEGREE – RESEARCH PROPOSAL BY MR. GEORGE NDJITAVIUA

This letter serves to inform you that Mr. George Ndjitaviua has approached and requested approval of the National Health Training Centres to do an assessment of the Epidemiology of Sharps Injuries amongst nursing students at our respective Training Centre, namely; Windhoek, Keetmanshoop, Otjiwarongo and Rundu for academic research purposes.
Kindly accept this letter as consent of the above request.

For any further enquiries, please contact Mr. Claassen, Deputy Head of Training, National Health Training Centre, Windhoek, Namibia at +264 61 203 2586 or e-mail: ellyline44@gmail.com

Yours sincerely,

pp .....

Mr. S.L Claassen

The Training Network
2019 -04- 21
Ministry of Health and Social Services

EDUCATION, TRAINING, COMPETENCE AND COMMITMENT FOR HEALTH AND SOCIAL DEVELOPMENT