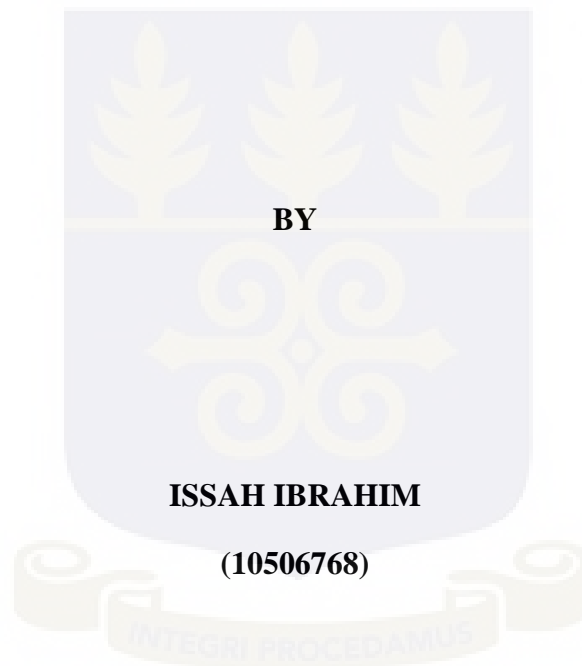


**SCHOOL OF PUBLIC HEALTH
COLLEGE OF HEALTH SCIENCES
UNIVERSITY OF GHANA**

**OCCUPATIONAL EXPOSURE TO NEEDLE STICK INJURIES AMONG HEALTH
CARE WORKERS AT THE TAMALE TEACHING HOSPITAL**



**THIS DISSERTATION IS SUBMITTED TO THE UNIVERSITY OF GHANA,
LEGON IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE
AWARD OF MSC. OCCUPATIONAL HYGIENE DEGREE**

JULY, 2015

DECLARATION

I declare that except for references to other people's work which have been duly acknowledged, this dissertation is the result of my own research and that this dissertation either in whole or in part has not been presented for another degree elsewhere.

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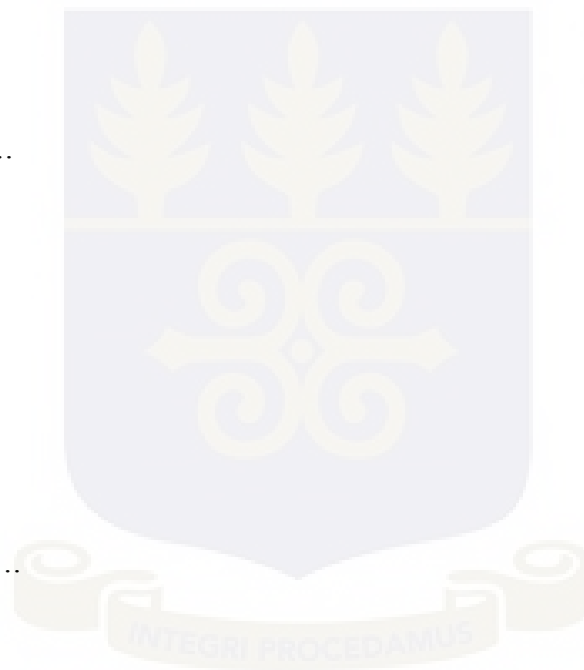
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(Supervisor)



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Date

DEDICATION

To my lovely wife Ramatu and my son Aidan Baiwah without whom this dissertation would have been a distant reality.



ACKNOWLEDGEMENT

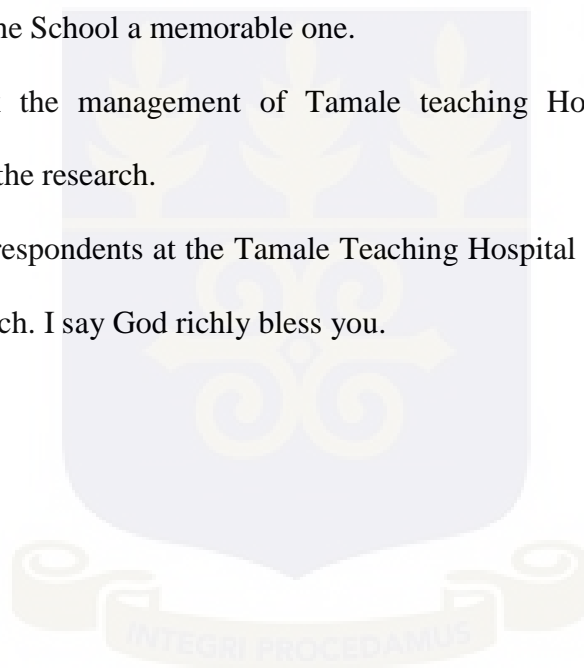
I wish to express my profound gratitude to the Almighty God for his unfailing love, care and grace to me throughout this programme. This work has been done through the contributions of various people. Their support, contributions and constant encouragement played a vital role in seeing me through this programme successfully.

I am very grateful to my academic supervisor, Dr. John Arko-Mensah for his guidance, insightful suggestions, support and time that led to the production of this useful work.

I would also extend my gratitude to all lecturers of School of Public Health who in diverse ways made my stay in the School a memorable one.

I would like to thank the management of Tamale teaching Hospital for granting me permission to carry out the research.

Finally, I thank all my respondents at the Tamale Teaching Hospital who willingly agreed to participate in this research. I say God richly bless you.



ABSTRACT

Background: Needle stick and sharp injuries (NSSIs) or needle stick injuries (NSI) have been recognized as one of the most serious occupational health hazards among health care workers (HCWs) with a potentially high risk of transmitting blood borne pathogens. Such pathogens include hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV). The incidence of NSIs is highest in low income countries ostensibly due to lack of strict adherence to the use of personal protective equipment (PPE) or lack of these PPE thereof.

Objectives: The aim of this study was to identify the category of HCWs likely to be more exposed to NSIs, determine the practices leading to these injuries, evaluate the frequency of these injuries among HCWs, and finally assess whether there are existing control measures at the Tamale Teaching Hospital to prevent or minimize these injuries.

Methods: The study was a descriptive cross-sectional study and utilized a pre-tested, structured and self-administered questionnaires. A total of 250 participants (HCWs) were included in this study. A proportional stratified sampling method was used to sample participants for the study. Convenience sampling method was then used to select from each stratum to get the required sample size (n= 250). Completed questionnaires were coded, entered into Microsoft Excel spreadsheet (Version 13) and statistical analysis done in STATA (Version 13).

Results: The study findings revealed that 165(66%) of the respondents were involved in NSIs at the hospital of which 98(59.4%) were males. Majority of the injured respondents (54.6%) experienced injuries between 1-2 times in their professional life, whereas a few (7.3%) experienced injuries between 5-10 times. The most common activity which led to NSIs among participants was during administration of injection to patients (36.4%). Other

activities included recapping of needles after use (28.5%), venous cannulation and setting of drips (26.1%) and suturing (24.9%). Of the injured workers, 60.6% were nurses, 5.5% midwives, 20% medical doctors, 6.1% laboratory technicians, 4.2% anesthetists, and 3.6% were cleaners. Needle stick injuries was significantly lower in female workers (OR=0.58; 0.34, 0.98), compared to their male counterparts, but significantly higher in workers aged 30-39 years (OR=2.25; 1.29, 3.94), and those who had training in infection prevention and control in the last five years (OR=4.33; 1.84, 10.21). Almost all the respondents 237 (94.8%) indicated that they were provided with gloves and 81.6% reported that safety boxes were provided for the disposal of sharps. Forty eight and half percent (48.5%) of the injured respondents did not report their injuries.

Conclusion:

Results of this study showed high prevalence of NSIs among HCWs at the Tamale Teaching Hospital. The object or sharp that caused most of the injuries is the hypodermic needle, and majority of the respondents have had 1-2 times NSI mostly during administration of injection to patients. Periodic education to staff involved in the handling of sharps on potential health implications of such injuries as well as adequate supply and training on use of PPE and safety devices can help reduce the rate of NSIs at the Tamale Teaching Hospital.

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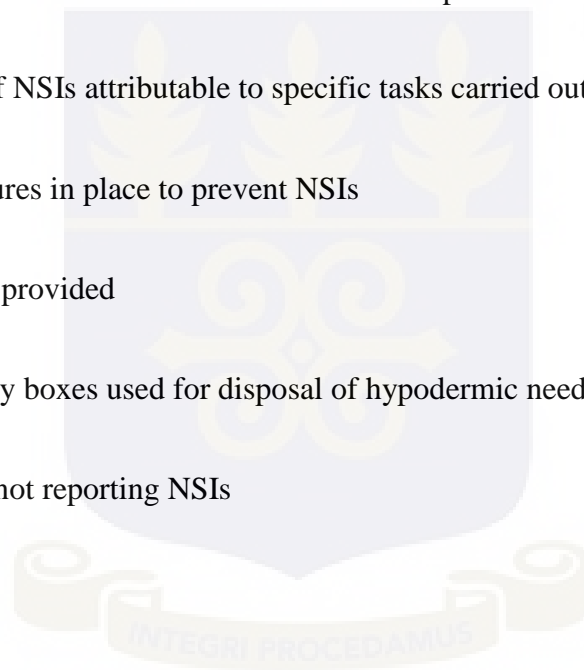
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LIST OF ACRONYMS

| | |
|-------|--|
| ABE | Accidental Blood Exposure |
| A&E | Accident and Emergency |
| AIDS | Acquired Immune Deficiency Syndrome |
| CDC | Centers for Disease Control |
| GHS | Ghana Health Service |
| HBAg | Hepatitis B Antigen |
| HBsAg | Hepatitis B surface Antigen |
| HBV | Hepatitis B virus |
| HCV | Hepatitis C virus |
| HCWs | Health Care Workers |
| HIV | Human Immunodeficiency Virus |
| ICP | Infection Control and Prevention |
| IV | Intravenous |
| MoH | Ministry of Health |
| NIOSH | National Institute of Occupational Health and Safety |
| NSSIs | Needle Stick and Sharps Injuries |
| O&G | Obstetrics and Gynecology |
| WHO | World Health Organization |

DEFINITION OF TERMS

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.

Hazard: The inherent potential of a material or a situation to cause injury or to damage people's health, or to result in loss of property.

Health-care worker: A person (e.g. nurse, physician, pharmacist, technician, mortician, dentist, student, contractor, attending clinician, public safety worker, emergency response personnel, health-care waste worker, first-aid provider or volunteer) whose activities involve contact with patients or with blood or other body fluids from patients.

Hierarchy of controls: Concept used by the industrial hygiene profession to prioritize prevention interventions. Hierarchically these include; elimination, substitution, engineering, administrative and personal protective equipment.

Needle stick: Penetrating stab wounds caused by needles.

Personal protective equipment (PPE): Equipment designed to protect workers from serious workplace injuries or illnesses resulting from contact with chemical, radiological, physical, x ray, electrical, mechanical, or other workplace hazards.

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. Preventive therapy or —primary prophylaxis is given to at-risk individuals to prevent a first infection; —secondary prophylaxis is given to prevent recurrent infections.

Recapping: The act of replacing a protective sheath on 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



CHAPTER ONE: INTRODUCTION

1.1 Background

Needle stick and sharp injuries (NSSIs) or needle stick injuries (NSIs) have been recognized as one of the most serious occupational hazards among health care workers (HCWs) (Kebede, Molla, & Sharma, 2012). Globally, more than 35 million health care workers face the risk of percutaneous injury with contaminated sharp objects every year (Wicker, Jung, Allwinn, Gottschalk, & Rabenau, 2008). In this regard, HCWs are directly at risk of transmission of blood borne pathogens through their handling of contaminated body fluids (Lee, 2009). In addition to the physical injuries, HCWs could suffer significant anxiety and emotional distress following a NSI (Wicker et al., 2008).

Studies have indicated that NSIs account for approximately 80% of percutaneous exposure to blood among HCWs. These injuries could expose HCWs to potentially fatal infections such as hepatitis B virus (HBV), hepatitis C virus (HCV) or human immunodeficiency virus (HIV) (Talaat et al., 2003). It has been shown in another study that, NSIs account for about 40% of hepatitis B and C and 2.5% of HIV infection in HCWs worldwide (Cho et al., 2013).

Different studies have revealed that HCWs are highly exposed to needle stick injuries. According to a recent Center for Disease Control and Prevention (CDC) report, an average of 385,000 NSIs occurs annually in US hospitals (Talas, 2011). A global outlook depicts high incidence rate of NSIs. For example, as high as 500,000 needle stick injuries were reported among health care workers in Germany (Wicker et al., 2008), whereas 18,700 cases was documented annually in Australian hospitals in 2008, a figure recently revised upwards to

19,355 (Murphy, 2010) Similarly, a cross-sectional study among nurses in a state hospital in Turkey in 2008 found that 30.1% of the 143 nurses sampled had experienced NSIs in the previous year (Irmak, 2012). In Uganda and South Africa, NSIs among junior doctors over a 6 months period was found to be up to 55% and 91% respectively (MOH/GHS, 2010). Despite these levels of exposure to NSIs, reports still indicate that non-reporting of NSIs is highly prevalent (Irmak, 2012). In developing countries, occupational infections are less often documented because of the lack of routine surveillance of sharp injuries and blood exposures (Phillips et al., 2012). Also, excessive handling of contaminated needles, high patient demand for injections and lack of safe needles and sharp containers enhance the risk of occupational transmission of blood borne pathogens in developing countries (Talas, 2011). Consequently, 45.7% of 1241 HCWs sampled in different countries in West Africa had sustained accidental blood exposure in the previous year with the majority, 80.1% due to percutaneous injury (Lee, 2009).

Based on the above studies, it is evident that NSIs occur in different countries and pose occupational health risks to health care workers.

1.2 Problem Statement

More than 95% of HIV infections occur in developing countries, two-thirds of which is in sub-Saharan Africa, where over 28 million people are living with HIV (WHO, 2007). Unfortunately, the number of NSIs is also highest in these countries. For example, over half of the hospitalized patients in South Africa are HIV positive (Wilburn, 2004). Also, in some areas of Africa and Asia, almost all hepatitis B and C infections among HCWs are

attributable to contaminated sharps and African HCWs suffer an average of 2 to 4 needle stick injuries per year (Wilburn, 2004).

Health care workers in Ghana are documented to be at higher risk of infection from blood borne pathogens than the general population (MOH/GHS, 2010). The highest risk groups are those whose activities entail exposure to blood and blood products with emphasis on blood borne pathogens such as hepatitis B, hepatitis C and HIV (MOH/GHS, 2010). Needle stick injury causes significant stress and anxiety to the affected individual and their families (Raghavendran, Bagry, Leith, & Budd, 2010). The WHO estimates that sharps injuries constitute 30% of new cases of HBV and 2.5% of annual infection of HIV among HCWs in Sub-Saharan Africa (MOH/GHS, 2010). Among the predisposing factors found to influencing these trends include NSIs resulting from recapping of needle with two hands and over use of injections (MOH/GHS, 2010). In Ghana, data on NSIs is non-existent or minimal at best, but likely to be of similar magnitude to other African countries like Uganda and South Africa with NSIs up to 55% and 91% respectively (MOH/GHS, 2010). It has been documented that the risk of hepatitis B among unimmunized HCWs is very high and according to the WHO, in some areas of the world, over 80% of HCWs have not been immunized against hepatitis B despite its 95% efficacy rate (Wilburn, 2004). In Ghana, a study conducted by Lee in 2009 in school children found that 61.2% had markers of HBV infection (Lee, 2009).

In Africa, the lack of safe devices in hospitals, because of the low expenditure on health care and occupational safety and health services and a high ratio of patient to health care worker contribute to work environment predisposing the HCWs to a greater risk of NSIs, and

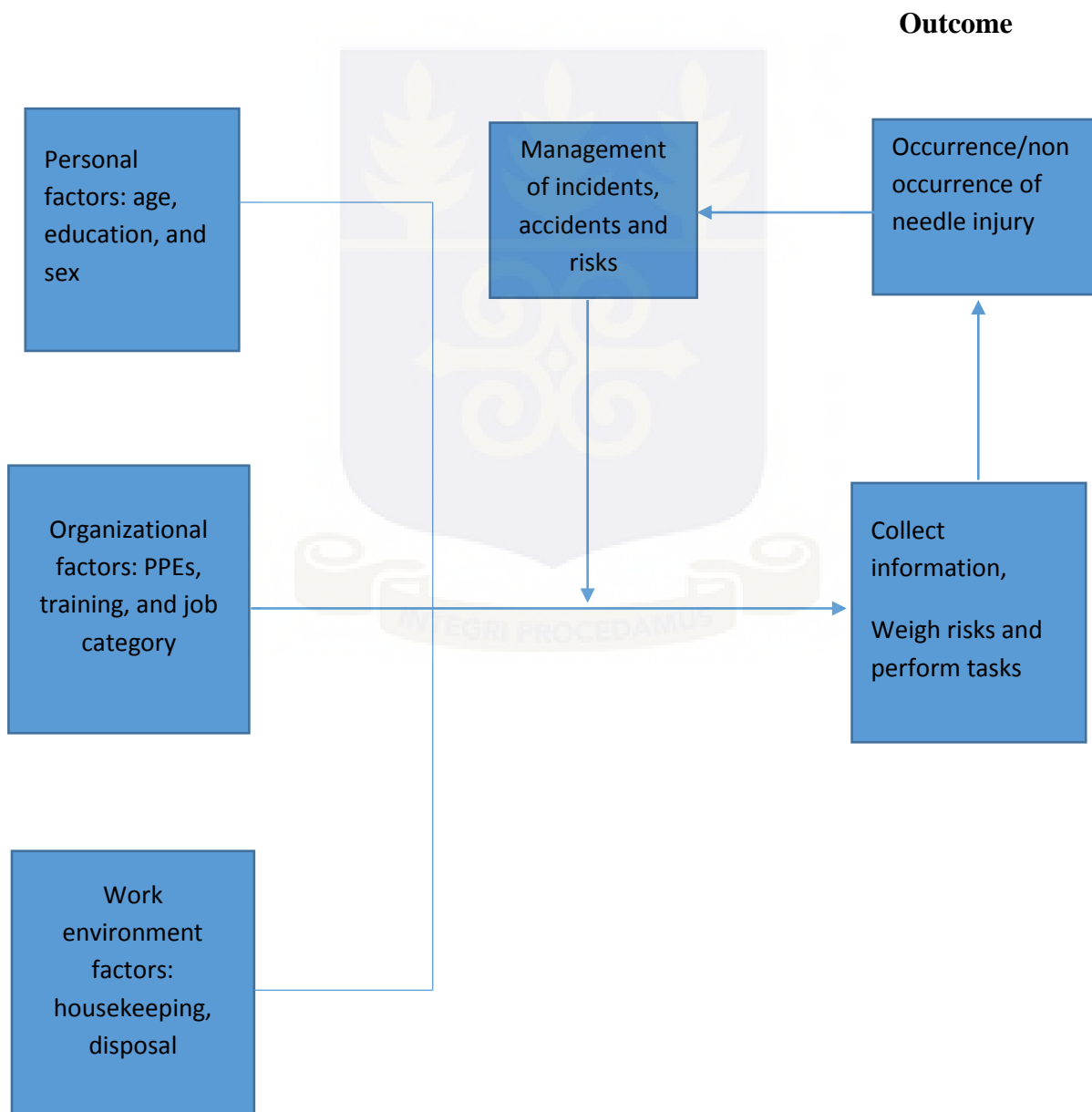
consequently to blood borne infections (Nsubuga & Jaakkola, 2005). In Ghana, there is no structured mechanisms in place whereby individuals who sustain NSIs can report and obtain specialist occupational health advice. It is also not given priority by health care managers because of limited resources and HCWs have not recognized it as a main concern yet. This research seeks to assess the exposure to NSIs among HCWs in TTH.



1.3 Conceptual framework

The model presented below explains the factors that could lead to occurrence of NSIs. The independent variables include human, organizational and environmental factors interacting with an interface of collecting information, weighing risks and performance of tasks. The outcome of the task could be occurrence of injury or non-occurrence of injury. The conceptual frame work is presented below.

Figure 1: Conceptual frame work



1.4 Study justification

The Tamale Teaching Hospital (TTH) is a major referral center for the Northern, Upper East and West regions, the northern parts of Brong Ahafo region and the neighboring parts of La Cote D'ivoire, Burkina Faso and Togo. The hospital has a bed capacity of four hundred and seventy five (475) and the work force is currently about one thousand and eight hundred and seventy six (1,876).

In Ghana, Health Care workers in health facilities are constantly exposed to needles which contribute to immediate injury to self, and possible disease transmission. Needle Stick Injuries to hospital staff is quite frequent and can result in infections and diseases. Globally, Ghana is considered to be in the highest category for prevalence of HBV infection (Mkandawire, Richmond, Dixon, Luginaah, & Tobias, 2013). Despite the existence of Occupational Health and Safety (OHS) policy in the Ministry of Health/Ghana Health Service (MOH/GHS), the assessment of risks within Tamale Teaching Hospital is inadequate.

For example, there is no formal mechanism in the Tamale Teaching Hospital where NSIs are reported; hence injuries sustained by HCWs go unreported even though they are aware of the dangers involved. The staff of TTH are however at risk of acquiring blood borne pathogens such as hepatitis B due to its high prevalence in the region.

Against this background, this study intends to assess exposure to NSIs among HCWs at the TTH. The study will assess the frequency of exposure to NSIs amongst HCWs and determine specific jobs or tasks which predispose HCWs to increasing risk of exposure to NSIs. It is

hoped that the findings of this study will help bring to the notice of management the level of risk workers are exposed to with respect to NSIs. It will also help put in place proper documentation of NSIs with the objective of helping to re-appraise existing OHS policy and to enforce proper implementation of existing occupational safety measures including vaccination.

1.5 Objectives

1.5.1 General objective

To assess the occupational exposure to needle stick injuries among health care workers in Tamale Teaching Hospital.

1.5.2. Specific objectives

The specific objectives of this study are:

1. To identify the categories of health care workers exposed to needle stick injuries
2. To determine the risk factors of needle stick injuries
3. To determine the frequency of exposure to needle stick injuries
4. To identify the needle stick injury preventive measures that are in place for health care workers in Tamale Teaching Hospital

CHAPTER TWO

2.0 Literature review

2.1 Background

There are many hazards to which health care workers (HCWs) are exposed to, among which infections present the greatest risk, especially those carried by blood borne pathogens (Orji, Fasubaa, Onwudiegwu, Dare, & Ogunniyi, 2002). According to Patterson et al., (1985), hospital personnel are subject to various occupational hazards ranging from physical, chemical, biological, ergonomic and psychosocial hazards. Awareness of these risks, compliance with basic preventive measures and adequate resources for interventions are essential components of any occupational health program.

Needle stick injuries (NSIs) are frequently reported as occupational injuries among HCWs (van der Molen, Zwinderman, Sluiter, & Frings-Dresen, 2011). The National Institute of Occupational Safety and Health (NIOSH) defines NSI as the injury caused by needle such as hypodermic needles, intravenous (IV) stylets and needles used to connect parts of IV delivery systems (NIOSH Alert, 1999). Other authors have also defined NSIs as the introduction into the body of health care providers during the routine performance of their duties, of blood or other potentially hazardous material by a hollow bore needle or sharp instruments e.g. needles, lancets and contaminated broken glass (Waqar, Siraj, Razzaq, Malik, & Zahid, 2011).

Among HCWs, nurses and physicians appear especially at risk (Memish et al., 2013). Most reported needle injuries involve nursing staff; but laboratory staff, physicians, housekeepers and other HCWs are also prone to NSIs (NIOSH Alert, 1999). Hospital nurses are at particularly high risk for contracting blood-borne infections, as most of their NSI incidents

involve devices that are very efficient at transmitting pathogens, such as hollow-bore needles (Smith et al., 2006). Research also suggests that around two thirds of disease sero-conversions following NSI will occur among nursing staff as such nurses clearly shoulder a significant NSI burden in many parts of the world (Smith et al., 2006).

2.2 Causes of Needle Stick Injuries

Many factors lead to the occurrence of NSIs. The most common causes of NSIs are double – handed recapping, and the unsafe collection and disposal of sharps waste (Yacoub et al., 2010). Other causes include the overuse of injection, lack of supplies, lack of awareness about the hazards of NSIs, lack of training and failure to properly dispose of used needles in a puncture-proof sharps disposal containers (Abkar, Wahdan, Sherif, & Raja'a, 2013).

Injections are one of the most common medical procedures. Each year some 16 billion injections are administered in developing countries and transitional countries and the chances of exposure to NSIs are increased simply due to increased numbers of procedures being carried out (Lee, 2009; Paul et al., 2011). In many developing countries, the reason for the high demand for injections is driven from the belief that they are more effective than other forms of treatment. In Ghana, 80 to 90 percent of the patients who visited a health center received one or more injections per visit. Similar findings have been reported in Uganda and Indonesia (Sagoe, Pearson, Perry & Jagger, 2001).

Unsafe injections are important sources for transmitting blood borne pathogens. In response to this, the WHO in 1999 created the Safe Injections Global Network (SIGN) in order to promote the use of safe injection, defined as injection that 'does not harm the recipient, the provider or the community' (Kermode, Holmes, Langkham, Thomas & Gifford, 2005). The

main elements of the strategy are; changing behavior of both patients and HCWs to avoid injection over-use and achieve safe practices, through information, education and communication materials, providing enough injection equipment to ensure injection device security, and developing appropriate healthcare waste management systems (Kermode et al., 2005).

A safe injection does no harm; but unsafe injection practices are a plague of many health systems. Each year unsafe injections cause an estimated 1.3 million early deaths, a loss of 26 million years of life and an annual burden of US \$ 535 million in direct medical costs (Paul et al., 2011).

It is stated in some studies that, irrational and unsafe injection practices are most common in developing countries and more than 80% of NSIs can be prevented through the use of safety devices and effective safety programs (Waqar et al., 2011). A study conducted in Pakistan also pointed out inadequate knowledge about the risks associated with NSIs, recapping and surgical stitch needles as the common causes of NSIs (Waqar et al., 2011). It is also observed in some studies that, most of the needle stick injured persons are responsible for causing the injuries. For example, Bilski, (2005) has shown that, more than 75% of injuries occur while performing every day activities of patient care and that most of the injuries are self-inflicted (84%), while only 5% are caused by colleagues and 11% by patients. It is also documented that 10-25% injuries occurred while recapping a used needle (Shah, Mehta, Fancy, Nayak, & Donga, 2010) and according to Martins, Coelho, Vieira, Matos, & Pinto, (2012), between 22% and 55% of NSIs occur when recapping after use. Unsafe procedures, difficult working conditions and unsafe devices as well as lack of knowledge, training and enforcement and fatigue are also reported as causes for NSIs (van der Molen et al., 2011).

A similar study conducted by Kebede et al., (2012) showed that, the prevalence of NSSIs among HCWs in Ethiopia was significantly associated with lack of training on occupational health and safety (OHS), high work load, lack of perception of risk and dissatisfaction with work environment and work culture. Adverse schedule characteristics such as long work hours and understaffing were also seen to significantly increase the risk of NSSIs. According to Nsubuga & Jaakkola, (2005), the lack of safe devices in hospitals because of the low expenditure on health care and occupational safety and health services and a high ratio of patients to health care worker contribute to a work environment predisposing the health care workers to a great risk of needle stick injuries, and consequently, to blood borne infections. In 1985, in order to increase awareness among HCWs of the dangers of sharp injuries and other types of disease transmission, the Centers for Disease Control (CDC) and the Occupational Safety and Health Administration (OSHA) in the United States introduced the “Universal Precaution Guidelines,” which have become the worldwide standard in both hospital and community care settings (Shah et al., 2010).

2.3 Needle Stick Injuries and Disease Transmission

Contaminated NSIs are well-known for their ability to transmit serious blood borne infections such as HBV, HCV and HIV between patients and health care staff (Smith et al., 2006).

Needle stick and sharp objects injuries NSSIs are commonly encountered by people handling needles in the medical setting (Memish et al., 2013) and the frequency of such injuries is estimated to be about 500,000 annually in Germany (Wicker et al, 2008; Memish et al., 2013), 100,000 in the UK and 600,000 – 800,000 in the USA (Memish et al., 2013). One of the most efficient modes of HBV transmission in the health care setting is percutaneous exposure to HBV due to an unintentional injury from a sharp objects contaminated with

HBsAg-positive blood from an infected patient (Chaudhari, Bhagat, Ashturkar, & Misra, 2009).

Worldwide, it has been estimated that, in 2000 alone, percutaneous injuries led to 16,000 HC, 66,000 HB and 1000 cases of HIV and the incidence of HB infection following NSI has been reported to be high among unvaccinated staff (Mbaisi, Wanzala, & Omolo, 2013,; Yacoub et al., 2010). After a needle stick exposure to an infected person, a HCW's risk of infection depends on the pathogen involved, the immune status of the worker, the severity of the needle injury and the availability and use of appropriate post exposure prophylaxis (PEP) (CDC, workbook).

In developing countries 40-60% HBV infections in HCWs are attributed to percutaneous occupational exposure due to sharp injuries (Chaudhari et al., 2009). In some areas of Africa and Asia, close to all hepatitis B and C infections among HCWs are attributable to contaminated sharps (Wilburn, 2004).

Under-reporting appears to be common within hospital environments, with surveys suggesting that between 60% and 80% of nurses do not officially report their NSI incidents (Smith et al., 2006). It is believed that only one out of three NSIs are reported in the USA, while these injuries virtually go undocumented in most developing countries (Shah et al., 2010).

2.4 Incidence of Needle Stick Injuries

Globally, there is under reporting of NSIs and in Africa the incidence is quite high in countries where data exist. Although the majority of these occupational infections occur in developing countries where the prevalence rates of blood borne pathogens and risk of occupational injuries are high, most documented infections are reported from developed countries, where surveillance is most commonly conducted (Kebede et al., 2012).

The WHO estimates that 3 million percutaneous exposures occur annually among 35 million HCWs globally; over 90% occurring in resource constrained countries (Mbaisi et al., 2013). Health care workers in Africa suffer two to four needle stick injuries per year on average (Wilburn, 2004, Mbaisi et al., 2013), with Nigeria, Tanzania and South Africa reporting 2.10 injuries per HCW on average (Mbaisi et al., 2013).

The incidence of needle stick injuries among HCWs in developing countries is far higher than in their developed counterparts. For example, a West African survey of 1241 HCWs found that 45.7% had sustained an accidental blood exposure in the previous year with 80.1% due to percutaneous injury. Estimated incidence was 0.33 accidental blood exposures per HCW per year. By comparison, France has an annual exposure of 0.11/year (Lee, 2009).

Few studies have attempted to evaluate the incidence rate of Accidental Blood Exposure (ABE) in African HCWs. In a study carried out in Tanzania, medical ward personnel showed a risk of five percutaneous injuries (PCIs) and nine mucocutaneous contacts (MCCs)/HCW/year. In Nigeria, one study documented a risk of two PCIs/ surgeon/year, 0.4 PCIs/medical doctor/year and 0.6 PCIs/nurse/year. Another study in surgical wards in Zambia estimated the annual risk to be three PCIs/ surgeon. A survey conducted in Dutch health workers returning from developing countries estimated the annual risk to be two PCIs for doctors (including surgeons) and 1.9 PCIs in nurses (Tarantola et al., 2005).The true

magnitude of this problem is difficult to assess due to the lack of national surveillance systems in the majority of the countries, to underreporting (thought to be as high as 90%) and because available information on the frequency of injuries among HCWs working in other settings is not available (e.g., long-term care, home healthcare private offices) (Rapparini et al., 2007).

2.5 Prevention of Needle Stick Injuries

Needle stick injuries can be prevented and the overall objective should be their elimination. In high-income countries, implementation of Standard/Universal Precautions (UPs), injury surveillance programs, provision of personal protective equipment (PPE), routine hepatitis B vaccination, post-exposure prophylaxis (PEP) and engineered safety devices have yielded results. In USA, the proportion of HCWs experiencing one or more NSI in one year preceding survey fell from 24 to 8.6% in a span of eight years (Sangwan, Kotwal, & Verma, 2011). Strategies to prevent occupational infection with blood borne pathogens include pre-exposure vaccination with hepatitis B vaccine, post exposure management of needle stick and sharp injuries, and implementation of precautions to prevent exposure to blood and infectious body fluids (Talaat et al., 2003). Appropriate measures to minimize the occurrence of needle and sharp injuries include the education of HCWs and reduction of invasive procedures, and the use of safer devices, and to reduce the risk of staff acquiring a blood borne infection, the US Government released the “Needle stick Safety and Prevention Act” in November 2000 to ensure availability of safety devices to all staff by the employers (Wicker et al., 2008). van der Molen et al., (2011) recommended the introduction of safety devices as one of the main starting points to prevent NSIs. Additional preventive measures, such as training in safe

working routines and personal protective equipment are expected to further improve safe work conditions.



CHAPTER THREE

3.0 METHODS

3.1 Study design

The study is a descriptive cross-sectional study by means of pre-tested, structured and self-administered questionnaires.

3.2 Study site

The study was conducted at the Tamale Teaching Hospital (TTH). Tamale Teaching Hospital is located in the Eastern part of the Tamale metropolis with a total surface area of 490,000 square meters, out of which 122,500 square meters has been developed. It is located in a catchment area which has a population of about 2.4 million. The hospital offers health care to patients from the Northern region, Upper East and West regions, the northern part of Brong Ahafo region and the neighboring countries of La Cote D'ivoire, Burkina Faso and Togo.

The hospital is currently the largest National referral teaching and research hospital in the Northern region with estimated staff strength of 1,876 employees and bed capacity of 475.

The hospital shares boundaries with the Dohinayili community to the West and Dapkema JHS and Dabokpaa community to the east. To the North is the Tamale –Yendi high way which also boards the Kukou community, and south is the Tamale Nurses' and Midwifery Training College.

The hospital serves as the main teaching facility for the School of Medicine and Health Sciences of the University for Development Studies (UDS) and the other health training schools in the region. The location of TTH is found in fig 2 below.

Figure 2: map of the study area- TTH



3.3 VARIABLES

3.3.1 Dependent

The dependent variable is the occurrence of needle stick injury.

3.3.2 Independent

The independent variables are risk factors to needle stick injuries. These factors comprise of personal factors (such as education, skills, age, and sex), organizational factors (such as PPEs availability and usage, job category, and training), work environment factors (such as level of cleanliness, and availability and usage of safety devices), and work practices (such as injection, recapping, suturing, disposal, and cleaning)

3.4 Study population

The source population included all 961 (see table 1) health care workers at Tamale Teaching Hospital (TTH) who handle needles and sharps during the course of their work. From this, 250 participants (see section 3.5 and table 1) were selected for this study.

3.5 Determination of sample size

The proportion of health care workers at risk of needle stick injury in Ghana is estimated to be 32.4% (Kebede et al, 2012). Also, a confidence level of 95% and a desired level of precision set at 5% was used for the sample size determination.

The sample size was then calculated using the formula developed by Cochran (1963:75) to yield a representative sample for proportions.

$$n_0 = \frac{z^2 pq}{e^2}$$

Where,

n_0 =the sample size

Z=standard normal deviate which is 1.96 at 95% confidence interval

P=the proportion of the population estimated to be at risk (0.32)

q=the proportion of the population not at risk (1-0.32 = 0.68)

e=desired level of precision set at 5% (0.05)

This implies that,

$$n_0 = \frac{1.96^2 * 0.32 * 0.68}{0.05^2}$$

$$n_0 = \frac{0.8359}{0.0025}$$

$$n_0 = 334$$

Since the target population is less than 10,000. The final sample size is adjusted using the formula bellow:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Where,

n = sample size desired when the population is less than 10,000 and

N=the population size = 961

This gives,

$$n = \frac{334}{1 + \frac{334 - 1}{961}}$$

$$n = \frac{334}{1.35}$$

$$n = 247 \approx 250$$

Therefore a sample size of 250 was obtained for the study.

3.6 Sampled proportions of the source population of 961 HCWs

The hospital has HCWs in different job categories which are considered as different strata. The allocation of the sample size across strata was done using the proportional allocation method.

Let k represent the various job categories, the formula for the k th sample size is given by

$$n(k) = n(N_k/\sum N_k)$$

$n(k)$ = number selected from each stratum

n = sample size = 250

N_k = population in each stratum and $\sum N_k$ = total number of strata (job categories) = 961

Therefore,

$$n(\text{nurses}) = 250(585/961) = 152.19 \approx 152$$

$$n(\text{doctors}) = 250(185/961) = 48.13 \approx 48$$

$$n(\text{lab. technologists}) = 250(57/961) = 14.83 \approx 15$$

$$n(\text{anesthetists}) = 250(29/961) = 7.54 \approx 8$$

$$n(\text{midwives}) = 250(55/961) = 14.31 \approx 14$$

$$n(\text{cleaners}) = 250(50/961) = 13.01 \approx 13$$

Hence, out of the overall sample size of 250, 152 respondents were selected from nurses, 48 from doctors, 15 from lab. Technologists, 8 from anesthetists, 14 from midwives and 13 from cleaners as presented in table 1.

Table 1: Sampled proportions of the source population of 961 HCWs

| Health care workers (HCWs) | Number of HCWs | Proportion | Sample from each stratum |
|----------------------------|----------------|--------------|--------------------------|
| Doctors | 185 | 250(185/961) | 48 |
| Nurses | 585 | 250(585/961) | 152 |
| Laboratory technicians | 57 | 250(57/961) | 15 |
| Anaesthetists | 29 | 250(29/961) | 8 |
| Midwives | 55 | 250(55/961) | 14 |
| Cleaners | 50 | 250(50/961) | 13 |

3.8 Sampling method

A proportional stratified sampling method was used to sample participants for the study. Convenience sampling method was then used to select from each stratum to get the required sample size (n= 250).

3.9 Data collection techniques

A structured questionnaire was used in collecting the data from each stratum. For respondents with no formal education, the questionnaire was explained to them and their responses recorded. The questionnaire comprised of both close and open ended questions.

3.10 Quality control

Completed questionnaires were critically reviewed at the end of each day for correctness. An independent person was employed to enter data and the output was compared to ensure accuracy. Also, problems that needed to be addressed were done immediately after each day's work.

3.11 Data processing and analysis

The completed questionnaires were coded, entered into Excel (Version 13) and analyzed by importing the Excel file into STATA (Version 13). Tables and charts were generated by STATA to present the main results. Descriptive statistics such as frequencies and percentages were used to analyze categorical data. Logistic regression was used to compute crude odds ratio of the relationships between independent variables such as gender, job category, duration of service and the dependent variable; needle stick injury.

3.12 Ethical consideration

Approval for this study was obtained from the Ethics Review Committee (ERC) of the Ghana Health Service (GHS). Also, permission to conduct the study was obtained from the Tamale Teaching Hospital. The participants were involved on voluntary basis and confidentiality and privacy was assured. They were not required to indicate their names on the questionnaires to ensure anonymity.

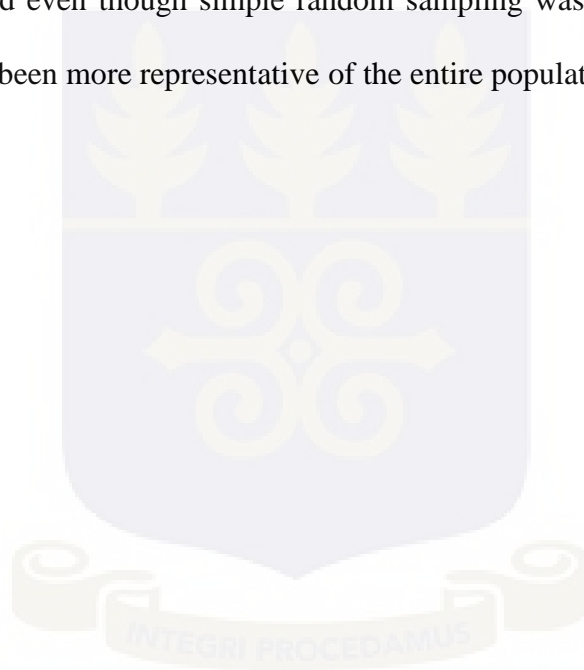
3.13 Pretest/Pilot study

The questionnaire was pre-tested on a random sample of twenty health care workers at Tamale Central Hospital for practicality and interpretation of responses and was modified

accordingly. Modified questionnaire was administered to 250 health care workers working in the Tamale Teaching Hospital.

3.14 Limitation of the Study

1. The major limitation of this study is the study design. A follow-up study would have been better but given the limited time (in particular) and resources, that was not feasible.
2. Due to time constraints and the shift nature of their work, convenience sampling method was used even though simple random sampling was proposed for the study and would have been more representative of the entire population.



CHAPTER FOUR: RESULTS

4.1 Socio-demographic characteristics of study population

The study population comprised of 250 respondents, who were sampled from four departments at the Hospital. Out of the 250 respondents, 54.80% were males and 45.20% were females. In terms of age, majority of the participants 51.60% fell within the age range of 20-29 years and very few 1.20% were above age 50 years. The data also revealed that, up to 50.80% had obtained diploma as the highest level of education and only 4.80% had a master's degree. Also, over half of the respondents 60.40% were nurses. Up to 64% of the respondents worked for 5-8 hours daily. Some of the respondents 59.60% had served the hospital for 1-5 years whilst very few 0.80% had served for more than 30 years. Table 1 shows the demographic characteristics of the study population in details.

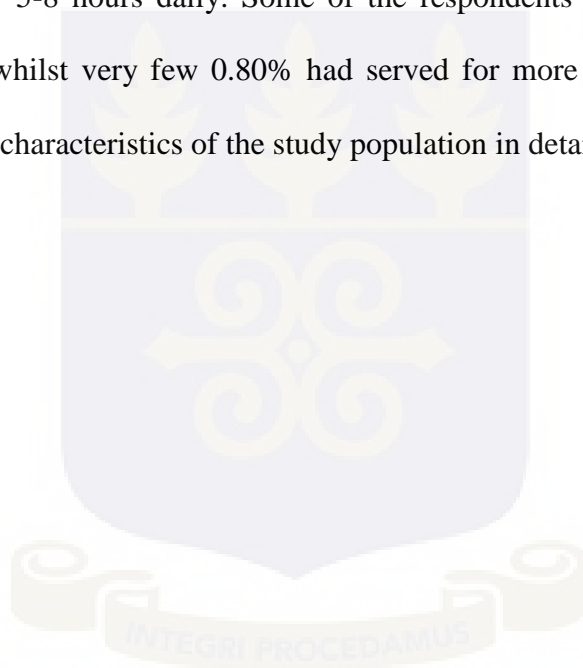


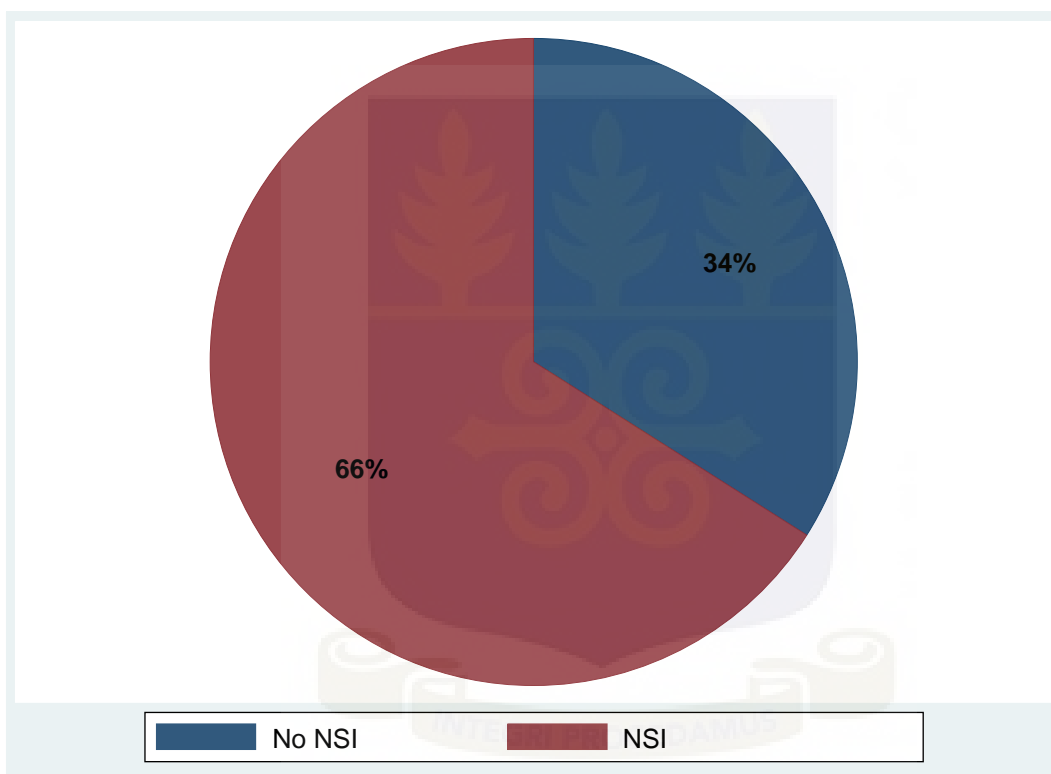
Table 2: Characteristics of study population (n = 250).

| Variables | n | % |
|----------------------------|-----|-------|
| Gender | | |
| Male | 137 | 54.80 |
| Female | 113 | 45.20 |
| Age_years | | |
| 20-29 | 129 | 51.60 |
| 30-39 | 109 | 43.60 |
| 40-49 | 9 | 3.60 |
| 50+ | 3 | 1.20 |
| Level of education | | |
| Illiterate | 4 | 1.60 |
| Primary | 3 | 1.20 |
| Secondary | 7 | 2.80 |
| Diploma | 127 | 50.80 |
| Degree | 97 | 38.80 |
| Masters | 12 | 4.80 |
| Job category | | |
| Nurse | 152 | 60.80 |
| Midwife | 14 | 5.60 |
| Medical doctor | 48 | 19.20 |
| Laboratory technician | 15 | 6.00 |
| Anaesthetist | 8 | 3.20 |
| Cleaner | 13 | 5.20 |
| Work experience | | |
| <1yr | 48 | 19.20 |
| 1-5yrs | 149 | 59.60 |
| 6-10yrs | 41 | 16.40 |
| 11-15yrs | 8 | 3.20 |
| 16-20yrs | 1 | 0.40 |
| 21-25yrs | 1 | 0.40 |
| >30yrs | 2 | 0.80 |
| Hours of work daily | | |
| 1-4hrs | 4 | 1.60 |
| 5-8hrs | 160 | 64.00 |
| >8hrs | 86 | 34.40 |

4.2 Frequency of needle stick injuries

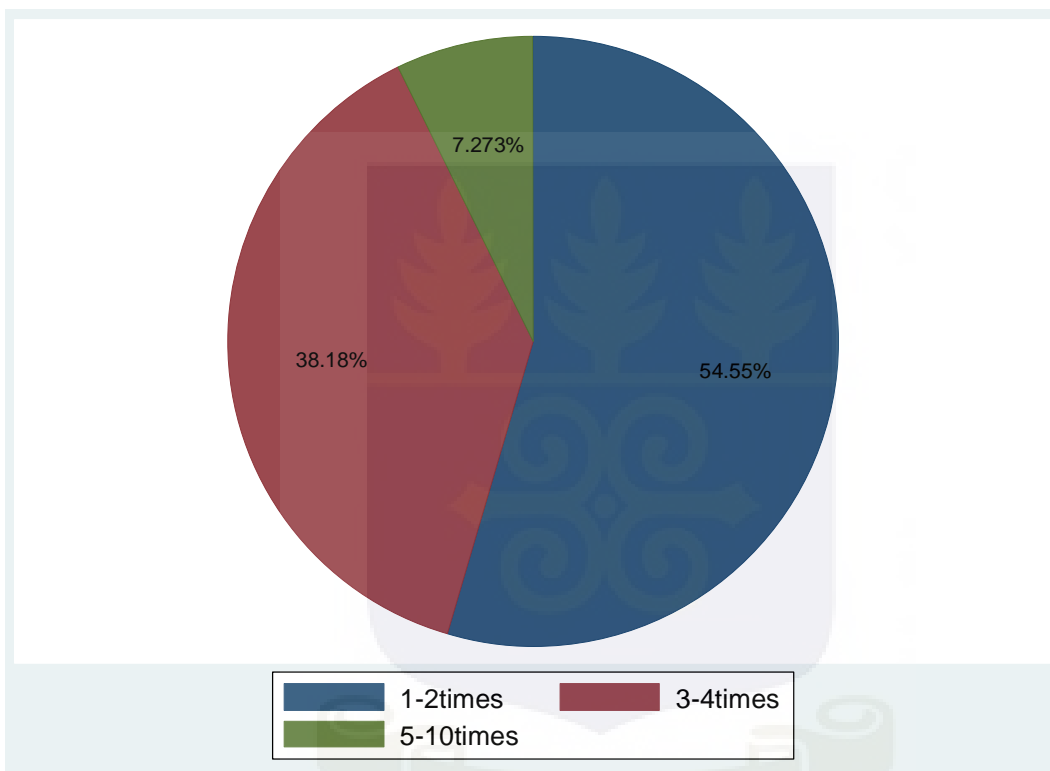
Among the 250 HCWs, 165(66%) reported needle stick injuries at the hospital, while 85(34%) indicated that they have never had such injuries. Figure 3 shows the percentage of respondents who have experienced NSIs on the job.

Figure 3: Percentage of respondents who had experienced NSI (n=250)



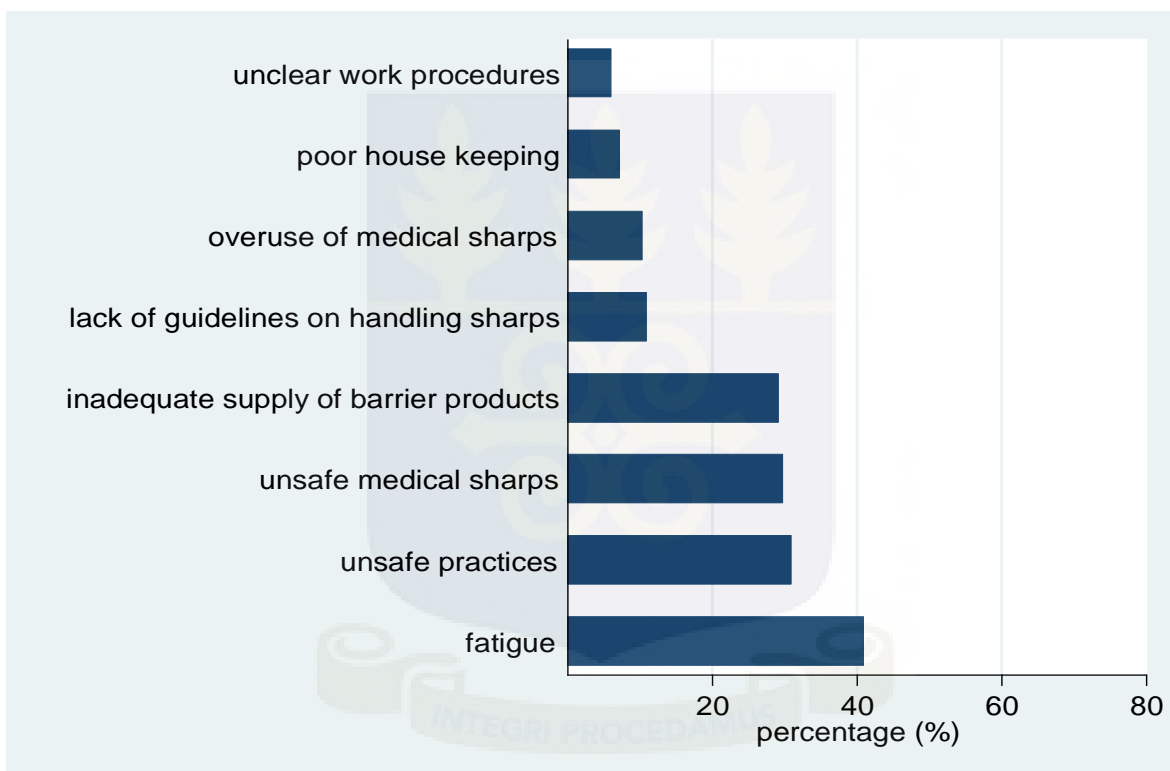
The results also show that a majority 90(54.55%) of respondents have had NSIs between 1-2 times in their professional life, 63(38.18%) between 3-4 times, and few 12(7.27%) between 5-10 times.

Figure 4: Frequency of injuries expressed as percentages among respondents.



Some of the reasons cited by respondents as contributing to their involvement in NSIs include fatigue 67(40.9%), unsafe medical sharps 49 (29.7%) and only a few 10(6.1%) cited unclear work procedures as the contributory factor to NSIs. Figure 5 below gives the distribution of the contributory factors to the occurrence of NSIs by injured respondents.

Figure 5: Factors given by respondents as responsible for their NSIs

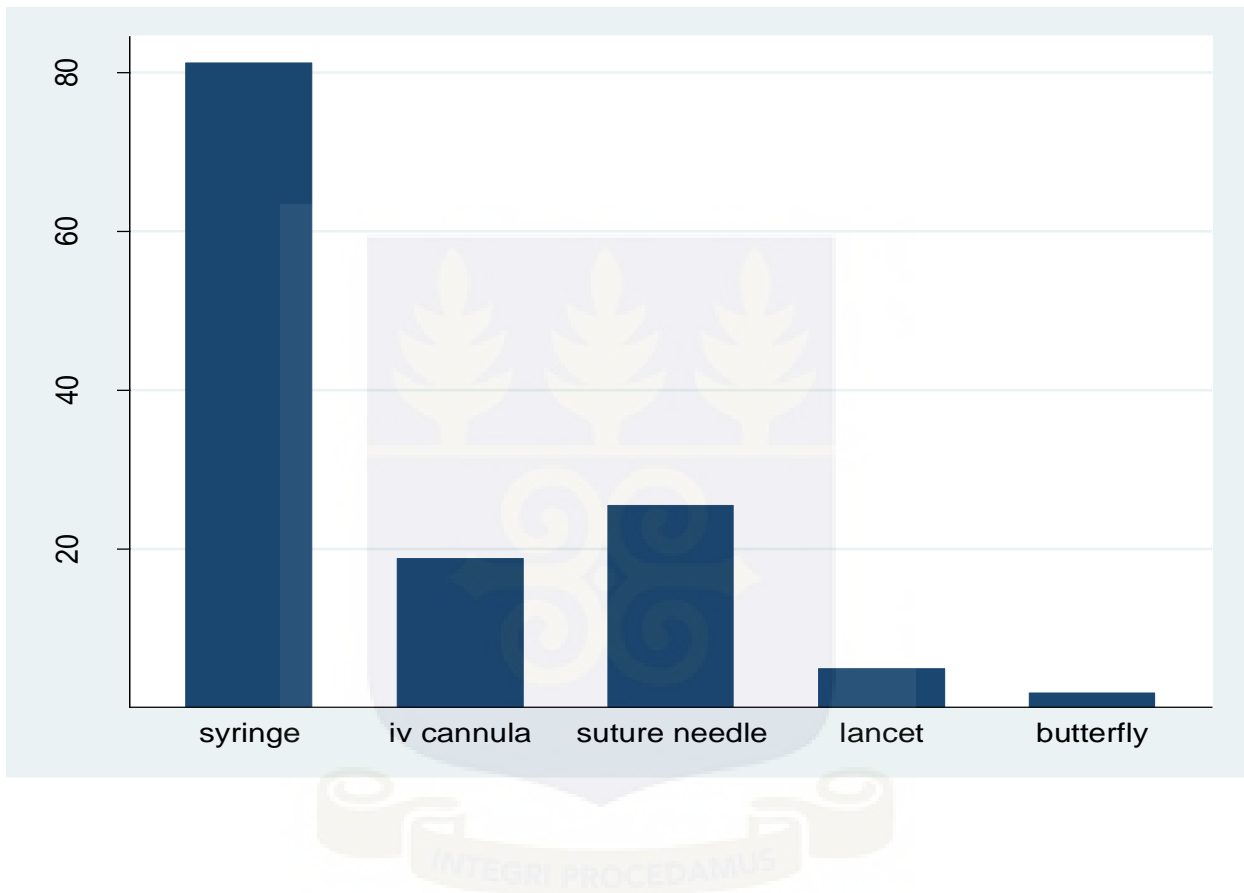


4.3 Type of needle involved in injury

With regards to the type of needles that caused the injuries, majority of the respondents 134(81.2%) reported hypodermic needle as responsible for their injuries. A reasonable number of the respondents 42(25.5%) also reported suture needle as the cause of injury while

very few 3(1.8%) reported the butterfly needle as the cause of injury. Figure 6 shows the type of needle that caused the NSIs.

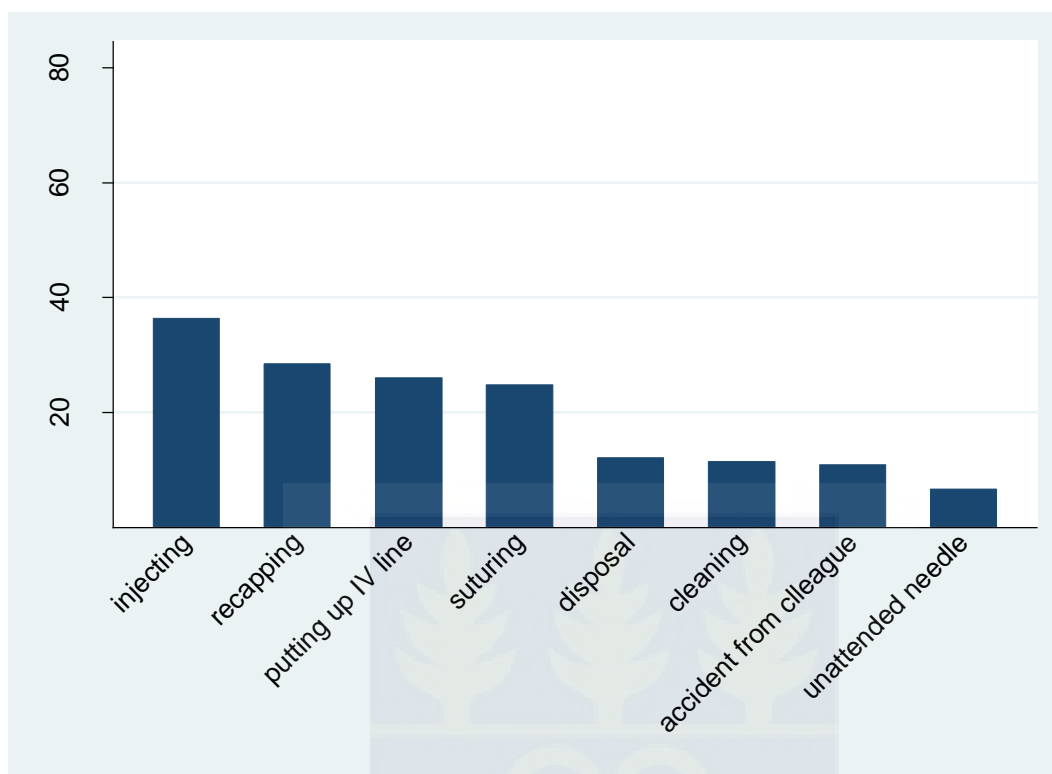
Figure 6: Percentages of NSIs attributable to different sharps among respondents.



4.4 Percentages of NSIs attributable to specific task carried out by respondents

In this study, majority of the injuries occurred during injection 60(36.4%), followed by recapping 47(28.5%) and putting up an IV line 43(26.1%). Only 18(10.9%) of the respondents were injured by another person. The distribution of injury by practices/procedures among injured respondents as shown in Figure 7.

Figure 7: Procedure/activity responsible for NSIs among respondents (n=165)



4.5 Factors contributing to occurrence of needle stick injuries

The results of this study show that majority, 66% of the respondents reported to have been involved in NSIs at the hospital, while few, 34% respondents reported not to have been involved. This study utilized logistic regression analysis to test the association between independent variables such as; gender, department, education, job category, training in infection control, years of service, and daily work duration against the dependent variable of NSI.

Table 3: Association between risk factors and NSIs

| Variable | needle stick injury | | Crude odds ratios (95% CI) | p-value |
|-----------------------------------|---------------------|------|----------------------------|---------|
| | Yes=n(%) | No=n | | |
| Gender | | | | |
| Female | 67(59.3) | 46 | 1.00 | |
| Male | 98(71.5) | 39 | 1.73 (1.02, 2.93) | 0.04 |
| Age | | | | |
| 20-29yrs | 74(57.4) | 55 | 1.00 | |
| 30-39yrs | 82(75.2) | 27 | 2.25 (1.29, 3.94) | 0.004 |
| 40-49yrs | 7(77.8) | 2 | 2.60 (0.52, 13.01) | 0.24 |
| 50+ | 2(66.7) | 1 | 1.49 (0.13, 16.81) | 0.75 |
| Level of education | | | | |
| Illiterate | 2(50.0) | 2 | 1.00 | |
| Primary | 1(33.3) | 2 | 0.5 (0.02, 11.09) | 0.66 |
| Secondary | 4(57.1) | 3 | 1.33 (0.11, 15.70) | 0.82 |
| Diploma | 78(61.4) | 49 | 1.59 (0.22, 11.67) | 0.65 |
| Degree | 70(72.2) | 27 | 2.59 (0.35, 19.39) | 0.35 |
| Masters | 10(83.3) | 2 | 5.00 (0.42, 59.66) | 0.20 |
| Job category | | | | |
| Nurse | 100(65.8) | 52 | 1.00 | |
| Midwife | 9(64.3) | 5 | 0.94 (0.30, 2.94) | 0.91 |
| medical doctor | 33(68.8) | 15 | 1.14 (0.57, 2.30) | 0.71 |
| Lab.technologist | 10(66.7) | 5 | 1.04 (0.34, 3.20) | 0.95 |
| Anaesthetist | 7(87.5) | 1 | 3.64 (0.44, 30.38) | 0.23 |
| Cleaner | 6(46.2) | 7 | 0.45 (0.14, 1.39) | 0.17 |
| Trained in infection prev. | | | | |
| No | 9(34.6) | 17 | 1.00 | |
| Yes | 156(69.6) | 68 | 4.33 (1.84, 10.21) | 0.001 |
| Department | | | | |
| O&G | 70(70.0) | 30 | 1.00 | |
| Surgery | 46(66.7) | 23 | 0.86 (0.44, 1.66) | 0.65 |
| Medicine | 33(63.5) | 19 | 0.74 (0.37, 1.51) | 0.41 |
| A&E | 16(55.2) | 13 | 0.53 (0.23, 1.23) | 0.14 |
| Daily work time | | | | |
| 1-4hrs | 1(25.0) | 3 | 1.00 | |
| 5-8hrs | 105(65.6) | 55 | 5.73 (0.58, 56.36) | 0.14 |
| >8hrs | 59(68.6) | 27 | 6.56 (0.65, 65.94) | 0.11 |

4.5.1 Relationship between gender and incidence of needle stick injury

The results of the study revealed that 71.5% of the male respondents had been involved in needle injuries, compared to 59.3% of females. These results show that male HCWs are 1.7 times more likely to experience NSIs (OR=1.73; 1.02, 2.95) as compared to their female counterparts. There was a positive association between being a male and NSIs.

4.5.2 Relationship between age and incidence of needle stick injury

This study showed that respondents in their 20s are less likely to report NSIs than those in their 30s (OR=2.25; 1.29, 3.94) or 40s (OR=2.60; 0.52, 13.01). There was a positive association between NSIs and ages 30-39 (OR=2.25; 1.29, 3.94). Overall, older respondents (50years+) had the least likelihood of experiencing NSIs.

4.5.3 Relationship between level of education and incidence of needle stick injury

The results show that the level of education had no direct relationship with the occurrence of NSIs. Thus, as presented in table 2, HCWs with primary, secondary, diploma, degree, and master's certificate had similar likelihood of experiencing NSIs. Table 2 gives a summary of the relationship between level of education of respondents and NSIs.

4.5.4 Relationship between job category and incidence of risk of needle stick injury

This study revealed that both nurses and medical doctors experienced similar levels of NSIs, 100(65.8%) and 33(68.8%) respectively, whereas anaesthetists experienced the highest of NSI incidents, 7(87.5%) as presented in table 2. These results show that anaesthetists are 3.64 times more likely to experience NSIs (OR=3.64; 0.44, 30.38) as compared to the reference

job category, nurses. There was however no significant relationship between job category and NSI.

4.5.5 Relationship between previous training in infection prevention/control and incidence of needle stick injury

Majority, 69.6% of respondents who have had some training in infection prevention and control during their professional career reported NSIs compared to 34.6% of those who had little or no training in infection prevention and control. Health Care workers who had training in infection prevention and control during their professional training were 4.33 times more likely to report NSI compared to those who had no training (OR=4.33; 1.84, 10.21). This results shows a high significant relationship between respondents who had previous training in infection, prevention and control during their schooling days and NSI as compared to those with no previous training.

4.5.6 Relationship between department of work and incidence of NSI

Majority, 70% of respondents who work in the Obstetrics and Gynaecology department reported NSIs while a little over half (55.2%) of those at Accident and Emergency department reported NSIs. Overall, the incident of NSI was not dependent on the department where a person worked. All HCWs in the various departments stood an equal chance of exposure to NSIs. For example, HCWs sampled from either the medical department or obstetrics and gynaecology department had similar likelihood of experiencing NSIs (OR=0.74; 0.37, 1.51).

4.5.7 Relationship between daily duration of work and incidence of needle stick injury

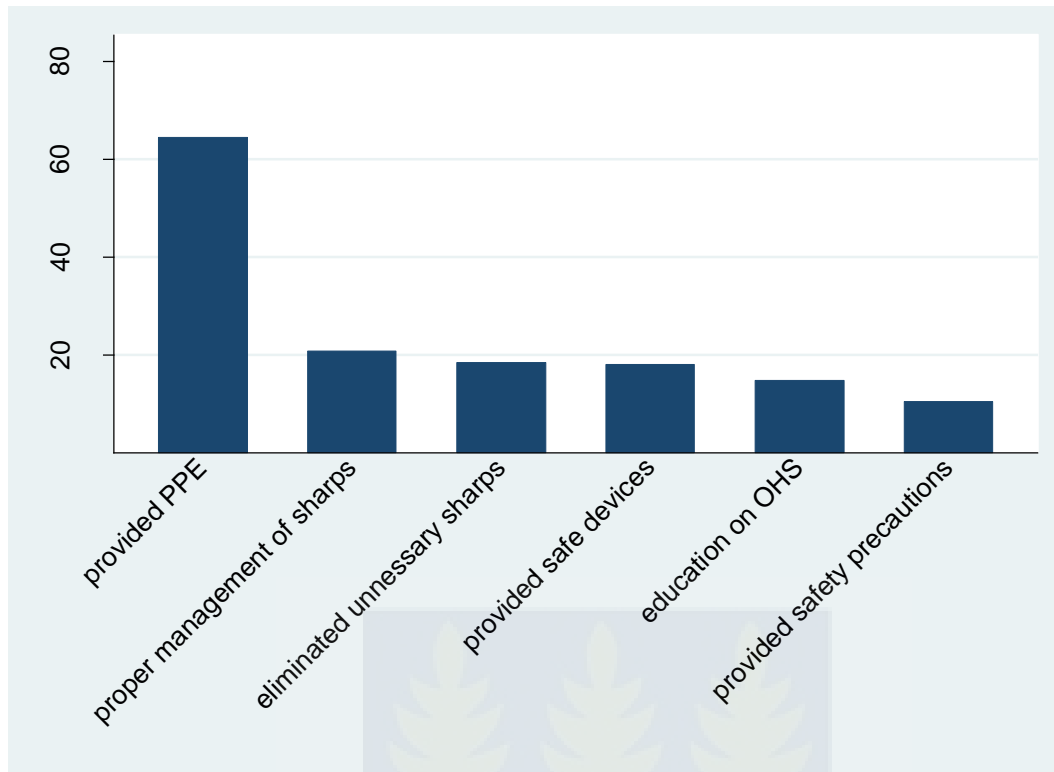
This study showed that 65.6% of the HCWs who work for 5-8 hours a day were involved in NSIs while 68.6% of those who work for >8 hours reported injuries. The results however did not show a significant association (OR=5.73; 0.58, 56.36) or (OR=6.56; 0.65, 65.94) between longer duration of work (5-8 hrs or >8 hr) and NSI as compared to those working for only 1-4 hours daily. Table 2 gives a summary of the relationship between daily work duration and NSI.

4.6 Measures put in place by hospital management to prevent needle stick injuries

4.6.1 Control measures

In this study, 161(64.4%) of the respondents indicated that the hospital management provides barrier products such as gloves as a measure to preventing blood borne infections due to exposure to infected body fluids. Only 37(14.80%) indicated that management conduct education and awareness on occupational safety and disease transmission prevention.

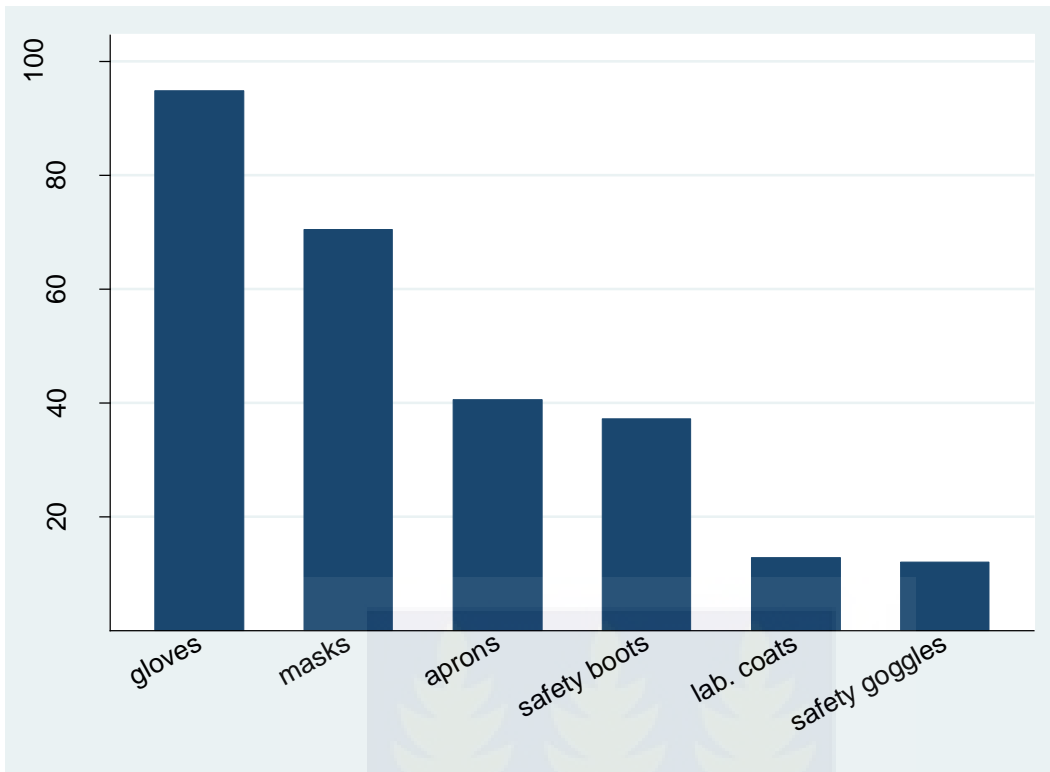
Figure 8: Measures put in place at the hospital to prevent or minimize needle stick injuries.



4.6.2 Safety equipment

Majority of the respondents 182(72.8%) indicated that they do not use auto-retractable needles, while 68(27.2%) indicated that they use auto-retractable needles. Almost all the respondents 237(94.8%) reported that they were provided with gloves, 176(70.4%) were provided with masks and only 30(12%) were provided with safety goggles. Figure 9 shows the distribution of PPE among respondents in the hospital.

Figure 9: Types of personal protective equipment provided (n=250)



Only a few 56(22.4%) of respondents indicated that the personal protective equipment provided were adequate, while majority 194(77.6%) of the respondents were of the opinion that equipment provided were inadequate. Most of the respondents 172(68.8%) in this study indicated that they always used PPE at work, whereas some respondents 66(26.4%) used PPE occasionally and only 3(1.2%) of the respondents had never used PPE at all.

Table 4: Summary of measures put in place at the hospital to control needle stick injuries (n=250)

| Variables | n | % |
|--------------------------------------|-----|------|
| Adequate PPE | | |
| No | 194 | 77.6 |
| Yes | 56 | 22.4 |
| Use of PPE | | |
| Always | 172 | 68.8 |
| Occasionally | 66 | 26.4 |
| Rarely | 9 | 3.6 |
| not at all | 3 | 1.2 |
| Work procedure/guidelines | | |
| No | 47 | 18.8 |
| Yes | 203 | 81.2 |
| Disposal of sharps | | |
| Safety boxes | 204 | 81.6 |
| Plastic bags | 42 | 16.8 |
| Mixed with other waste | 4 | 1.6 |
| Guidelines on sharps disposal | | |
| No | 47 | 18.8 |
| Yes | 172 | 68.8 |
| Don't know | 31 | 12.4 |
| Reporting | | |
| No | 80 | 48.5 |
| Yes | 85 | 51.5 |

4.6.3 Provision of work procedures and guidelines

Majority of the respondents 203(81.2%) reported that they were given clear work procedures and guidelines in their job categories, while 47(18.8%) of the respondents indicated that they were not given clear work procedures and guidelines.

4.6.4 Education on handling used medical sharps

The study also revealed that most of the respondents 172(68.8%) reported that the hospital has standard guidelines for handling used disposable sharps, 47(18.8%) reported that there are no guidelines on handling used disposable sharps while 31(12.4%) indicated that they do not know whether the hospital has guidelines in dealing with disposable sharps.

4.6.5 Availability of needles disposal containers

In this study, 204(81.6%) of respondents indicated that they dispose used needles into safety boxes after procedures of which 42(16.8%) disposed needles in plastic bags and only 4(1.6%) reported that they mix needles with other waste.

Figure 10: A typical safety box used for disposal of hypodermic needles at the hospital.

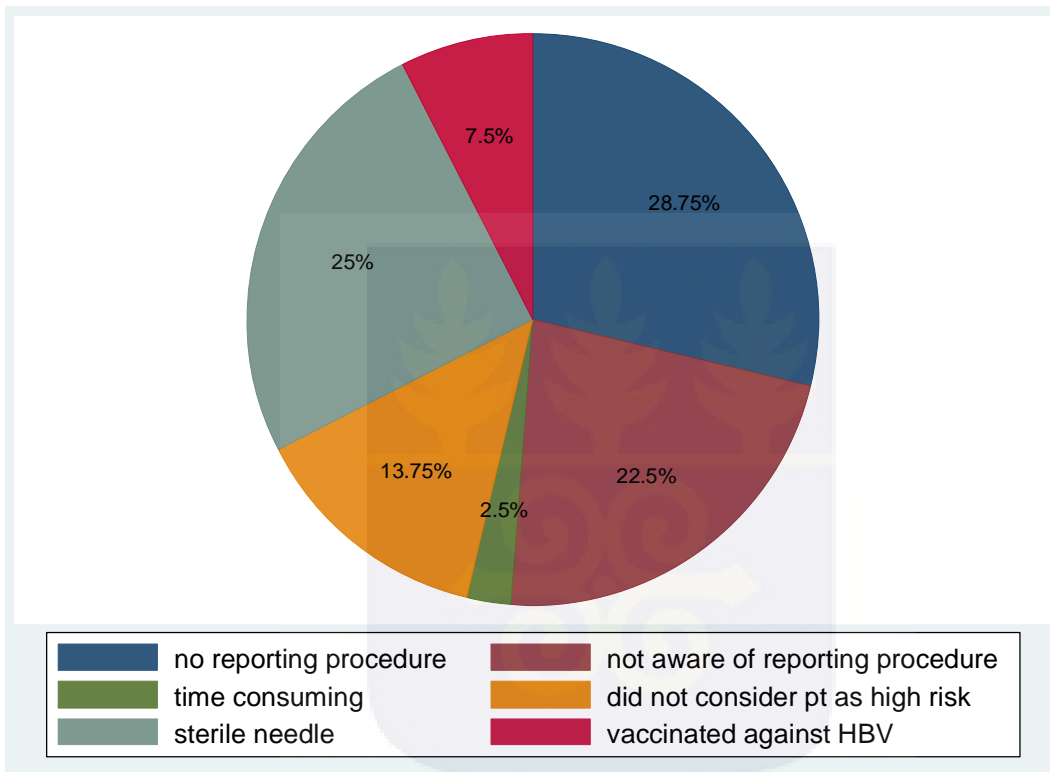


4.6.6 Reportage of needle stick injuries among respondents

With regards to reporting of injuries, 80(48.5%) of the injured respondents indicated that they did not report the occurrence of needle stick injury incidents, while 85(51.5%) reported the

occurrence of needle stick injury incidents. Some of the reasons indicated for not reporting needle injuries are shown in figure 11 below.

Figure 11: reasons for not reporting needle stick injuries (n=80)



4.6.7 Hepatitis B vaccination status among respondents

With regards to hepatitis vaccination status of the respondents, majority 209(83.6%) reported that they were fully vaccinated against hepatitis B virus, while a few 41(16.4%) had not. Most of the unvaccinated respondents 23(56.1%) indicated that hepatitis vaccination was not provided at the hospital as a reason for not been vaccinated, while a few 2(4.9%) indicated that the vaccination cannot protect them. Table 4 below gives details of the reasons for not been vaccinated against hepatitis B virus.

Table 5: Reasons for not been vaccinated against HBV (n=41)

| Variable | n | % |
|---|----|------|
| Reasons for not been vaccinated | | |
| It is not provided for by the hospital | 23 | 56.1 |
| I am not aware of the requirement for vaccination | 4 | 12.2 |
| I am too busy to get time for vaccination | 5 | 9.8 |
| It cannot protect me from hepatitis B | 2 | 4.9 |
| Scared of injections | 4 | 9.8 |
| Worried about side effects of vaccination | 3 | 7.3 |

CHAPTER FIVE: DISCUSSION

5.1 Category of HCWs more exposed to NSIs

Several studies have reported higher risk of needle stick injuries among nurses (Ashat, et al., 2011; Fekadu & Azage, 2015; Kebede et al., 2012; Martins et al., 2012; Mehta et al., 2005; Memish et al., 2013; S. Sharma, Gupta, & Arora, 2010; Waqar et al., 2011). For example, Muralidhar and co-workers showed that, among health care workers in an Indian hospital, nurses were more prone to NSI as high as 100% of them having experienced NSIs in the preceding year (Muralidhar, Singh, Jain, Malhotra, & Bala, 2010). Similarly, study conducted in India ("needle stick injuries in a tertiary care hospital," 2009), showed a low incidence of NSIs among both nurses and doctors (28.4%) and (21.6%) respectively. Consistent with the studies in India, a similar study among HCWs working in the hemodialysis unit of a big hospital in Nigeria also reported a high incidence of NSIs among HCWs with (60%), (45.2%) and (21.4%) rate among doctors, nurses and dialysis technicians respectively, (Amira & Awobusuyi, 2014).

In this study however, anesthetists had the greatest risk (87.5%) of experiencing NSI, followed by doctors (68.8%), laboratory technicians (66.7%), nurses (65.8%), midwives (64.3%) and cleaners (46.2%). This compares well with a cross-sectional study conducted in Syria by Yacoub and co-workers, (Yacoub et al., 2010), which found that anesthesiology technicians had the greatest NSI incidents compared to office workers, doctors, nurses and housekeeping workers. The possible reason for this high risk of NSI among anesthetists in the hospital could be due to understaffing which is likely to result in longer hours of work. Working excessive hours can result in stress and emotional and physical exhaustion, which are likely to increase the chance of human error and contribute to a tendency towards risky behaviours, such as recapping needles and poor compliance with the precautions in general (Kebede et al., 2012). Fatigue is a major contributory factor to NSI as indicated in this study

(40.9%), which compares favorably with a similar study by (R. Sharma, et al., 2010) which found that more than half (50.4%) of HCWs ascribed fatigue as the cause of their NSI. Although the exposure risk of NSI is highest among anesthetists in this study, the prevalence remains high among the other categories (doctors, laboratory technicians, nurse, midwives and cleaners).

5.2 Practices that expose HCWs to NSIs

The most common activity leading to NSI in this study was the administration of injections (36.4%). This compares favorably with a study among nurses in sub-Saharan Africa (Nsubuga & Jaakkola, 2005) where almost 40% of the NSIs reported in the last previous year were related to administering injections. Another study in Ethiopia (Kebede et al., 2012) found that majority of NSIs occurred during injection (23.6%). Similarly, a study among Turkish nursing students also found administration of injections (60%) as the most common cause of NSI (Irmak & Baybuga, 2011).

Administration of injection is one of the most common procedure in developing countries. It has been reported that, each year, some 16 billion injections are administered in developing and transitional countries and the chances of exposure to NSI are increased simply due to increased number of procedures been carried out (Ismail, Mahfouz, & Makeen, 2014; Lee, 2009; Paul et al., 2011). In some cases, as many as nine out of 10 patients who report to a primary health care provider receive an injection, of which over 70% are unnecessary or could be given in an oral formulation (Ismail et al., 2014). According to Sagoe and co-workers, 80 to 90 percent of patients who visited a health center in Ghana received one or more injections per visit and this high demand for injections in developing countries is

derived from the believe that they are more effective than other forms of treatment (Sagoe et al., 2001). It has been reported that irrational and unsafe injection practices are most common in developing countries and more than 80% of NSIs can be prevented through the use of safety devices and effective safety programs (Waqar et al., 2011).

In the present study, majority of the respondents (72.8%) indicated that they do not use auto-retractable needles. The reasons for injection been reported as the common activity resulting to NSI may be due to the unavailability of safety devices such as auto-retractable needles in the hospital, coupled with unexpected or sudden movement by the patient during injection or momentary lack of concentration, and the high demand for injections in the region. In developed countries, adoption of safe injection practices has reduced the risk of NSI (Ismail et al., 2014). According to Rosenthal, (2004), the proper use of needless IV systems can significantly reduce the risk of NSIs.

Several other studies (Amira & Awobusuyi, 2014; Gabriel, 2009; Khushdil, Farrukh, Din Sabir, Awan, & Qureshi, 2013; Mobasherizadeh, et al., 2011; Narantuya & Tsolmon, 2011; Shah et al., 2010; R. Sharma et al., 2010; S. Sharma et al., 2010; Trivedi, et al., 2013) have also reported recapping as a common exposure risk to NSI.

5.3 Frequency of needle stick injuries among health care workers

In this study, the prevalence of NSI among HCWs was 66%, which is comparable with findings from North India (68.2%), Iran (61.4%), and Uganda (57%) (Ashat et al., 2011; Mobasherizadeh et al., 2011; Nsubuga & Jaakkola, 2005). However, compared to the 66% incidence found in this study, lower rates 36%, 40.2%, 28% and 30.8% have also been reported in Gujarat in India, Nigeria, Poland, and Ethiopia respectively (Shah et al., 2010;

Amira & Awobusuyi, 2014; Bilski, 2005; Kebede et al., 2012). Compared to the 66% incident rate observed in this study, higher rates were reported in Nepal (80%), Syria (76.6%), Mongolia (84%), and India (80.1%), (Muralidhar et al., 2010; Narantuya & Tsolmon, 2011; Sayami & Tamrakar, 2013; Yacoub et al., 2010). This discrepancy may be due to variations in the different work environment and safety culture, or availability of resources such as PPEs. For example, in the current study, participants were HCWs from different departments (medicine, surgery, obstetrics and gynecology and accident and emergency), whereas the study in Nigeria which reported lower prevalence involved HCWs in hemodialysis units which has infection control policies instituted in all the studied centers.

This current study found that most respondents (54.6%) experienced NSIs between 1-2 times in their professional life, which is consistent with the 53.4% reported among nurses in a tertiary hospital , in Bhubaneswar, East India although evaluation was done in one year only (Pattnaik, Pattnaik, & Rout, 2012).

5.4 Measures put in place by management to prevent NSIs

Needle stick injuries can be prevented and the overall objective should be its elimination. Most NSIs are due to preventable causes such as recapping needles, improper disposal or sealing a sample for blood gas analysis with a cork (Richard, Kenneth, Ramaprabha, Kirupakaran, & Chandy, 2001). The prevention of NSIs among all HCWs is clearly desirable and one that may be pursued using combined strategies (Smith & Leggat, 2005).

In the current study, most of the respondents, (64.4%) reported that, the most widely used measure put in place by management of the hospital to prevent NSI is the provision of barrier products or PPE. The commonest PPE provided were gloves as almost all (94.8%) the respondents indicated that gloves are provided them to perform procedures. About 77.6% of the respondents however indicated that the barrier products provided are not adequate and that management should ensure that they are always available for use.

According to Smith & Leggat, (2005), education and training programs form an essential component that can help reduce NSI exposures and can increase the official reporting of incidents. However, this is not seen as a priority in preventing NSIs at the TTH as evidenced by only 14.8% of the respondents reporting that management conducts education and awareness on occupational safety and infection control.

Another important measure in the prevention of NSIs is the provision of sharps containers for the disposal of sharps. The finding that 81.6% of HCWs dispose used needle in a safety box compares well with the report by (Sayami & Tamrakar, 2013), which found a 93.3% use of puncture proof bucket for disposal of used sharp needles. In this study, safety boxes were available in each ward of the hospital for the collection of used needle and other sharps materials and replaced when full. Suffice it to say 16.8% of all respondents disposed sharps in plastic bags. This shows that sharps management remains a challenge given the fact that some HCWs still mix sharps with other waste in plastic bags.

Hepatitis B vaccination is one of the best ways to protect HCWs from hepatitis B infection. In this present study, 83.6% of the respondents indicated that they were vaccinated against hepatitis B while 16.4% were still unvaccinated and therefore at risk of infections. This finding is higher than that found in several other studies where only a small percentage of HCWs were vaccinated against Hepatitis B (Khushdil et al., 2013; Shah et al., 2010; Waqar et al., 2011; Yacoub et al., 2010). Respondents who were not vaccinated gave various reasons as to why they were not vaccinated. Some indicated that the vaccine was not provided for them by the hospital, or they were unaware of the requirements for vaccination, or they were too busy, or they were worried about the side effects of the vaccination.

Almost half (48.8%) of the respondents in this study did not report their injuries. This finding is lower than rate reported in a study conducted in Africa where 88.9% of HCWs did not report their injuries in Cairo university hospitals (Zawilla & Ahmed, 2013), and other developing countries where 80% did not report (Narantuya & Tsolmon, 2011). Reporting of injuries to occupational health departments can reduce rates of injury by identifying risk-prone behaviours and practices. Underreporting may lead to inaccurate information regarding the overall risk of exposure to pathogens, and full documentation of exposure injuries would guide improvements in prevention (Martins et al., 2012).

CHAPTER SIX: CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusion

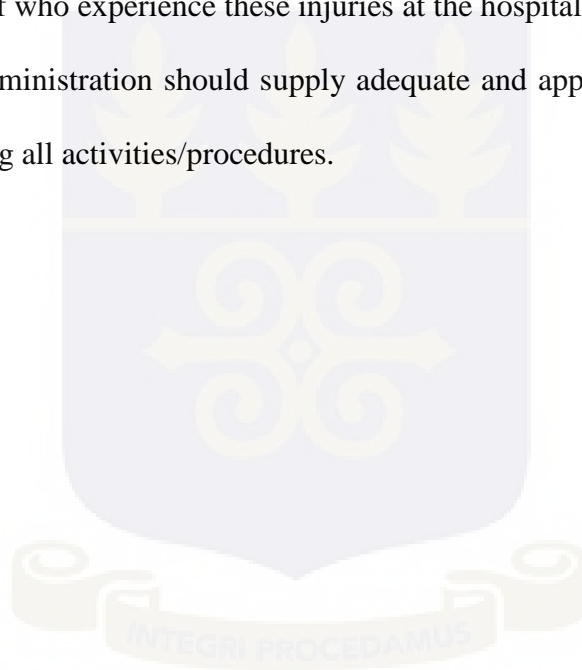
This study documented a high prevalence of NSIs among HCWs at the Tamale Teaching Hospital. Amongst the sharps used routinely at the hospital, hypodermic needles were responsible for most of NSIs, and majority of the respondents have had between 1-2 times injuries previously. Health Care Workers job category and the departments in which they work were not associated with NSIs. This implies that, all HCWs in all the departments stood an equal chance of reporting NSIs. However, being a male HCW was positively associated with NSIs.

Overall, there is inadequate provision of PPEs, although the hospital provides safety boxes in the wards for the disposal of needle and other sharps. There is also low reporting of NSIs needle injuries to the appropriate authorities.

6.2 Recommendations

1. Ongoing education for staff involved in handling and disposal of sharps instruments through in-service training programs should be carried out to update knowledge about prevention of NSI. e.g. universal precaution practices, careful handling and proper disposal of used needles
2. Guidelines for universal precaution measures should be provided and disseminated among all HCWs for continuous practice in the ward environment with provision of display boards in each unit.

3. Ministry of Health and hospital administration should take major steps to procure safer needle devices (auto-retractable needles), and recruit more HCWs to reduce work overload
4. HCWs scheduled for long work hours should be provided with short breaks to revitalize or refresh themselves
5. The hospital administration should develop a mechanism to keep mandatory reporting of all NSI incidents for documentation.
6. Vaccination of HCWs against HBV should be mandatory and counseling service be provided to staff who experience these injuries at the hospital.
7. The hospital administration should supply adequate and appropriate PPE for use by all HCWs during all activities/procedures.



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APPENDICES

APPENDIX I: Informed Consent

Institutional Affiliation

Department of Biological Environmental and Occupational Health Sciences (BEOHS):
School of Public Health, College of Health Sciences, University of Ghana-Legon.

Background

Dear participant, my name is Issah Ibrahim. I am a student of the school of Public Health, University of Ghana. I am conducting a study on Occupational exposure to Needle Stick Injuries among Health Care Workers at the Tamale Teaching Hospital. The purpose of the study is to determine the category of health workers that are more exposed to needle stick injuries, the frequency of exposure, the common work practices that lead to the injuries and whether there are safety measures in place to prevent health care workers to needle stick injuries.

Procedures

The study will involve answering questions from a questionnaire. There will be no invasive procedure to take samples from participants. I will appreciate your participation in this study. This is purely an academic research which forms part of my work for the award of a master's degree.

Risks and Benefits

The study does not involve any biological sample collection from respondents and therefore will NOT employ any invasive procedure that will cause any discomfort to participants. It is hoped that the results obtained for this study will be used by policy makers to either improve

upon existing occupational safety policies or to enforce existing ones with the objective of better protecting the health care workers from incidences of needle stick injuries.

Right to refuse

Participation in this study is voluntary and you can choose not to answer any individual question or all the questions. You are at liberty to withdraw from the study at any time. However, I will encourage you to participate since your opinion is important in determining the outcome of the study.

Anonymity and Confidentiality

I would like to assure you that whatever information you will provide will be handled with strict confidentiality and will be used purely for the research purposes. Your responses will not be shared with anybody who is not part of the research team. Data analysis will be done at the aggregate level to ensure anonymity.

Dissemination of results

The result of this study will be mailed to you if you provide your address below.

Before taking the consent, do you have any question you wish to ask about the study? Yes

No (if yes, questions to be noted bellow)

.....
.....
.....

If you have questions later, you may contact Issah Ibrahim on 0209250537.

Consent

I....., declare that the purpose of the study have been thoroughly explained to me in English language and I have understood. I hereby agree to answer the questions

Signature.....

Date.....

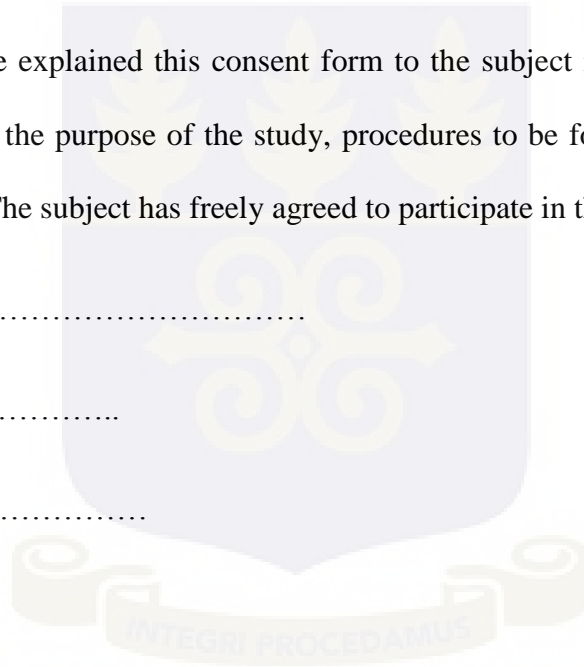
Interviewer's Statement

I, the undersigned, have explained this consent form to the subject in the English language that he/she understands the purpose of the study, procedures to be followed as well as risks and benefits involved. The subject has freely agreed to participate in the study.

Interviewer's signature.....

Date.....

Address.....



APPENDIX II: Questionnaire

OCCUPATIONAL EXPOSURE TO NEEDLE STICK INJURIES AMONG HEALTH CARE WORKERS AT THE TAMALE TEACHING HOSPITAL

Dear participant, my name is Issah Ibrahim. I am a student of the School of Public Health, University of Ghana, Legon. I am conducting a study on Occupational exposure to Needle Stick Injuries among Health Care Workers at the Tamale Teaching Hospital. The purpose of the study is to determine the category of health workers that are more exposed to needle stick injuries, the frequency of exposure, the common work practices that lead to the injuries and whether there are safety measures in place to prevent these workers from needle stick injuries. The study will involve answering questions from a questionnaire. I will very much appreciate your participation in this study. This is purely for the purposes of academic research which is part of my M.Sc. degree program. Information provided will be handled with strict confidentiality and will be used only for the research purposes.

Please indicate your answer with a tick (√).

1. Gender
 - Male
 - Female
2. Age_ (years)
 - 20-29
 - 30-39
 - 40-49
 - 50+
3. Level of education
 - Illiterate
 - Primary
 - Secondary
 - Diploma
 - Degree
 - Masters
 - Doctorate

4. What is your job category?
- Nurse
 - Midwife
 - Medical doctor
 - Laboratory technician
 - Anesthetist
 - Cleaner
5. Were you trained in disease transmission and control during your professional training?
- Yes
 - No
6. Work experience in years
- <1 Year
 - 1-5 Years
 - 5-10 Years
 - 10-15 Years
 - 15-20 Years
 - 20-25 Years
 - 25-30 Years
 - »30 Years
7. Department
- Obstetrics and gynaecology
 - Surgery
 - Medicine
 - Accident and Emergency
8. How long do you work (on a daily basis) at the hospital?
- < 1 Hour
 - 1-4Hour
 - 5-8 Hours
 - >8 Hour
9. Night shifts worked per month
- None
 - 1-5
 - 6-10
 - 11-15
 - 16-20
 - >20

10. Are you given clear work procedures/guidelines in your job category?
- Yes
 - No
11. What types of sharps do you handle in the course of your job?
- Needle
 - Blade
 - Scalpel
 - Broken Glass(e.g. Vials/Ampoules)
 - Any other (specify.....)
12. Do you use hypodermic needles with the auto-retractable needles?
- Yes
 - No
13. Have you been involved in any needle stick injury?
- Yes
 - No
14. What type of needle caused the injury?
- hypodermic needle
 - Intravenous cannula (catheter)
 - Suture needle
 - Lancet insulin needle
 - Butterfly needle
15. During what procedure or activity did the incident /accident mentioned in question 13 above occur?
- Injecting
 - Putting up IV line
 - Disposal
 - Recapping
 - Suturing
 - Cleaning
 - Unattended needle
 - Accident from colleague
16. How many times in the course of your practice at the hospital have you experienced the injury mentioned in question 13 above?
- 1-2
 - 3-4
 - 5-10
 - >10

17. What would you consider as the contributing factor(s) to the injury mentioned in question 13 above?
- Fatigue
 - Unsafe medical sharps
 - Overuse of medical sharps
 - Inadequate supply of barrier products such as gloves and pads
 - Unclear work procedures
 - Lack of guidelines on handling healthcare sharps
 - Poor house keeping
 - Unsafe practices
 - Any other (specify)
18. Did you report the incident /accident that occurred?
- Yes
 - No
19. If the answer to question 18 above is No, then why did you not report the incident/accident?
- There is no reporting procedure at the hospital
 - Not aware of the procedure
 - Time consuming
 - Did not consider the patient to be of high risk
 - The needle was sterile
 - Vaccinated against HBV
20. Are there standard guidelines for handling used disposable healthcare sharps?
- Yes
 - No
 - Don't know
21. Where do you dispose used healthcare sharps after procedures?
- Safety boxes
 - Plastic bags
 - Left on the floor
 - Left on the operating table
 - Mixed with other wastes
 - Other (specify).....
22. What personal protective equipment/ material does the hospital provide for your use?
- Masks
 - Gloves
 - Aprons
 - Lab coats
 - Safety boots
 - Safety goggles

23. Are the personal protective equipment provided adequate for use all the time?
- Yes
 - No
24. How often do you use the personal protective equipment/ material listed in question 22 above?
- Always
 - Occasionally
 - Rarely
 - Not at all
25. Have you been vaccinated against Hepatitis B?
- Yes
 - No
26. If the answer to question 25 above is No, then why have you not been vaccinated?
- It is not provided for by the hospital
 - I am not aware of the requirement for vaccination
 - I am too busy to get time for vaccination
 - It cannot protect me from Hepatitis B
 - I scared of injections
 - Worried about side effects of the vaccination
 - Any other reason (state).....
27. What measures has the hospital management put in place to control occupational related infections caused by Hepatitis B virus, Hepatitis C virus and Human immunodeficiency virus (HIV)?
- Eliminating unnecessary
 - Providing safe medical devices
 - Providing barrier products such as gloves and pads
 - Conducting education and awareness on occupational safety and infection prevention control
 - Developing and availing guidelines on precautions
 - Proper management of medical sharps
 - Any other (specify).....

Thank you