OCCUPATIONAL RISK FACTORS CONTRIBUTING TO INJURY BY MEDICAL SHARPS AMONG HEALTH WORKERS AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

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DECLARATION

This thesis is my original work and has not been presented for any degree in any other University.

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DEDICATION

To my dear wife Damaris for her motivation, my son Adrian and my daughter Ammie; “the fear of the Lord is the beginning of wisdom”.

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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; administrative controls, engineering controls, personal protective equipment and work practice controls.

Medical sharps: Any object used in the healthcare setting that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.

Medical Sharps injury: An exposure event occurring when medical sharps penetrate the skin.

Needlestick: 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,

electrical, mechanical, or other workplace hazards. Besides face shields, safety glasses, hard hats, and safety shoes, PPE includes a variety of devices and garments such as goggles, coveralls, gloves, vests, earplugs and respirators.

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.

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AMREF	African Medical Research Foundation
CDC	Centers for Disease Control
GDP	Gross Domestic Product
Gok	Government of Kenya
HBAg	Hepatitis B Antigen
HBsAg	Hepatitis B surface Antigen
HBV	Hepatitis B virus
HCV	Hepatitis C virus
HCW	Health Care Waste
HCWs	Health Care Workers
HIV	Human Immunodeficiency Virus
ICP	Infection Control and Prevention
IV	Intravenous
KEMRI	Kenya Medical Research Institute
KMTC	Kenya Medical Training College
KNH	Kenyatta National Hospital
MoH	Ministry of Health
MS	Microsoft
NIOSH	National Institute of Occupational Health and Safety
NEMA	National Environment Management Authority

NSSIs	Needle Stick and Sharps Injuries
SPSS	Statistical Package for Social Sciences
TEQ	Toxicity Equivalence
UON	University of Nairobi
US	United States of America
WHO	World Health Organization

ABSTRACT

Healthcare workers are at risk of medical sharps injuries, which according to the Kenya national policy on injection safety, 58% of healthcare workers have suffered these injuries. This study was conducted with the aim of establishing occupational risk factors contributing to injury by medical sharps among healthcare workers at Kenyatta National Hospital, Nairobi, Kenya. The objectives of this study were to; determine the frequency and severity of injuries from medical sharps; assess the risks due to exposure to medical sharps at the hospital, to ascertain the factors that contribute to occurrence of injury by medical sharps, and assess the measures in place to report, document, prevent, control, or manage injuries from medical sharps among health care workers. This descriptive cross sectional study was conducted between July and December 2010. A self administered questionnaire was distributed to 320 respondents from different job cadres of healthcare workers at the hospital who were selected proportionate to the sample frame. A checklist was used to observe medical sharps wastes management practices at the hospital. Focus group discussions were held with healthcare workers to obtain in-depth information on the root causes of medical sharps injuries at the hospital. Data were entered into MS Access database and analysis was done by use of Statistical Package for Social Sciences (SPSS), version 11.5. The study findings suggest that 44% of respondents were involved in medical sharps injury at the hospital. The majority of the injured respondents (91%) experienced medical sharps injuries between 1-2 times, while few of the respondents (5%) experienced medical sharps injuries 3-4 times within the past one year. Sixty two percent of injured respondents suffered moderate injuries which were characterized by skin puncture and some bleeding, while 33% of respondents suffered superficial injuries which were without any bleeding and 5% of respondents experienced severe injuries which were characterized by profuse bleeding. Many 75% of the injured respondents suffered a needle prick, 30% experienced a glove tear, while few 18% contracted upper respiratory tract infection, only 2% contracted pulmonary tuberculosis, and a paltry 0.3% of the respondents reported to be occupationally infected with Human Immunodeficiency virus, Hepatitis A and cellulites. The factors associated with medical sharps injury include; working in the critical care section (OR: 3.17, 95% CI: 1.4-7.2, p=0.01), working in the job cadre of a nurse (OR: 1.85, 95% CI: 1.16-2.95, p=0.01), and healthcare workers with education level of below diploma (OR: 1.85, 95% CI: 1.16-2.95, p=0.01). Seventy four percent of the respondents did not seek for post-exposure prophylaxis, while only 26% reported to have sought for post exposure prophylaxis. The research concluded that nurses were among healthcare workers at the highest risk of sharps injury, the critical care section presented more sharps injury risks than other sections at the hospital. Underreporting of medical sharps injury was common while many injured respondents did not seek for post-exposure prophylaxis. There is need for adequate supply and use of safety engineered devices, safe disposal of medical sharps, better reporting and surveillance of sharps injury cases at the hospital.

CHAPTER ONE: INTRODUCTION

1.1. Background

Medical sharps injuries have been recognized as one of the occupational hazards among healthcare workers. Medical sharps injuries cause about 2 million HBV, 900, 000 HCV and 170, 000 HIV infections among health-care workers each year globally (WHO, 2006). These blood borne infections have serious consequences, including long-term illness, disability and death and are a matter of concern for many African as well as Asian countries (Al-Ansi *et al*., 2006). The Centers for Disease Control and Prevention (CDC) estimates that 385, 000 needlesticks and other medical sharps injuries occur per year among hospital workers in the United States (CDC, 2008). Other Authors have estimated the annual rate in the United States to be between 500,000 and 800,000 (Jagger J. *et al*, 2008). It is estimated that 100,000 Needlestick injuries occur annually in the United Kingdom alone and 500,000 annually in Germany (Ramphal, L. *et al*; 2010).

The epidemiology of medical sharps injuries could be higher considering studies on underreporting of medical sharps injuries. For instance, in the United States of America, an extensive survey documented an underreporting of medical sharps injuries at 58%, while other studies estimate underreporting at 90% (Braun, B., 2011). Globally, 3 million healthcare workers are exposed to blood borne pathogens through the percutaneous route annually, 90% of these cases occur in the developing countries (WHO, 2006).

Different studies have established that healthcare workers are prone to needle stick and medical sharps injuries. In Iran, a descriptive cross-sectional study among hospitals staff found that 75.6% of the 352 healthcare workers experienced at least one needlestick injury in that year (Nasiri *et al* 2010). In South Africa, a cross-sectional retrospective survey assessing the prevalence of needle-stick and sharps injuries found (21%) of the respondents to have been exposed to sharps injuries despite the high risk of occupational exposure to HIV among health care workers in busy labour wards (Mosweu *et al* 2005)

In most developing countries, there is a paucity of standard reporting protocols apart from the fact that most exposures among health workers are caused by medical sharps (Tetali and Choudhury 2006). A cross sectional survey in Mauritius found that needlestick injuries were the most common type of injury sustained by nurses (Subratty and Moussa, 2007) .In Saudi Arabia, for example, a five years surveillance study found that most reported sharps injuries involved the nursing staff, followed by doctors then downstream staff. (El-Hazmi and Al-Majid, 2008). A retrospective study conducted in West African hospital wards found an estimated incidence of 0.33 percutaneous injuries per healthcare worker per year in medical or intensive care personnel and 1.8 percutaneous injuries year in surgeons. (Tarantola *et al* 2005)

Hospital workers in Tanzania were observed working in hazardous environments and most of them were not aware of the health and safety issues (Manyele *et al*, 2008). In Uganda, a cross-sectional study found an annual incidence rate of 3.94 needlestick and medical sharps injuries per healthcare worker (Nsubuga, 2009). The mentioned studies demonstrate that medical sharps injuries occur in different countries and pose serious occupational health risks to healthcare workers.

1.2. Problem statement

Exposure to hazardous healthcare waste can result in disease or injury. Occupational infections and injuries leads to economic, physical and psychological damage to the healthcare worker and family (Manyele *et., al* 2008). An estimated 1,000 HCV infections, 6,000 HBV infections, and approximately 100 HIV infections occur annually in Kenya among HCWs and are attributable to sharps injuries (Taegtmeyer, *et al*, 2008). In Kenya, 58% of health workers are at risk of injuries from injection equipment coupled with improper management of healthcare waste in an estimated 70% of the health facilities (MoH, 2007 a). One of the main causes of these injuries is inappropriate recapping of the needles which was observed in 30% of health workers (MoH, 2007 b). A cross sectional study of nurses in Nairobi found that 61% of needle stick and 46% of the injuries occurred due to recapping and 12% in the process of disposing (MoH, 2007 a). A study at Kenyatta National Hospital on the perceptions of occupational risk of exposure to blood borne pathogens among registered nurses recommends the need for further research on other risk factors which contribute to occupational exposures (Ngesa, 2008).

The mentioned studies show that medical sharps injuries occur especially among nurses and there is a gap on the factors associated with occupational risks of exposure to medical sharps across different cadres of healthcare workers. Further to that, the researcher had conducted several compliance environmental audits in different healthcare settings and through experience observed several challenges associated with managing medical wastes. Therefore, this research aimed at establishing occupational risk factors contributing to injury by medical sharps among healthcare workers at Kenyatta National Hospital in Nairobi, Kenya.

1.3. Research questions

i. What risks are presented by exposure to healthcare sharps at the hospital?

ii. What is the frequency and severity of injuries from sharps among health workers at the hospital?

iii. What factors contribute to occurrence of injury by healthcare sharps among health workers?

iv. What measures are in place to report, document, prevent, control or manage injuries from medical care sharps at the hospital?

1.4. General objective

The general objective of this research was to establish the occupational risk factors contributing to injury by medical sharps among health workers at Kenyatta National Hospital, Nairobi, Kenya.

1.4.1. Specific objectives

i. To assess the risks of exposure to healthcare sharps at the hospital among health workers;

ii. To determine the frequency and severity of injuries from healthcare sharps among healthcare workers at the hospital;

iii. To find out the factors that contribute to occurrence of injury by healthcare sharps among health workers; and

iv. To assess the measures in place to report, document, prevent, control, or manage injuries from healthcare sharps among health workers.

1.5. Research hypothesis

1.5.1. Null hypothesis

There are no occupational risk factors that contribute to injury by medical sharps among health workers at Kenyatta National Hospital, Nairobi, Kenya

1.6. Justification of the study

In Kenya, healthcare workers in health facilities are constantly exposed to medical sharps which contribute to injury and infection. An estimated 58% of health workers in Kenya are at risk of medical sharps injury (MoH, 2007a). Despite the existing policy and institutional measures, the underlying contributing factors to injuries and infections from occupational exposure to medical sharps have not been adequately addressed. Factors such as human, environmental and institutional, which are considered in this study, would be useful in finding a lasting solution to this challenge at Kenyatta National hospital. The findings of this study will help in addressing the root causes of continuous exposure to medical sharps and the associated risks in similar health care facilities in Kenya.

1.7. Significance of the study

It is expected that the results of this research will assist Kenyatta National Hospital to identify suspected cases of adverse health effects of medial sharps and adequately document, with precise descriptions of exposure, exposed individuals or populations, and outcome. Within the hospital, the surveillance of infection and record-keeping will be vital tools that could provide indications of inadequate hygiene practices or of contamination of the immediate environment (including that caused by medical sharps). Surveillance will allow an outbreak of infection to be recognized and investigated and

will provide a basis for introducing control measures, assessing their efficacy and of the routine preventive measures taken by the hospital and for reducing the level of avoidable infection. It will also assist health managers at the hospital to ascertain that any control measures have maximum effect.

1.8. Delimitations and scope of the study

Healthcare wastes are categorized in to pathological, clinical, medical sharps, radiological wastes, chemical wastes, and pharmaceutical wastes. This study was limited to medical sharps and not the whole spectrum of healthcare wastes. Healthcare workers may be exposed through body fluids or the percutaneous route, however, this study was limited to exposure through sharps injury. Medical sharps present a risk to the environment, the community, patients and the healthcare workers, more so when handled and disposed inappropriately. The study was limited to occupational risks among healthcare workers at Kenyatta National Hospital, Nairobi, Kenya.

1.9. Study Limitations and challenges

There are various aspects of this research that were beyond the control of the researcher in the research process. . The respondents were required to recall all incidents of medical sharps injuries in the past 12 months. It is therefore highly possible that the respondents may not have recalled all the incidents. Furthermore, the generalization of findings from this research may only be limited to healthcare workers in similar setups. There were few challenges especially in scheduling and conducting of focus group discussions which had to be rescheduled several times due to the busy schedule of some respondents. The researcher had to seek for adequate finances to complete this research in time.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This study reviewed literature on the epidemiology of medical sharps, the risks associated with handling them among different cadres of healthcare workers, and the control and management of the associated occupational risks. This review of literature covered the phenomenon of medical sharps injuries in the developed countries, developing countries and in Kenyan. A conceptual framework which shows the relationship between causes and consequences of exposure to medical sharps injuries and the interventions for control and management of the associated risks has been developed.

Occupational hazards are important deterrents to retention among health workers especially the risks of infection during handling of biomedical waste (WHO, 2006). Poor management of health-care waste can cause serious disease to health-care personnel, to waste workers, patients and to the general public (W.H.O 2005a). Percutaneous injuries to health-care workers from needlesticks and other sharps carry significant risks of transmitting blood borne pathogens such as HBV, HCV and HIV. (Prüss-Üstün, Rapiti & Hutin, 2005).

Health workers have been identified as a neglected group with regard to the monitoring of their occupational health status, and research has shown that their health does not get the attention it deserves by employers (Michell, 2010). The risk of contracting an infection from the patients is high in developing countries where the hygienic conditions in hospitals may be problematic and where infectious diseases are rampant (WHO, 2005b).

2.2. Healthcare sharps injury in developed nations

It is estimated that 100,000 needlestick injuries occur annually in the UK alone and 500,000 annually in Germany (Ramphal *et al* 2010). Each year, 3 million health workers worldwide are exposed through the percutaneous route to blood borne pathogens: 2 million are exposed to hepatitis B, 900 000 to hepatitis C and 170 000 to HIV. These injuries result in 15 000, 70 000 and 1000 infections, respectively. More than 90% of these infections occur in developing countries (WHO, 2006). These blood borne infections have serious consequences, including long-term illness, disability and death. In addition to HBV, HCV and HIV, other pathogens can be transmitted to health-care workers by sharps injury, including those that cause tuberculosis, diphtheria, herpes, malaria, Ebola plague, and Epstein-Barr infection (Pruss-Ustun. A., *et al*., 2005)

While several studies report that injuries occur frequently to nurses, physicians and technicians, housekeeping and other support staff are also at risk (Hiransuthikul, Tanthitippong & Jiamjarasrangsi, 2006). As a measure of likelihood of injury among hospital workers, it has been estimated that 28 sharps injuries occur annually for every 100 occupied hospital beds (Perry, Parker & Jagger, 2009 b). According to the WHO, 2005, the global burden of disease from sharps injuries to health care workers includes 40% of all hepatitis infections and 4.4 % of all HIV infections among health workers. The risk of health care worker infection following a Needlestick injury from an infected source patient depends on the virus. The Hepatitis B virus is about 10 times more transmissible than hepatitis C virus, which in turn is more easily transmitted than HIV (Wilburn, 2004). The reason for choosing to examine only health-care workers is that the data will be more relevant, since policy actions and interventions will mainly be directed to this professional group.

The World Health Organization (WHO, 2005 b) estimates that unsterilized syringes cause between 8 to 16 million cases of hepatitis B, 3 to 4.7 million cases of hepatitis C, and 80,000 to 160,000 cases of HIV every year.

Needlestick and other sharps injuries are a serious hazard in any medical care situation. These injuries are caused by different types of needles and sharps, such as scalpels and broken glass containers. Contaminated needles and sharps may inject healthcare workers with blood that contains pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV), all of which pose a grave, potentially lethal, risk. Although immunization is available to prevent hepatitis B illness, no immunization is available to prevent HCV or HIV (CDC, 2010).

Hospital-based U.S. healthcare personnel sustain approximately 385,000 percutaneous injuries from needles and other sharps devices each year - equivalent to more than 1,000 injuries a day. This figure does not include sharps injuries that may have occurred in non-hospital settings, such as in private medical and dental offices, in home healthcare settings, and long-term care facilities. Direct and indirect costs associated with sharps injuries can be substantial. Occupational exposures to blood borne pathogens also take an emotional toll that is more difficult to quantify, but no less significant (CDC, 2005).

The gravity of workplace risks is seen in the recent International Labour Organization (ILO) estimate that among the world's 2.7 billion workers, at least 2 million deaths per year are attributable to occupational diseases and injuries (ILO, 2003). The ILO estimates for fatalities are the tip of the iceberg because data for estimating nonfatal illness and injury are not available for most of the globe. Underreporting of sharps injuries by employees is well documented in the literature with estimates ranging from 22% to 99%,

and has been found to vary by occupation and by hospital (Au *et al*., 2008; Nagao et al., 2009).

The ILO also notes that about 4 percent of the GDP is lost because of work-related diseases and injuries (ILO, 2003). The average direct costs, including laboratory costs for tests of both source patients and exposed employees, labor costs associated with testing and counseling, and the costs of post-exposure prophylaxis, are estimated to be $3,042 (ranging from $1,663 to $4,838) (O'Malley, Scott, Gayle, Dekutoski, Foltzer, Lundstrom, *et al.*, 2007).

Sharps injuries are preventable and the overall goal should be their elimination. As a step in that direction, the U.S. Public Health Service has called for the reduction of sharps injuries among health care workers by 30% as a national health objective for 2010 (CDC, 2010). In addition, health care facilities are required by federal regulations to implement comprehensive plans to reduce these injuries. Preventing sharps injuries requires the combined effort of government agencies, employers, and equipment manufacturers, as well as health care workers themselves.

Elements of a successful sharps injury prevention program, as outlined by the CDC, include: promoting an overall culture of safety in the workplace, eliminating the unnecessary use of needles and other sharp devices, using devices with sharps injury prevention features, employing safe workplace practices, and training health care personnel, sharps injury surveillance is also a key component of a comprehensive program. (CDC, 2008).

Appropriate measures to minimize the risks of medical sharps injuries would include the provision of safer needle devices and sharps containers. A combination of training, safer working practices and the use of medical devices incorporating sharps protection mechanisms can prevent the majority of Needlestick and sharps injuries (D.Adams and T.S.J. Elliott, 2006).

2.3. Healthcare sharps in developing countries

The results of a WHO 2004 assessment conducted in 22 developing countries showed that the proportion of health care facilities that do not use proper waste disposal methods range from 18% to 64% (WHO, 2005 b). EPInet data for 2008 reports a rate of approximately 27 needle stick injuries (NSIs) per 100 beds in teaching hospitals. There are few reports on NSIs from India and with limited data; it is not possible to estimate an annual incidence (Bairy *et al*., 2009).

African health care workers suffer on average two to four needle stick injuries per year and over half of the hospitalized patients in South Africa are HIV positive (Nemutandani *et al*., 2005). In some regions of Africa and Asia close to half of all hepatitis B and C infections among health care workers are attributable to contaminated sharps. In some areas of the Eastern Mediterranean region over two-thirds of hepatitis B and C infections in health care workers are attributable to contaminated sharps. Over two-thirds of all hepatitis B in Central and South America are the result of occupational exposure (Prüss-Üstün *et al*., 2005). Preventable needle stick injuries, while still common in the United States, occurs most commonly in Africa and Southeast Asia. These are the settings where health care workers are at greatest risk for infection. Factors associated with an increased risk of occupational exposure to sharps injuries can differ from place to place. While developed countries are busy designing new protective devices and improving their

policies, the developing world still struggles with the lack of basic equipment, inadequate policies and poor adherence to them.

Sub-Saharan countries in Africa have a heavy burden of HIV/AIDS and other blood borne infectious diseases and high usage of injections. Lack of safe devices in hospitals because of the low expenditure on health care, 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. Only a few studies have been published on sharps injuries from developing countries in general although 90% of needle sticks injuries occur in developing countries (Nsubuga and Jaakkola, 2005).

Unreported needle stick and sharps injuries are a serious problem and prevent injured health care workers from receiving post-HIV exposure prophylaxis shown to be 80% effective against HIV infection. Without documentation of the injury, the worker is unlikely to receive worker's compensation benefits if later becoming infected with the human immunodeficiency virus (HIV) or hepatitis. Needle stick and sharps injuries (NSSIs) remain a source of infection for health care workers (HCWs) worldwide. Active surveillance and periodic review of interventions are important aspects to reduce NSSIs in targeted high-risk occupational groups (Jahan, 2005).

2.4. Health care sharps in Kenya

2.4.1 Current epidemiology in Kenya

During a survey of sharps-related injuries among Healthcare workers in Maua hospital in rural Kenya, it was found that 30% of those surveyed had sustained a blood-contaminated sharps injury in the preceding year (Nkuchia, 2007). In another cross sectional study, Taegtmeyer, 2008, reported that an estimated incidence of 0.97 Needlestick injuries per healthcare worker per year.

Improper management of healthcare waste was observed in an estimated 70% of the health facilities in Kenya. Health workers are at a unique risk of injuries from injection equipment. Needle stick injuries occur commonly, 58% of health workers have reported these injuries (MoH, 2007a). One of the main causes of these injuries is inappropriate recapping of the needles which was observed in 30% of health workers. These studies are supported by a a cross sectional study by the University of Nairobi, where 214 nurses in Nairobi which found 61% needle stick, 46% of the injuries were due to recapping and 12% in the process of disposing (MoH, 2007 b).

A recent cross sectional study focusing on management of blood and fluids and compliance to universal precaution by nurses was conducted at Kenyatta National Hospital, Nairobi (Ngesa, 2008). The study found that only 19% of respondents attended an in-service course on universal precautions policy and that there was inaccurate understanding of transmission modes of blood borne pathogens. The study however did not consider occupational risk factors contributing to injury by medical sharps especially among the broad array of healthcare workers at Kenyatta National Hospital.

2.4.2 Current Policy and Institutional Framework

In Kenya, there are currently several institutions and policies that deal with healthcare waste management and the related occupational risks. The Ministry of Public Health and Sanitation established the National Policy on Injection Safety and Medical Waste Management, which aims at guiding health professionals and stakeholders to provide safe injections and proper waste management in order to protect health care providers and the community from medical sharps injuries (MoH, 2007). The Waste Management Regulations 2006, under the EMCA 1999, imposes duty of care on the occupier of premises where health care waste are handled to take measures to ensure that such waste is handled without adverse effects on human health and to the environment and natural resources (GoK, 2006).

The Ministry of Labor oversees the implementation of the Occupational, Safety and Health Act, 2007, which covers provisions for health, safety and welfare of workers in various places. (GoK, 2007). The Public Health Act Cap 242, part IX deals with sanitation and housing. The Act imposes responsibility on local authorities to take measures and maintain their areas in clean and sanitary condition. The policies highlighted here were found to be relevant when conducting this study at Kenyatta National Hospital. It is however important to emphasize that the existence of these policies may not translate to their immediate implementation considering the likely challenges such as availability of financial resources. This research also, did not entirely focus on healthcare wastes policy analysis, but attempted to unveil the existing level of healthcare sharps management in comparison with the existing internal controls and the occupational risks due to handling healthcare sharps at the hospital.

2.5. Conceptual framework

The researcher developed a model to explain the various factors that could lead to occurrence of injury by medical sharps. In this model, the independent variables including human, organizational and environmental factors interact with an inter-phase of collecting information, weighing risks and performance of tasks by the healthcare worker. The outcome of the task performed could be occurrence or non occurrence of sharps injury. The conceptual framework is presented below.

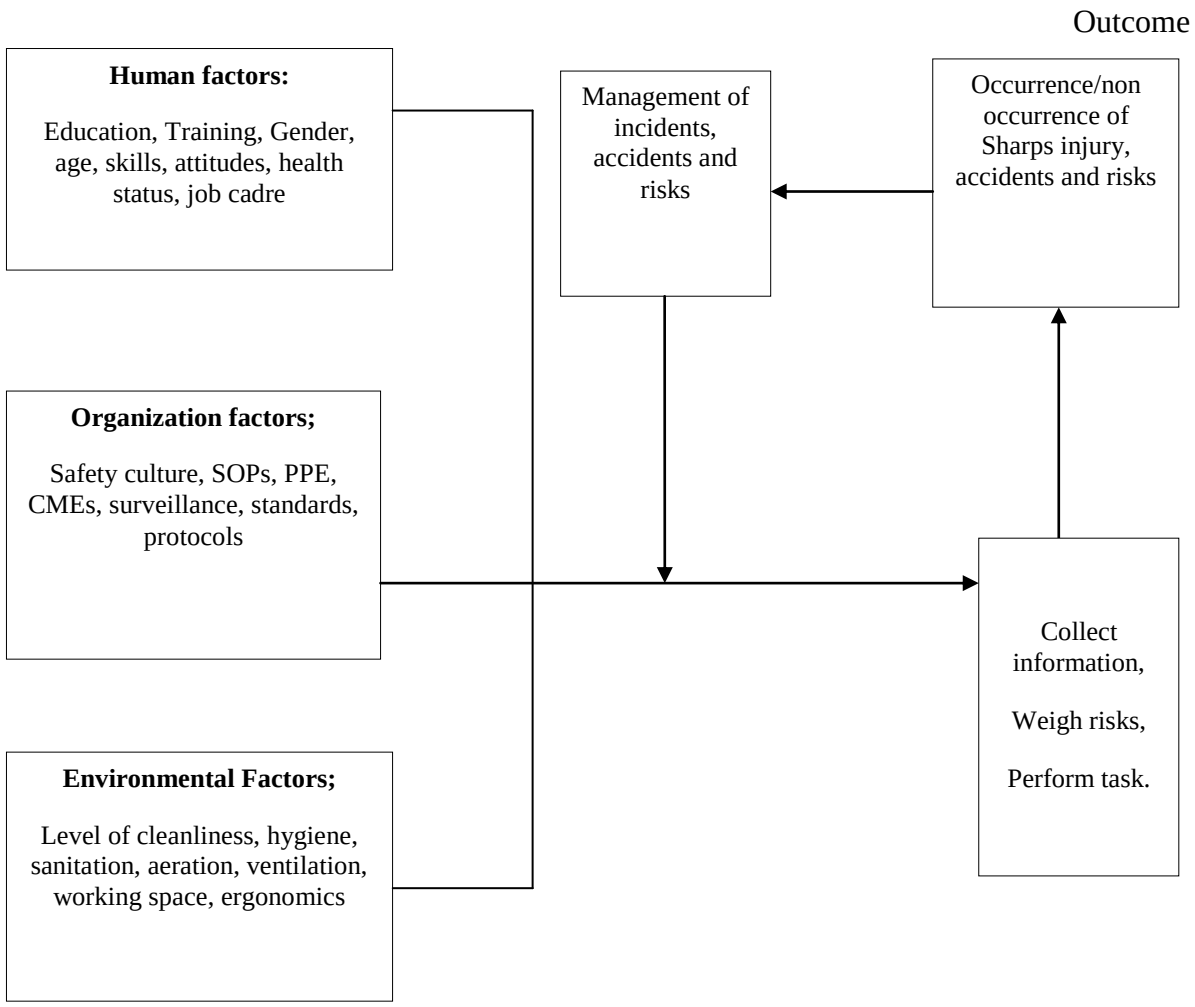

Figure 1: Conceptual Framework (Researcher, 2012)

CHAPTER THREE: METHODOLOGY

3.1. Research design

This was a descriptive cross sectional study design conducted by means of pretested, structured, self administered questionnaires, focus group discussions, key informant interviews and observation checklist. In this study, Kenyatta National Hospital was purposely sampled as the study site and the healthcare workers at the hospital, being the study population, were randomly selected using computer generated table of random numbers. The study focused on the occupational risks of exposure to medical sharps, the frequency and severity of the medical sharps injuries, the factors that contribute to the occurrence of the medical sharps injuries and the measures the hospital has put in place to control and manage the sharps injuries. This study was conducted between July 2010 and December 2010.

3.2. Variables

The independent variables are the factors that cause healthcare sharps injuries including: personal/human, managerial and environmental. The dependent variable is the occurrence of sharps injury; the number of individuals who experience cuts and punctures from healthcare sharps, number of individuals who report cuts and punctures from healthcare sharps.

3.3. Study site

Kenyatta National Hospital is situated in Nairobi city, Nairobi west district, Nairobi County which lies at an altitude of 1680m above sea–level. It is located at longitude 36° 50' East and latitude 1° 18 South about 140 km South of the Equator (GoK, 2008). The hospital offers healthcare services to patients from Kenya, Namibia, Burundi, Rwanda, Tanzania and Uganda (Ngesa, 2008). The hospital is currently the largest National referral, teaching and research hospital with an estimated staff capacity of 6,000 employees, bed capacity of 1,800 beds, an average Annual Outpatient attendance of 600,000 visits, and an average Annual Inpatient attendance of 89,000 patients (KNH, 2004). The location of Kenyatta National Hospital is shown in Appendix 5.

3.4. Target population

The study targets healthcare workers exposed to medical sharps that are potentially at risk of being injured or infected. In this case, healthcare workers in the following departments; Medicine, Orthopedics, Critical care unit, pediatrics, laboratory, nursing, accident and emergency, Public Health, Dental, Surgery, Cardiology and Ophthalmology at the hospital were considered the target population since the results of this study can be generally applied to them.

3.5. Study population

The study population in this case was healthcare workers at Kenyatta National Hospital who met the criteria for inclusion in this study. The study population composition and size include 98 doctors and dentists, 1415 nurses, 63 clinical officers, 116 laboratory technologists, 23 public health technicians and 2 incinerator operators, who total 2229

(KNH Strategic Plan 2005-2009). Out of the study population, a statistically representative sample was drawn.

3.6. Determination of sample size

The hospital has health care workers in different job cadres which were considered as different strata. The participants in this research were selected by randomly picking personal numbers from the employees list for each job cadre using a computer generated random number table. The participants per job cadre were selected proportionate to the study population to attain the required sample size as shown in Table 0-1

Table 0-1: Stratified job cadres and sample size

Job Cadre	**Number available**	**Sample size**
Nurses	1415	201
Cleaners	119	31
Student nurses	115	29
Laboratory technologists	116	16
Clinical officers	63	12
Doctors and Dentists	280	10
Student Doctors	55	8
Public health officers and technicians	23	5
Phlebotomists	20	3
Student Clinical Officers	21	3
Incinerator operators	2	2
Total	N=2229	n=320

3.7. Criteria for selecting the study population

The study population was health care workers including doctors, dentists, nurses, clinical officers, laboratory technologists, public health officers and technicians and sanitary staff who work at KNH.

The inclusion criteria in this study were the medical and non-medical staff in the sampling frame who works at KNH. The exclusion criteria in this study were medical and non-medical staff in the sampling frame who do not work at KNH

3.8. Sample size

Sample size was determined using the formula as used by Fisher, Laing and Stoceckell (Mugenda and Mugenda, 2003) for sample size with a population of over 10,000 as below

$n = Z^2pqD/ d^2$

Where n= the desired sample size if the target is more than 10,000

Z = The standard normal deviate which is 1.96 at 95% CI.

p= The proportion in the population estimated to be at risk (0.58) which is the 58% of health workers at risk in Kenya, (MoH,2007)

q= I- p (The proportion in the population not at risk)

d = The level of significance set at 0.05

D= The desired effect which is 1.

$N = 1.96^2 \times 0.58 \times 0.42 /0.05^2 = 374$

Since the target population was less than 10,000. The final sample size was;

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

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

N=the estimate of the population size=2229, nf=n/1+n/N, 374/1.167934, n=320

3.9. Research instruments

A structured questionnaire comprising closed and open ended questions was self administered. A checklist as an observation guide was constructed following the recommended standards for management of medical sharps. The observation guide was used to assess the observed practices of handling medical sharps in different sections at the hospital. There were key informant interviews which were conducted with the senior public health officer and the senior infection control nurse at the hospital. Three Focus groups, each with 10 nurses were conducted to discuss in depth the handling practices of medical sharps, the related risks, reporting and management practices of the associated risks. Consensus was built on the agreed points on every theme. Secondary data was obtained through the perusal of relevant hospital handbooks, manuals and policy guidelines and incidents occurrence books.

3.10. Pre-testing of data instruments

To ensure data quality, three research assistants were trained at Kenyatta National Hospital for a day so as to comprehend the research objectives, content and process. The research assistants were useful in the distribution of the questionnaires and clarification of any arising issues during the research. There was pre-testing of the questionnaire in English language on thirty healthcare workers at Kenyatta National Hospital, which were well answered and returned.

3.11. Data entry and analysis

Microsoft Access database was used to enter data collected from all the 320 respondents, which represented 100% response rate. The cleaned data was exported to SPSS version 11.5 and MS Excel for analysis. Descriptive statistics such as frequencies and percentages were used to analyze categorical data. Inferential statistics by use of Chi-square test and odds ratio were used to determine the statistical significance of relationships between independent variables such as gender, job cadre, duration of service and the dependent variable; sharps injury. The results were presented in pie charts, bar charts and tables.

3.12. Logistical and Ethical considerations

Permission to carry out the study was sought from the Board of postgraduate studies of Kenyatta University and the Ethics and Research Committee of Kenyatta National Hospital and College of Health Sciences, University of Nairobi. The research participants were involved on voluntary basis by reading and signing a consent form. The research participants were informed of the research objectives and assured of confidentiality.

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Introduction

This chapter deals with presentation and discussion of the results of this study that focused on the risks of exposure to healthcare sharps, the frequency and severity of injuries from medical sharps, the factors that contribute to occurrence of injury by medical sharps and measures in place to report, document, prevent, control or manage medical sharps injuries among health workers at Kenyatta National Hospital. The results of the study have been presented using descriptive statistics including; frequencies and percentages, in tables, bar charts and pie charts. These results are presented and discussed below.

4.1.1 Socio-demographic characteristics of study population

The study population comprised of 320 respondents, who were sampled from thirteen departments at the Hospital. Among the respondents who returned the filled questionnaires, (88) 27.5% of respondents were from the department of medicine, while only (2) 0.6% were from Cardiology. On the other hand (201) 62.8% of the respondents were Nurses. Many respondents 202 (63%) were female, while (118)37% were male. Up to (207) 64.7% had obtained a diploma as the highest level of education, and very few (8) 2.5 % of the respondents had a Master Degree. Up to (227) 71% of the respondents worked for 5-8 hours daily. Some of the respondents (70)21.9% had served at the hospital for 6-10 years while few (4)1.3% had served for more than 30 years. Table 0-1 shows the demographic characteristics of the study population.

Table 0-1: Demographic characteristics of the study population

Characteristics	n	Percent (%)
Gender		
Female	202	63.1
Male	118	36.9
Education		
Secondary	32	10
Certificate	17	5.3
Diploma	207	64.7
Degree	56	17.5
Masters	8	2.5
Cadre		
Nurse	201	62.8
Cleaner	31	9.7
Student Nurse	29	9.1
Laboratory technologist	16	5.0
Clinical Officer	12	3.8
Medical Doctor	10	3.1
Student Doctor	8	2.5
Public Health Officer	4	1.3
Phlebotomist	3	0.9
Student Clinical Officer	3	0.9
Incinerator operator	2	0.6
Public Health Technician	1	0.3
Trained in Infection Control and Prevention		
Yes	281	87.8
No	39	12.2
Duration of Service		
<1Yr	33	10.3
<4Yrs	67	20.9
5-9Yrs	70	21.9
10-14Yrs	70	21.9
15-19Yrs	37	11.6
20-24Yrs	31	9.7
25-29Yrs	8	2.5
>30Yrs	4	1.3
Hours of work Daily		
1-4Hrs	10	3.1
5-8Hrs	227	70.9
>8Hrs	83	25.9

4.1.2 Frequency and severity of healthcare sharps injuries

The results of this study show that 140(44%) of respondents were involved in healthcare sharps injury at the hospital, while (180)56% of respondents indicated that they were not injured. Figure 2 shows the percentage of respondents involved in healthcare sharps injury.

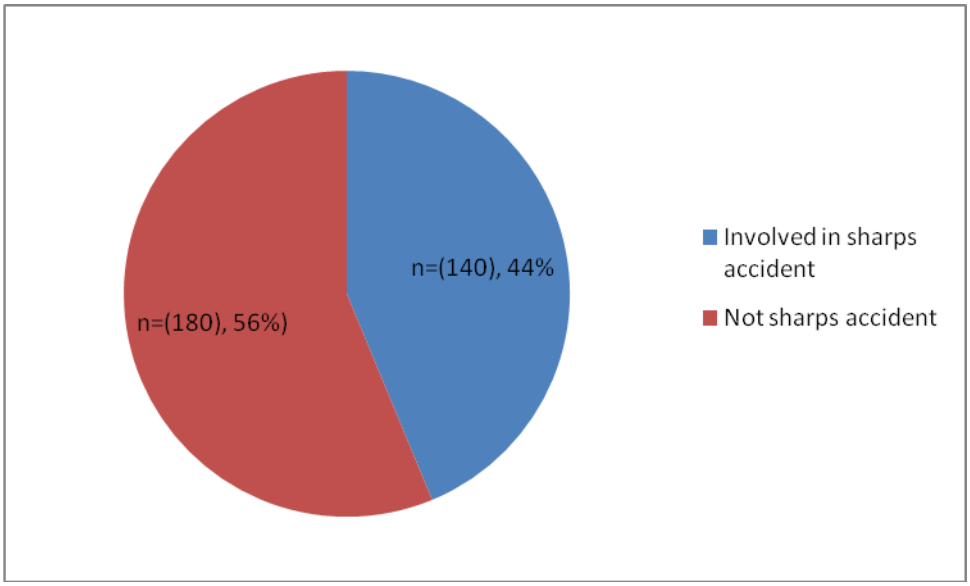

Figure 2: Percentage of respondents involved in sharps injury (n=320)

The results also show that a majority (125) 91% of respondents were injured by medical sharps injuries between 1-2 times, a few (8) 5.7% experienced sharp injuries between 3-4 times, and few (2) 1.4% of the injured respondents experienced sharps injuries 5-10 times, while only (3) 2.1% experienced sharps injuries more than 10 times (Figure 3).

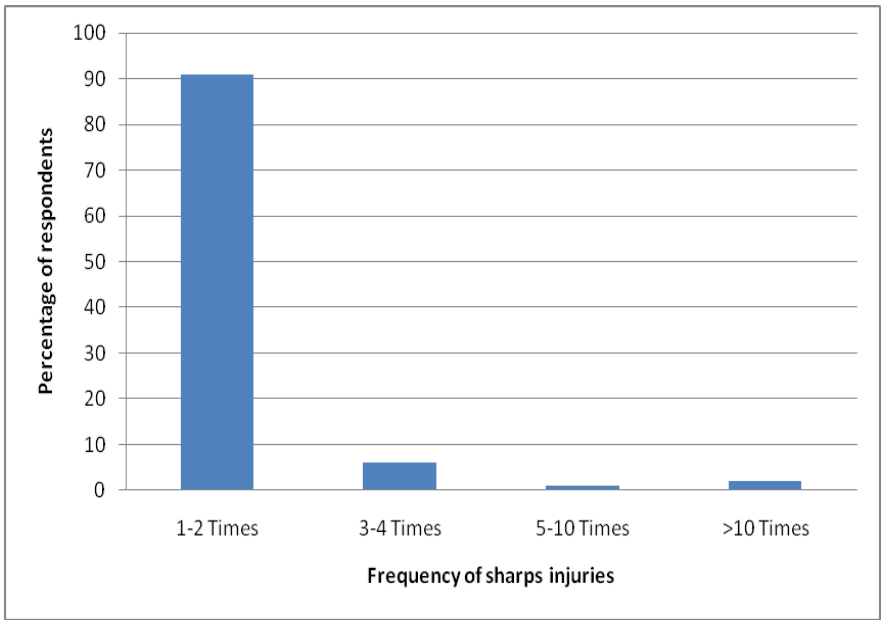

Figure 3: Frequency of sharps injuries among respondents (n=140)

In this study, (86) 62% of injured respondents suffered moderate injuries, which were characterized with skin puncture and some bleeding. Some respondents (45) 33% suffered superficial/ mild injuries which were characterized by no bleeding and few (7)5% respondents experienced severe injuries, which were characterized with profuse bleeding, (Figure 4).

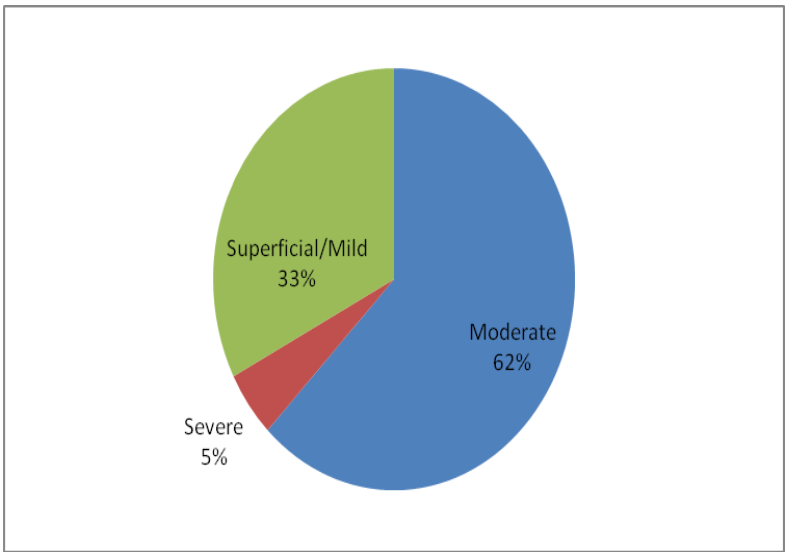

Figure 4: Severity of sharps injuries among healthworkers (n=140)

4.1.3 Risks of exposure to healthcare sharps

4.1.3.1 Incidents during the sharp injury occurrence

This study revealed that most (105) 75% of the respondents suffered a needle prick followed by (42) 30% who suffered a cut accident, and the same number (42) 30% suffered a glove tear by a healthcare sharp. Several respondents (41) 29.3% experienced blood splash, some (5)3.6% suffered an abrasion, a few (4)2.9% suffered a bruise and only (1)0.7% experienced urine splash as shown in Figure **5** below.

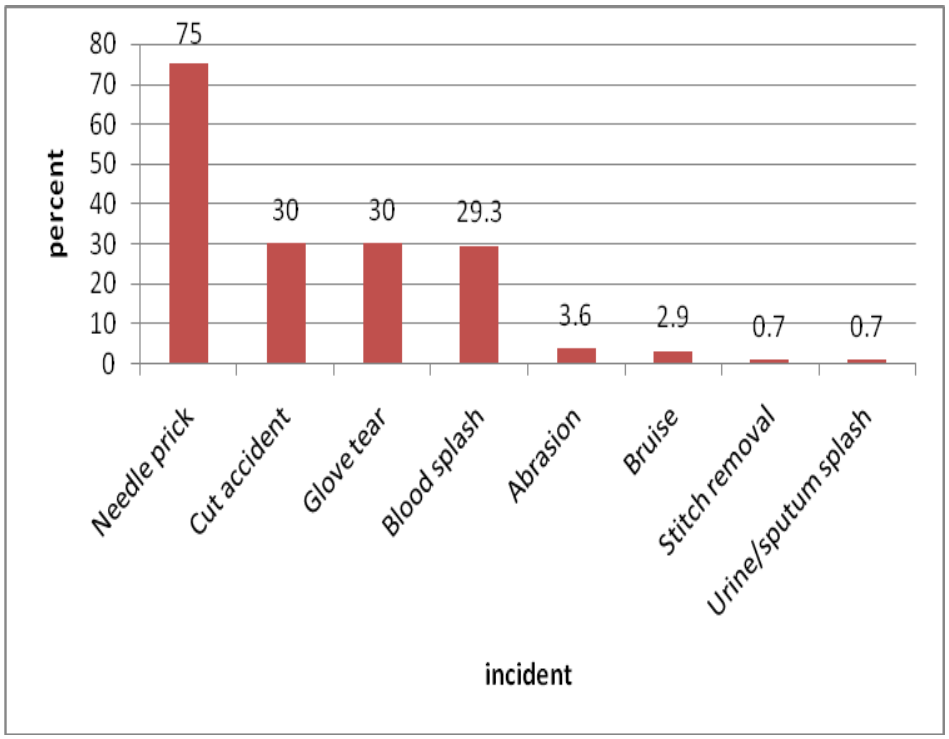

Figure 5: Incidents when handling sharps (n=140)

4.1.3.2 Procedures during the sharps injury incidents

In this study, some of the respondents (39) 27.9% were injured by a healthcare sharp during recapping, while (21)15% were injured during suturing and some (18) 12.9% were injured by sharps in unexpected areas. Only (4) 2.9% of the respondents were injured by another person. The highest number (107) 76% of the injuries were caused by needles, a good number (28)20% were caused by blade and few (8)6% were caused by other sharps as shown in Figure 6 below.

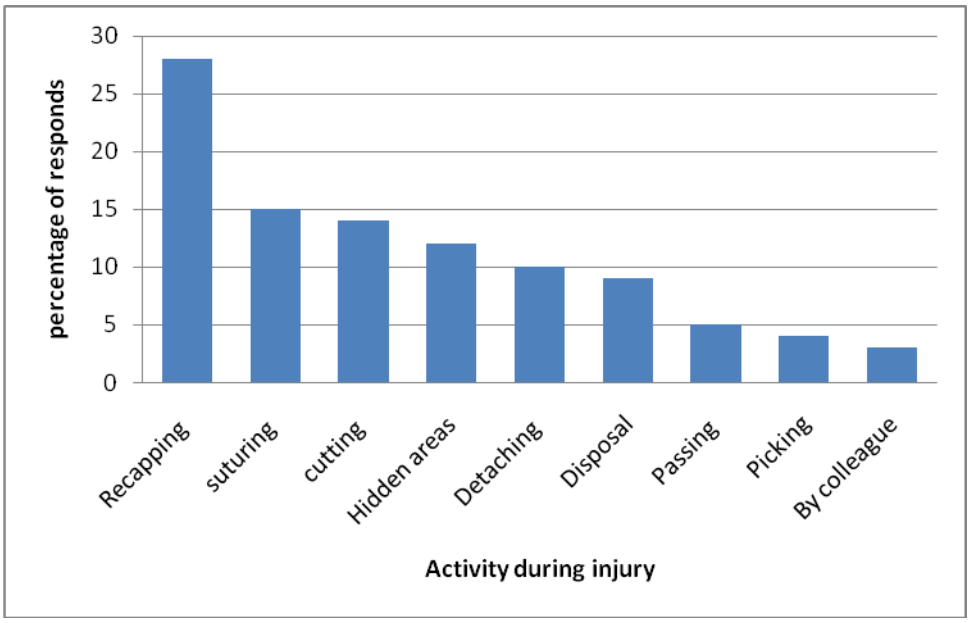

Figure 6: Procedure/activity during the sharps injury (n=140)

4.1.3.3 Occupational infections likely contracted by respondents

This study shows that several (24)18% respondents reported to have likely contracted upper respiratory tract infection (URTI) at the hospital, followed by few (3) 2% who reported to have likely contracted Pulmonary Tuberculosis. Only (1) 0.3% of the

respondents reported to have likely contracted HIV, the same number (1) 0.3% reported to have likely contracted Hepatitis A.

In the same vein, another respondent (1) 0.3% also reported to have contracted skin rashes, while another (1) 0.3% reported to have likely contracted cellulites at the hospital respectively as shown in Figure 7 .

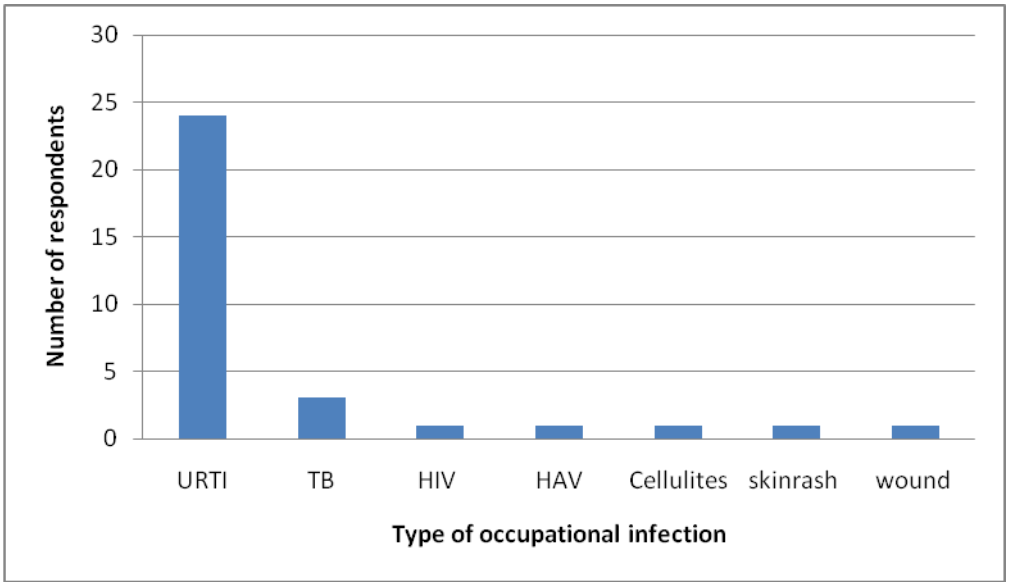

Figure 7: Occupational Infections likely contracted by respondents (n=140)

4.1.4 Factors contributing to occurrence of healthcare sharps injuries

The results of this study show that 44% of the respondents reported to have been involved in healthcare sharps injury at the hospital, while many 56% respondents reported not to have been involved. As discussed in the subsequent sub-sections, this study utilized Chi-square analysis to test the association between independent variables such as; gender, department, education, job cadre, training in infection control, years of service, daily work duration and HBV vaccination status against the dependent variable of sharps injury. The results of this study show that working in the job cadre of a nurse , working

in the critical care section and education level of below diploma are factors that are associated to medical sharps injury risks among healthcare workers at the hospital, while the risks associated with handling healthcare sharps are; needle sticks, pricks, abrasion and occupational infections.

4.1.4.1 Gender and the risk of medical sharps injury

The results of this study show that (88) 62.9% of the respondents involved in healthcare sharps injury were female while few (52) 37.1% of the respondents involved in sharps injury were male. There was however no statistical significance (OR; 0.98, 95%CI: 0.62-1.548, p=1.00) between gender and the risk of sharps injury. These results as shown in Figure 8 imply that both male and female respondents stand almost an equal chance of being involved in a sharps injury incident at the hospital.

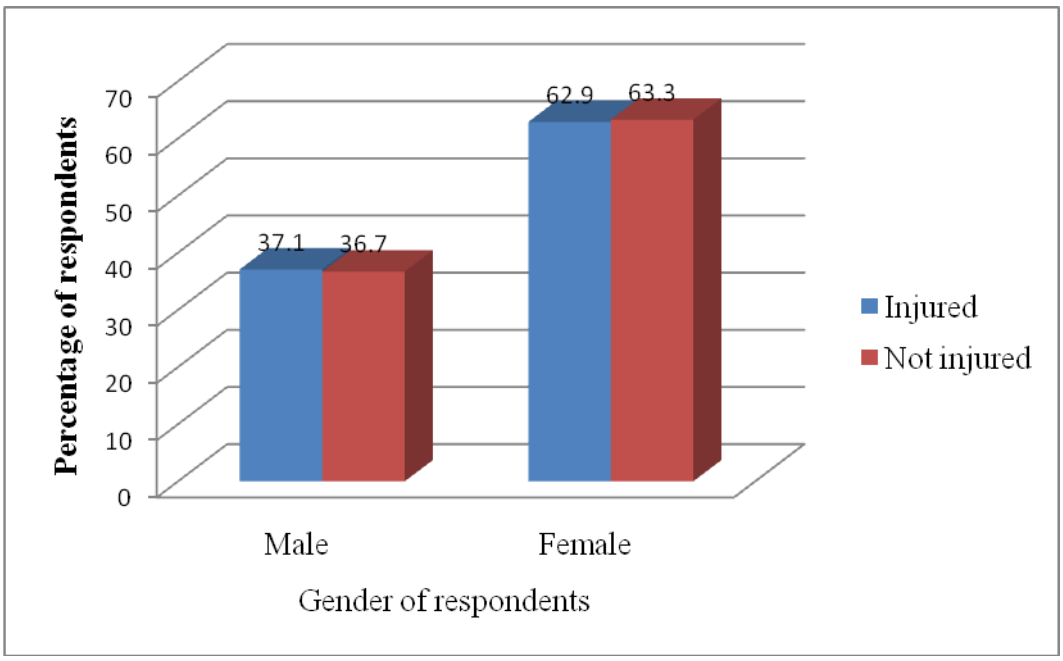

Figure 8: Gender and risk of exposure to sharps injury (n=320)

4.1.4.2 Working in hospital departments and the risk of sharps injury

In this study, (20) 69 % of respondents working in the critical care section were involved in sharps injury, while (120) 41% of respondents working in other departments were involved. This results showed a high statistical significance (OR; 3.167, 95%CI: 1.4-7.2, p=0.01) between working in the critical care section at the hospital and the risk of sharps injury. The results in Table 0-2 show a significant association between working in the critical care section at the hospital as compared to working in other sections and the chance of being involved in a medical sharps injury.

Table 0-2 Departments and the risk of medical sharps injury

Department	**Involved in sharps accident**	**Not involved in sharps accident**	**Odds Ratio (95% CI)**	**p-Value**
Medicine Other depts.	42 (47.7) 98 (42.2)	46(52.3) 134(57.8)	1.25 (0.76-2.04)	0.38
Orthopaedics Other depts.	14(45.2) 126(43.6)	17(54.8) 163(56.4)	1.07 (0.51-2.24)	0.87
CCU Other depts	20(69.0) 120(41.0)	9(31.0) 171(59.0)	3.17 (1.4-7.2)	0.01
Paediatrics Other depts.	10(40.0) 130(44.1)	15(60.0) 165(55.9)	0.85 (0.37-1.95)	0.69
Laboratory Other depts.	11(52.4) 129(43.1)	10(47.6) 170(56.9)	1.45 (0.6-3.5)	0.41
Nursing Other depts.	8(38.1) 132(45.7)	13(61.9) 167(54.3)	0.78 0.31-1.9)	0.59
Theatre Other depts.	8(53.3) 132(43.3)	7(46.7) 173(56.7)	1.5 0.53-4.24)	0.45
A/E Other depts.	4(30.8) 136(44.0)	9(69.2) 171(56.0)	0.56 (0.17-1.85)	0.34
Public Health Other depts.	2(22.2) 138(44.4)	7(77.8) 173(55.6)	0.36 (0.07-1.75)	0.21
Dental Other depts.	2(25.0) 138(44.0)	6(75.0) 174(56.0)	0.42 0.08-2.12)	0.29
Surgery Other Dept	32(64.0) 108(41.5)	18(36.0) 152(58.5)	2.50 (0.95-4.05)	0.10
Ophthalmic Other depts.	1(12.5) 139(44.6)	7(87.5) 173(55.4)	0.18 0.02-1.46)	0.11
Cardiology Other depts.	0(0) 140(44.0)	2(100) 178(56.0)		

4.1.4.3 Healthcare workers Job cadres and the risk of sharps injury

In this study, (99) 49.3 % of the respondents working as nurses in the hospital were involved in healthcare sharps injury, which showed a high statistical significance (OR; 1.85, 95%CI: 1.16-2.95, p=0.01) between working in the job cadre of a nurse in the hospital and the risk of healthcare sharps injury. The results imply that respondents who work as nurses or a non cleaner at the hospital stand a higher chance of being involved in a sharps injury incident as compared to those working in other job cadres. Table 0-3 shows the relationship between working in different job cadres and the risk of being involved in healthcare sharps injury at the hospital.

Table 0-3: Job cadres and the risk of sharps injury

Cadre	Involved in sharps accident	Not involved in sharps accident	Odds Ratio (95% CI)	p-Value
Nurses Others	99(49.3) 41(34.6)	102(50.7) 78(65.4)	1.85 (1.16-2.95)	0.01
Cleaners Others	7(22.6) 133(46.0)	24(77.4) 156(54.0)	0.34 (0.14-0.82)	0.02
Student Nurse Others	11(37.9) 129(44.3)	18(62.1) 162(55.7)	0.77 (0.35-1.68)	0.51
Clinical Officer Others	6(50.0) 134(43.5)	6(50.0) 174(56.5)	1.3 (0.41-4.12)	0.66
Medical Officers Others	3(30) 137(44.2)	7(70) 173(55.8)	0.54 (0.14-2.13)	0.38
Student Doctor Others	1(12.5) 139(44.6)	7(87.5) 173(55.4)	0.18 (0.22-1.46)	0.11
Laboratory technologist Others	8(50.0) 132(43.4)	8(50.0) 172(56.6)	1.3 (0.48-3.56)	0.61
Public Health Officer Others	1(25.0) 139(43.9)	3(75.0) 176(56.1)	0.32 (0.04-2.86)	0.31
Phlebotomist Others	2(66.7 138(43.5)	1(33.3) 179(56.5)	2.6 (0,23-28.9)	0.44

4.1.4.4 Education levels and the risk of sharps injury

In this study, results show that respondents with above secondary school education (154)53%, were less involved in a sharps injury incident, which shows a high statistically significant relationship between the level of education among respondents and the risk of healthcare sharps injury at the hospital (OR; 0.27, 95%CI: 0.11-0.66, p=0.01). The results imply that education level of above secondary school is negatively associated with being involved in a sharps injury incident at the hospital.

Table 0-4 shows the relationship between the level of education and the risk of being injured by medical sharps at the hospital.

Table 0-4: The level of education and risk of medical sharps injury

Education Level	Involved in sharps accident	Not involved in sharps accident	Odds Ratio (95% CI)	p-Value
Secondary Beyond secondary	6(18.8) 134(46.5)	26(81.3) 154(53.5)	0.27(0.11-0.66)	0.01
Certificate Others	10(58.8) 130(43.0.)	7(41.2) 173(57.0)	1.9(0.71-5.13)	0.2
Diploma Others	97(46.9) 43(38.0)	110(53.1) 70(62.0)	1.44(0.9-2.3)	0.13
Degree Others	22(39.3) 118(45.0)	34(60.7) 146(55.0)	0.8(0.44-1.44)	0.46
Masters Others	5(62.5) 135(43.3)	3(37.5) 177(56.7)	2.19(0.51-9.3)	0.29

4.1.4.5 Daily duration of work and the risk of sharps injury

In this study, (102) 44.9% of the respondents who work for eight hours and less daily at the hospital were involved in a medical sharps injury incident while (125) 55.1% were not involved. These results as presented in Figure 9 do not show a statistically significant

relationship between daily duration of work among respondents and the risk of medical sharps injury at the hospital (OR; 1.118, 95%CI: 0.676-1.847, P=0.76).

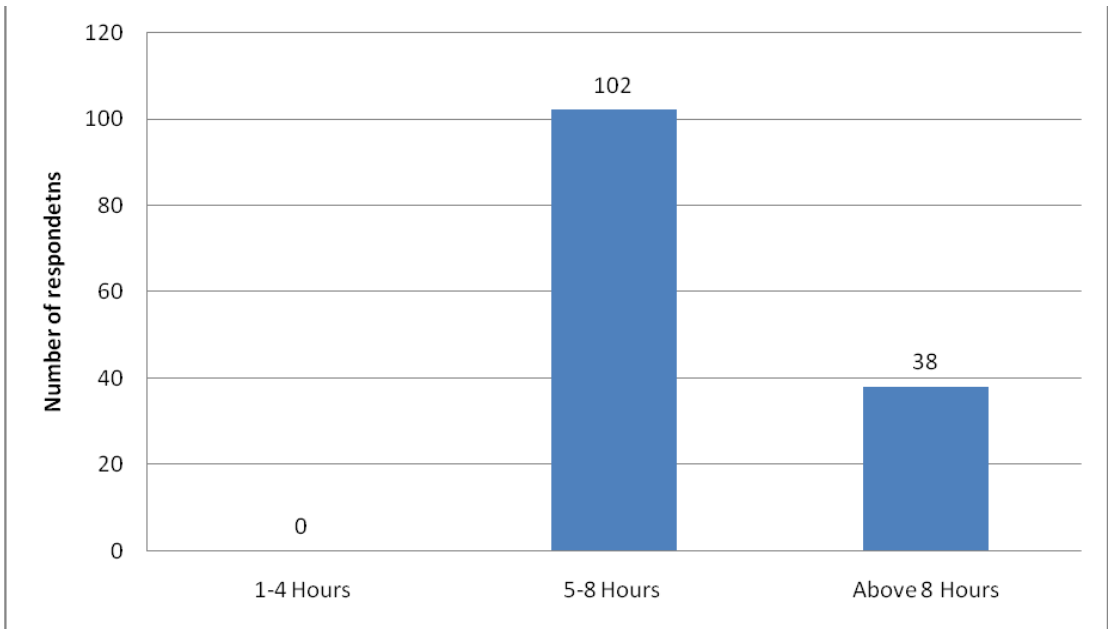

Figure 9: Daily Work Duration at the hospital by respondents

4.1.4.6 Years of service and the risk of sharps injury

A majority (158)55.1% of the respondents with above one year of service at the hospital were not involved in a sharps injury incident while about (129) 44.9% respondents were involved in a sharps incident. These results do not show a statistically significant relationship between years of service at the hospital by the respondents and the risk of healthcare sharps injury (OR; 61, 95%CI: 0.29-1.31, P=0.21). The results imply that the years of service at the hospital by respondents has little effect on the risk of being involved in a sharps injury incident. Table 0-5 shows the relationship between the years of service by respondents at the hospital and the risk of being injured by healthcare sharps.

Table 0-5: Years of service and the risk of medical sharps injury

Years of service	Involved in sharps accident	Not involved in sharps accident	Odds Ratio (95% CI)	p-Value
<1Yr 1 Yr and above	11(33.3) 129(44.9)	22(66.7) 158(55.1)	0.61(0.29-1.31)	0.21
5Yrs and below >5 Yrs	39(41.8) 101(45.9)	61(33.9) 119(54.1)	0.75(0.47-1.22)	0.25
10 yrs and below >10Yrs	70(41.2) 70(46.7)	100(58.8) 80(53.3)	0.8(0.51-1.25)	0.32
15Yrs and below >15Yrs	103(42.9) 37(46.3)	137(57.1) 43(53.7)	0.87(0.53-1.45)	0.6
20Yrs and below >20Yrs	122(44.0) 18(41.9)	155(56.0) 25(58.1)	1.09(0.57-2.1)	0.79
25Yrs and below >25 Yrs	136(44.2) 4(33.3)	172(55.8) 8(66.7)	1.58(0.47-5.36)	0.46
30Yrs and below >30Yrs	138(43.7) 2(50.0)	178(56.3) 2(50.0)	0.78(0.11-5.6)	0.8

4.1.4.7 HBV Vaccination and the risk of sharps injury

The results of this study show that slightly more than half of the respondents (131)55% who were vaccinated against HBV were not involved in a sharps injury incident, while several (106) 45% respondents who were vaccinated against HBV were involved. On the other hand (34) 41% of the respondents who were not vaccinated against HBV were involved in a sharps injury incident while several (48) 59% were not involved. These results do not show a statistically significant relationship between the HBV vaccination status among the respondents at the hospital by the respondents and the risk of healthcare sharps injury (OR; 0.85, 95%CI: 0.509-1.418, P=0.621). The results in Figure 10 show that HBV vaccination status among the respondents at the hospital has no effect on the risk of being involved in a sharps injury incident.

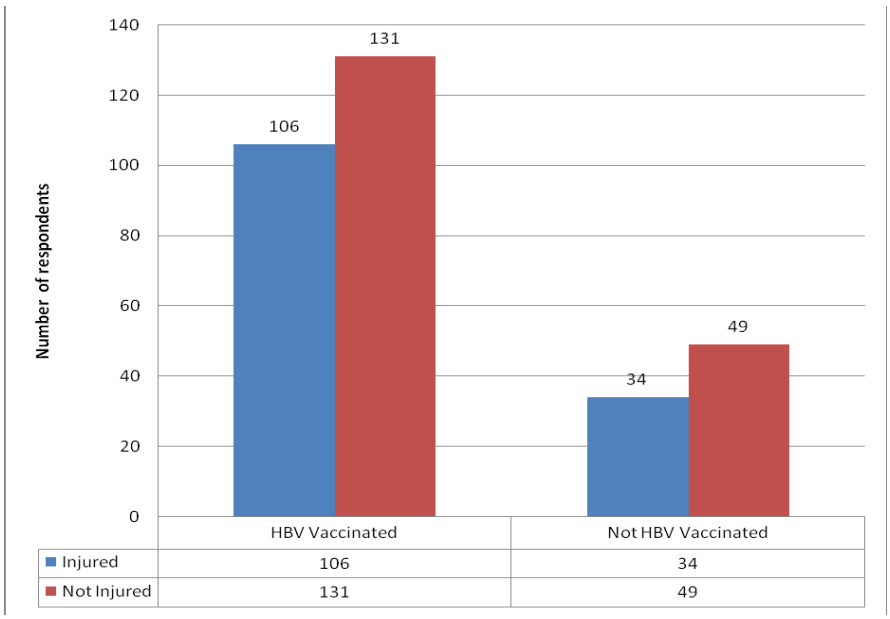

Figure 10: HBV Vaccination status and the risk of sharps injury

4.1.4.8 Continuous Medical Education and risk of sharps injury

In this study (160) 57% of the respondents with training in infection control and prevention were not involved in sharps injury, while few (121) 43% without training in infection control and prevention were involved in a sharps injury incident. On the other hand (20) 49% of the respondents who were not trained in infection control and prevention were not involved in a sharps injury incident while few (19) 49% of those not trained were not involved. These results do not show a statistically significant relationship between training in infection control and prevention by the respondents and the risk of healthcare sharps injury (OR; 0.13, 95%CI: 0.642-2.457, P=0.62). The results imply that training in infection control and prevention by respondents has very little positive effect on the risk of being involved in a sharps injury incident at the hospital.

It may also imply that the training content and structure is not adequately covered to address the pertinent issues related to medical sharps injury prevention and control.

Figure 11 shows the relationship between training in infection control and prevention course by respondents and the risk of being injured by healthcare sharps at the hospital.

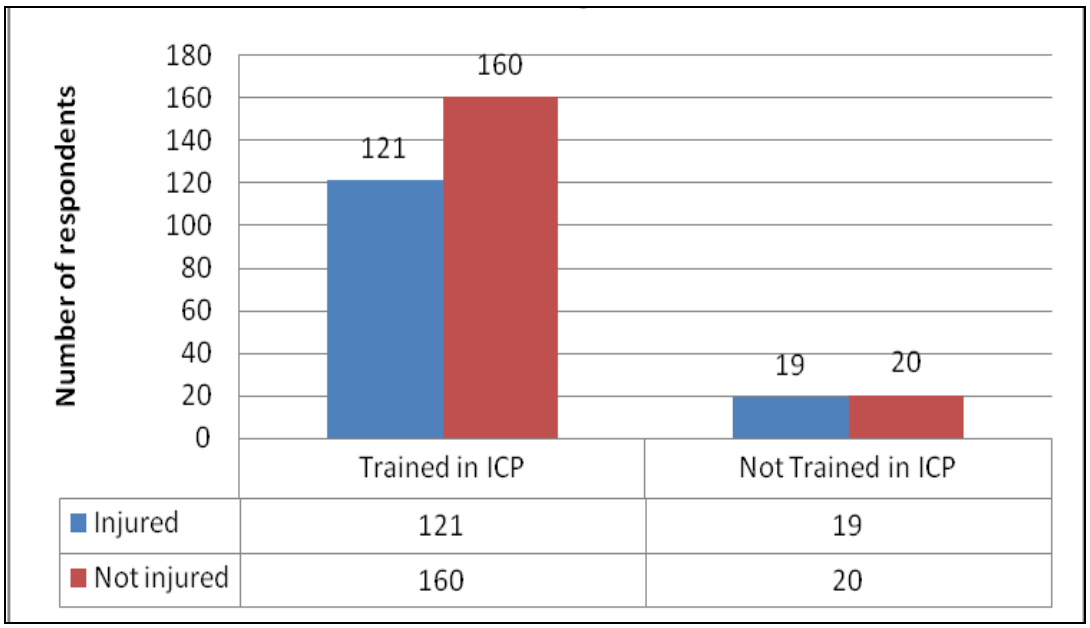

Figure 11: Training in ICP and the risk of sharps injury

4.1.5 Measures to control and manage healthcare sharps injuries

4.1.5.1 Vaccination services

Majority of respondents (271)84% indicated that the hospital provides vaccination services to the health workers and (266) 83% of the respondents indicated that there is provision of post exposure prophylaxis at the hospital.

4.1.5.2 Continuous medical education

In this study, (240)75% of the respondents indicated that the hospital management conducts continuous medical education on safety health and environment; only (15)4.7% indicated that there is a needle stick committee at the hospital. Figure 12 shows the measures in place to control and manage medical sharps injuries at the hospital.

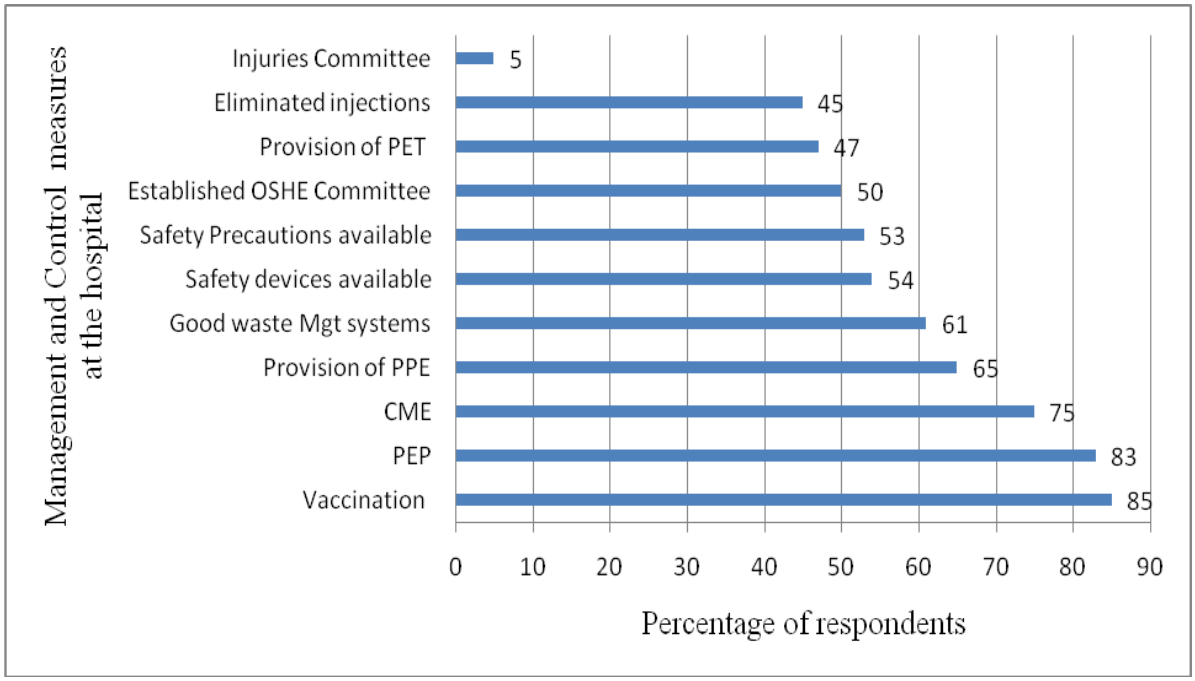

Figure 12: Measures to control and manage sharps injuries (n=320)

4.1.5.3 Safety equipment

Majority of respondents (245)77% indicated that they used syringes with auto-retractable needles, while (75)23% indicated that they do use auto-retractable needles. Most all of the respondents (314) 98% indicated that they were provided with gloves, (304)95% were provided with masks, (129)40% were provided with aprons, and only (96)30% were provided with lab coats. Figure 13 shows the distribution of personal protective equipment among the respondents at the hospital.

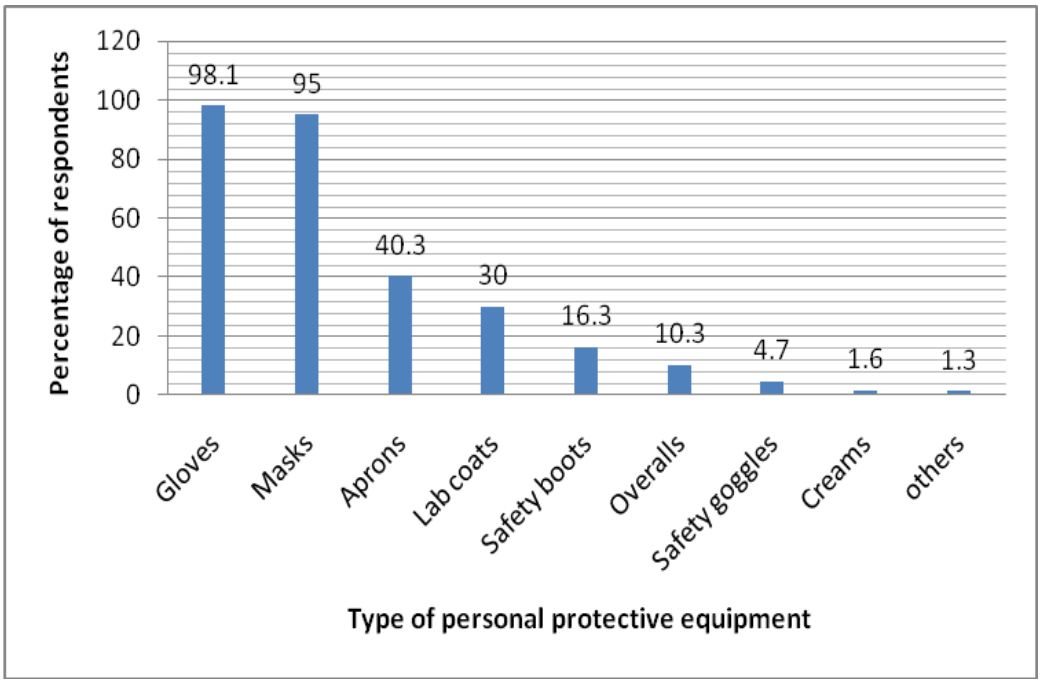

Figure 13: Types of personal protective equipment provided (n=320)

In this study, (220) 69% of respondents indicated that the personal protective equipment provided were adequate, while (98)31% of the respondents were of the opinion that the equipment were not adequate. Most of the respondents (261) 81.6% in this study indicated that they used personal protective equipment at work, while some respondents (52) 16.3% used the equipment occasionally and only (2) 1.3% of the respondents used the equipment rarely.

4.1.5.4 Guidelines on medical sharps

Majority of the respondents (311)97% in this study indicated that the hospital management provided guidelines on handling used healthcare sharps. Only (6)2% of the respondents were of the opinion that the hospital management had not provided guidelines and a paltry (3)1% of the respondents did not know whether the guidelines exist or not.

4.1.5.5 Medical sharps Disposal containers

In this study, (229) 72% of respondents indicated that they dispose used medical sharps in plastic containers after procedures. Similarly, (201)63% of the respondents dispose medical sharps in safety boxes and only (4) 1.3% dispose medical sharps in polythene bags. Figure 14 shows puncture proof containers used for disposal of hypodermic needles at the accident and emergency section of the hospital.

Figure 14: Puncture proof containers at the hospital

Figure 15 shows the different types of containers used for disposal of used sharps at Kenyatta National Hospital, Nairobi, Kenya.

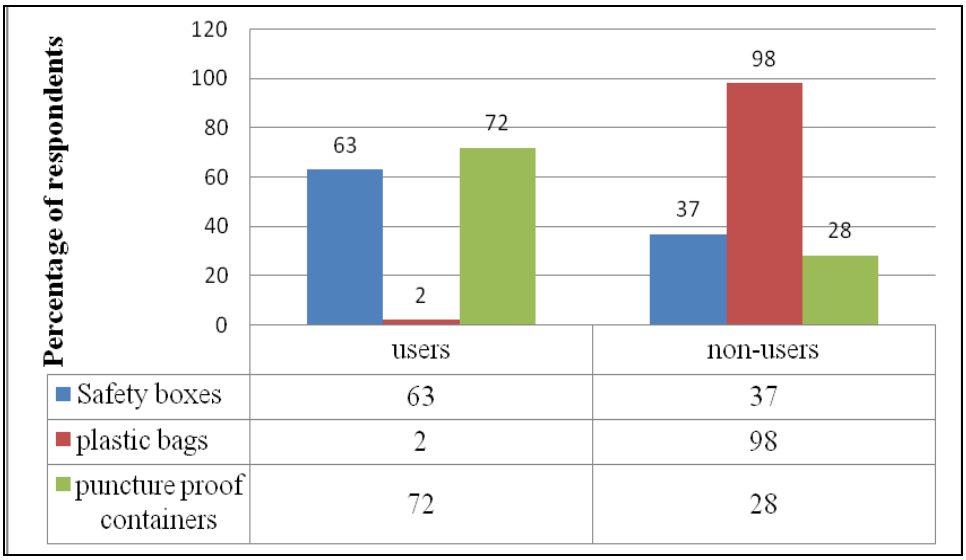

Figure 15: Types of containers used for disposal of sharps (n=320)

4.1.5.6 Provision of post-exposure prophylaxis

Although the hospital provides for post-exposure prophylaxis, most of the respondents (104) 74% did not seek for post-exposure prophylaxis, while only (36)26% reported to have sought for post exposure prophylaxis.

4.1.5.7 Work procedures and guidelines

In this study majority of the respondents (291) 90.9% indicated that they were given clear work procedures and guidelines in their job cadres, while (29) 9.1% of the respondents indicated that they were not given clear work procedures and guidelines in their job cadres.

4.1.5.8 Training in infection control

The majority of the respondents (281) 88% indicated that they were trained in infection control and prevention, while (39)12% indicated that they were not trained in infection control and prevention.

4.1.5.9 Reporting medical sharps injuries

Sixty four percent of the respondents indicated that they did not report the occurrence of medical sharps injury incidents, while (49)36% reported the occurrence of medical sharps injury incidents.

4.2. Discussion

4.2.1. Frequency and severity of healthcare sharps injuries

This study found that most respondents experienced sharps injuries between 1-2 times, which compares favorably with other studies reported in East African countries (le Pont *et al.*, 2003; Newson and Kiwanuka, 2002), although they evaluated the injury in one year. Most respondents suffered moderate injuries which were characterized with skin puncture and some bleeding. This compares well with a study in Ethiopia (Gebriel, 2004) in which deep and penetrating injuries constituted 64% of all the reported accidental injury by needle or other medical sharps. This study also found that some respondents suffered superficial/ mild injuries which were without any bleeding. This compares favorably with a study in Germany hospital (Wicker *et al.*, 2007) which found similar results. Focus group discussions with nurses at the hospital after consensus agreed that the reason why most of them reported moderate severity was due to the fact that several

infection control measures were being implemented by the hospital including; universal precautions, use of safety engineered sharps and fairly good management of healthcare sharps by collection in puncture proof containers and disposal through incineration. This was in line with the requirements under the national policies on healthcare waste management and injection safety (MoH, 2007). It was however observed that not all health workers were familiar with the use of auto-retractable needles which partly explains the occurrence of sharps injuries despite the efforts in place. , However some of the nurses during the focus group discussions were of the opinion that improvements need to be done especially with regard to the segregation and disposal of medical sharps at the hospital. This was noted and recommendations on the management of medical sharps were included in this study.

4.2.2. Risks of exposure to healthcare sharps

The risk of exposure to healthcare sharps in this study were needle pricks, cuts, glove tear, bloods splash, abrasion, bruise, urine splash and occupational infections. The finding that most respondents in this study suffered a needle prick compares favorably with a study at a Karachi Hospital (Ahmad *et al.*, 2008) which found that needle stick was the commonest (78%) type of exposure to blood and fluids compared to other forms of exposure such as injury by other sharps. In this study, 76% of the injuries were caused by needles; similarly injection needles caused most 76% of sharps injuries at Witbank hospital in South Africa (Lachowicz *et al.*, 2009). In this study, (24) 18% of the respondents reported to contract upper respiratory tract infection (URTI) at the hospital while (3) 2% of respondents reported to have contracted pulmonary tuberculosis at the hospital. It is therefore critical that healthcare workers should be protected from needle stick injuries that are a risk for infection, illness, disability and death from acute hepatitis,

chronic hepatitis, hepatocellular carcinoma and AIDS. It is estimated that about 4.4% (0.8%–18.5%) of HIV infections among HCWs may be attributable to occupational sharps injuries worldwide (Pruss-Ustun *et al.*, 2005).

In this study, 0.3% of the respondents reported to be infected with HIV/AIDS. This was observed that it could be higher due to low reporting of medical sharps injury and the stigma associated with infections such as HIV/AIDS. It is therefore vital to improve on the reporting of medical sharps injuries at the hospital and improve on the uptake of post-exposure prophylaxis.

Focus group discussions with nurses revealed that they were aware of the dangers faced by exposure to contaminated medical sharps. Some of the nurses were not comfortable discussing the subject of HIV/AIDS infection due to the possibility of stigmatization. It was however agreed that the reporting of such injuries should be improved especially on the reporting format and procedure. The participants wanted a simple and comprehensive format and content for the injury reporting logs which is recommended in this study.

4.2.3. Factors contributing to occurrence of healthcare sharps injuries

4.2.3.1. Gender

Both female and male health workers had the same chances of sharps injuries at the hospital. This study showed that there was no significant association between genders with healthcare sharp injury. Similar findings were reported in a cross-sectional study in Serdang Hospital Malaysia (Rampal *et al.*, 2010). These findings are however different from those of another study (El-Hazmi and Al-Majid, 2008) in which more than 60% of the reported injuries involved female employees, mostly nurses. Another study (Mehrdad *et al.*, 2008) found that male nurses had higher odds of experiencing an injury than female

nurses. Possible explanations could be that men are assigned more risky tasks or are less likely to use universal precautions. In this study it could be explained that since the healthcare staff in the same job cadre such as nurses perform similar tasks, whether they are male or female, there is therefore no significant difference in exposure between the male and female health workers at the hospital.

4.2.3.2. Working in hospital departments

Respondents working in the critical care section were at a higher risk of being injured by medical sharps, as compared to other sections in the hospital. Similar results were obtained in the United States of America (Perry and Jagger, 2005), where it was observed that the proportion of injuries in intensive care units from suture needles rose significantly.

One possible explanation for the similarity as obtained from discussions from the key informants mainly the infection control nurses was that safer alternatives to sharp tipped suture needles had not been as widely adopted as other types of safety engineered needles. Blunt tip suture needles which are sharps enough for suturing sub-cutanous tissue but not sharp enough in most cases, to penetrate skin, provide a safer alternative to sharp tip ones.

Medicine department also recorded a high incident of injuries which compares well with a cross-sectional study in Serdang Hospital Malaysia (Ramphal *et al.*, 2010) where the medical ward reported the highest 51.9% cases of sharps injuries. Another study (Ng *et al.*, 2002) found that the medical staff yielded the highest 40.2% proportion of sharps injuries. In this study, even though the medical ward reported highest cases of sharps injury, it was not statistically significant. The possible explanation for the high cases of

sharps injury in this section could be due to the fact that the medical section provides nursing care to many patients which involve the use of injections to administer medication. Therefore it could be that in the process of injecting the patients, healthcare workers are injured. Other reasons for this could be the unsafe practice of recapping of used needles by the healthcare workers, which is one of the unsafe practices that increases the risk of sharps injury. In this study, it was noted to be contrary to the requirements under the national policy on injection safety which discourages such behaviour (MoH, 2007 b).

4.2.3.3. Education level

Most respondents with a diploma education and above stand a lower chance of being involved in a sharps injury incident at the hospital as compared to those with an education level of secondary school and below. These results are similar from those obtained in another study, (Ghofranipour *et al.*, 2009), where nurses with academic qualifications were at a lower risk of sharps injury than those without academic qualifications. However, different results were obtained in a study in three hospitals in china (Tang *et al.*, 2009) which found no relationship between the level of education among respondents and the risk of sharps injury at the hospitals.

The similarity of results when considering the education level of respondents and the risks of sharps injury could be explained by the fact that those healthcare workers with higher level of education are thought to take more precautions when handling sharps since they are aware of the risks involved as compared to those with lower levels of education who may not know the risks involved when handling healthcare sharps. On the other hand, difference in the results could be due to the design used, whereby (Tang *et al.*,

2009) utilized the case-cross over design to evaluate risk factors for occupational exposure to blood borne pathogens.

4.2.3.4. Job cadre

Considering the independent variable of job cadres at the hospital, respondents working as nurses stand a higher chance of being involved in a sharps injury incident as compared to those working in other job cadres in the hospital. This compares well with a cross-sectional study in Serdang Hospital Malaysia (Ramphal *et al.*, 2010) which found that staff nurses had the highest prevalence 27.9% of sharps injuries. Another study in Saudi Arabia (El-Hazmi and Al-Majid, 2008) also found that the most reported needle stick injury involved the nursing staff 45% followed by doctors 26% and then downstream staff 24.8%. Nurses experience the majority of needle stick injuries in the world including half of the exposures that occur in the US (CDC, 2008; Prüss-Üstün *et al*., 2003), and 70% of exposures occurring in Canada (CCOHS, 2000).

Focus group discussion by the researcher with nurses at the hospital revealed that the reason why they were at the highest risk was due to the fact that they administer most of the injections and are responsible for venipunctures, intravenous fluid administration and other procedures which require the use of needles.

4.2.3.5. Training in ICP

The current study shows that the hospital conducts continuous medical education for her healthcare workers with focus on training in infection control and prevention. Of those with such training, several 43% respondents were involved in a sharps injury incident, while many 57% were not involved. The results show that training in infection control and prevention has a positive effect on the reduction of the risk of sharps injury among

healthcare workers at the hospital, even although the results are not statistically significant (OR: 1.256, 95%CI: 0.642-2.457, P=0.62). Similarly, a study in Pakistan (Janjua *et al.*, 2010) found that a higher knowledge of the risks of exposure to medical sharps was associated with fewer injuries, while a lack of professional qualification was associated with more incidents of sharps injury. In this study, the reason why the training does not give the maximum positive effect could be attributed to the methodology of the training program. It was observed that if the approach of the continuous medical training could be changed by emphasizing on attitude change among health workers such as nurses and doctors towards handling and accounting for healthcare sharps, it may lead to the desired positive effect of reducing or eliminating such risks. Continuous medical education programs have been proven to be effective in reducing the risk of sharps injury where Healthcare workers who never attended blood borne transmission prevention education programs were more likely to experience sharps injuries; a lack of knowledge could also put the HCWs in danger of injury (Tang *et al.*, 2009).

4.2.3.6. Years of Service

In this study, there is little association between duration of service and the risk of healthcare sharp injury where several 45.9% respondents with above five years of service at the hospital were involved in a sharps injury incident although there is no statistical significance. Similar results were obtained in other studies (Vecchio, *et al.*, 2005; Rampal *et al.*, 2010)) which also found little difference in the likelihood of injury on the basis of work experience when comparing nurses and other health workers who had worked for a period of five years and those who had worked for less than five years. However, in another study (Alamgir and Yu, 2008) on the epidemiology of occupational injury among

cleaners in healthcare settings in the Canadian Province of British Columbia, the study found that cleaners with more than 10 years of experience were at significant lower risk for all injury incidents.

Healthcare workers with less years of experience are likely to be at a higher risk of medical sharps injury than their counterparts with more than 10 years of work expertise. This could be due to the increased skill and good practice in handling of sharps better than those with fewer years of experience in healthcare settings such as the hospital.

4.2.3.7. Duration of work

The finding that daily duration of work by respondents at the hospital has no effect on the risk of being involved in a sharps injury incident is different from results obtained in another study (Ilhan *et al.*, 2006), at a university hospital in turkey, whereby fatigue was associated with the occurrence of medical sharps injury.

The explanation for this difference could be due to the fact that health workers in the hospital have a controlled shift system that regulates the duration of their work. Focus group discussion with nurses revealed that they work for 8 hours a day, except when there is an emergency, which could require them to extend. Key informant discussion revealed that there are two shifts; one from 8: 00am to 8:00pm and the other from 8:00pm to 8:00am with a change over period in between. These facts could explain the reason why there were very few health workers who reported to be overworked and the findings that no association was found between duration of work and the risk of sharps injury.

In other studies (Mustafa *et al.*, 2006; Fisman *et al.*, 2007) it was found that health workers had worked more hours per week and slept less the night before the injury than did other workers and that fatigue increased injury risk in the study population as a whole. However, t

this effect was limited to medical trainees and was absent for other healthcare workers. In another study, (Clarke *et al*, 2002) poor organizational climate and high workloads were associated with increase in the likelihood of needle stick injuries and near-miss incidents to hospital nurses. In a longitudinal study (Trinkoff *et al.*, 2007), it was found that working for 13 or more hours per day, at least once per week, was significantly associated with needle stick injuries among registered nurses. The main difference in these findings with other studies is that, in this study, most healthcare workers worked for eight or less hours, which could not lead to fatigue, however, there could be chances of high intensity of work among the nurses which could lead to exhaustion.

4.2.3.8. HBC Vaccination status

The results of this study showed that there was no statistical significance between HBV vaccination status among the respondents at the hospital and the risk of being involved in a sharps injury incident. Similar results were obtained in another study (Gershon *et al.*, 2007). The explanation for this could be due to the fact that there was a wide coverage with hepatitis B vaccination, due to continued awareness on the same by the infection control section. However, the exposure to healthcare sharps among healthcare workers at the hospital and the lack of exposure documentation were great concerns, which could mean that although HBV vaccination continues to be successful, the personal precautions against sharps could be declining, probably with the assumption that HBV vaccination would adequately take care of any risks associated with sharps injuries.

4.2.3.9. Unsafe practices

In this study, 27.9% of the respondents indicated that they were injured by a medical sharp during recapping. These findings were consistent with those of many studies on accidental exposure to blood borne pathogens in healthcare settings. This compares favorably with a

study in Kenya (Ngesa, 2008) which found that recapping of needles was the second leading cause of needle stick injuries, which caused (19/94) 20.2% of the total injuries by medical sharps. Similarly, other studies (Tetali *et al.*, 2006; Morkel *et al*, 2007; Musharrafieh *et al.*, 2008 and Lachowicz *et al.*, 2009) found that most exposures to needle pricks were due to recapping of needles. This is a practice which should not be performed, unless it is done with the one-handed method, as outlined in the OSHA Blood borne Pathogen Standard. This bad habit can also be reduced through good work practices by the healthcare workers. Focus group discussion with nurses revealed that recapping is a habit that has been discouraged for a long time but some health workers just find themselves doing so, even though it's risky.

They also indicated that it would be important to focus on the individual attitude change towards unsafe practices which could also reduce the risk it poses to other health workers.

In this study, few respondents indicated that they use auto-retractable needles. The best way to protect against needle stick injuries is the use of safety devices. These devices are a suitable and important tool in the reduction of needle stick injuries. The implementation of safety devices should result in an improvement in medical staff's health and safety (Cullen *et al*., 2006; Clarke *et al*., 2002; Suzuki *et al*., 2006; Visser 2006). The safety devices should be easy to activate, intuitive to use, activated with one hand, should not hinder use, and should have clear awareness of activation. A frequent argument against safer devices is the higher price compared with conventional sharps. Nevertheless, besides the commercial relevance there are ethical values such as protecting the health of hospital staff from known risks and harm that should not be ignored (Wijk *et al*., 2006b).

The new generation of devices has shown a high degree of safety efficacy, especially those used for vascular access and for drawing blood. These are the procedures that are associated with the greatest risk of blood-borne pathogen transmission. Other studies (Mendelson *et al.*,

2000; Lamontagne *et al*., 2007) have reported reductions in the number of injuries from needles for drawing blood after the introduction of safety-engineered alternatives. Furthermore sharp injuries could be reduced by 70% if recapping was avoided and needles were disposed promptly into puncture resistant containers (Mehrdad *et al.*, 2008). Therefore, HCWs should be encouraged to discontinue the recapping practice and to dispose used needles immediately. Furthermore, continuous training on the use of safety enhanced devices, (e.g., shielding, sheathing, or retracting) should be done to HCWs at Kenyatta National Hospital.

4.2.3.10. Uncooperative patients

Other factors that were mentioned to have contributed to sharps injury are the overuse of medical sharps and uncooperative patients. Similar findings were obtained in a study (Newson and Kiwanuka, 2002) which reported that most needle stick injuries occurred when patients moved since the patients feared injections and were not well prepared for it. Focus group discussion with nurses confirmed that these incidents could be reduced by preparing patients before procedures to avoid unexpected movements.

4.2.4. Measures to control and manage healthcare sharps injuries

The Kenyatta National Hospital infection Control Policy (Mboloi, 1999) require that following a needle stick injury, the affected individual should immediately sound for emergency to the nearest colleague and obtain immediate first aid that involves bleeding the site, washing it thoroughly with water or normal saline and covering it with a water proof dressing. The incidence should be recorded in the incidence book. The doctor is then informed to assess the risk associated with this exposure and evaluate the source and affected

member of staff by providing counseling and clinical assessment. A doctor will then assess whether there is need for post-exposure prophylaxis or follow up for Hepatitis B or C and attend to the patient accordingly (Mboloi, 1999). The post exposure prophylaxis should ideally be provided within 2-4 hours (Ducel *et al*, 2002).

During a discussion with the senior infection control nurse as a key informant at the infection control section, it was revealed that the above process was very long and tedious when an individual is involved in a sharps incident. The reporting format in a general incident book needed to be changed in to a simple log form that captures key relevant issues to the incident for quick action. During focus group discussion, some nurses stated that "there is no need to report if the victim would not be compensated".

Vaccination is one of the best ways to protect HCWs from infections, but vaccination is only available for HBV. In the present study, 70% of the respondents indicated that the hospital provides vaccination services to the health workers. On the other hand 30% of the respondents indicated that they were not vaccinated against Hepatitis B. This finding is lower than that found from a study at a Karachi Hospital (Ali Ahmad *et al.*, 2008) which found that most 83% of the health workers were vaccinated against Hepatitis B while only 17% were not vaccinated. Slightly more than half of the respondents 51% that were vaccinated were nurses. Respondents who were not vaccinated gave various reasons as to why they were not vaccinated. Some indicated that they fear the side effects of vaccination, they fear contracting injections in the process of vaccination, they did not complete the dose, and others were too busy, while some indicated that the vaccination service was not provided to them.

The finding that 72% of respondents dispose used sharps in plastic containers after procedures is much lower than the findings with one study (Nkuchia M. Mikanatha *et al.*,

2007) who found that sharps disposal containers were always available and that 82% of health workers always used them. In this study, 63% respondents indicated that they dispose medical sharps in safety boxes and 1.3% of respondents indicated that they dispose medical sharps in plastic bags. It is clear that there remains a challenge of managing medical sharps waste at the hospital given the fact that some health workers could still mix sharps waste with other wastes in plastic bags.

During the visits by the researcher at the hospital departments the challenge of mixing medical sharps with other clinical was mainly observed in the accident and emergency and medical wards sections.

Key informant discussions with the senior public health officer revealed that medical waste monitoring protocols were being developed by the Public Health department at the hospital and prevention strategies would target medical sharps disposal containers (both fixed and portable), and ensuring that they are available in adequate numbers, placed in appropriate locations, with protocols for replacing the containers when ¾ full.

Although the hospital provides for post-exposure prophylaxis, not all respondents seek for post-exposure prophylaxis. This finding compares favourably with one study (Taegtmeyer *et al.*, 2008) which found that the uptake of those requiring post exposure prophylaxes for Hepatitis B vaccination was low (4%) of those who had a needle stick injury. During focus group discussions with nurses at the hospital, it was revealed that the reasons for not seeking post exposure prophylaxes were that; the injury was mild and not serious; the source was HIV sero-nagative, the procedure for PEP was complicated, or, they were busy or afraid to seek for the PEP.

In this study, 75% respondents indicated that the hospital management conducts continuous medical education on safety, health and environment which could determine the waste management practices and responsibilities at the hospital. The hospital reportedly conducted annual environmental audit which covers aspects of waste management. One of the critical concerns is the disposal of healthcare sharps though incineration process. It was not certain as to whether the incineration standards were adhered to or not since this was not covered in the scope of this research. However, the fact that annual environmental and occupational safety audits are conducted by the hospital management shows how keen they are on compliance to relevant waste management policies and regulations.

4.2.5. Reporting of healthcare sharps injuries

In this study, the finding that 64% respondents did not report the occurrence of healthcare sharps injury is consistent with other studies from Africa and other developing countries, which found that between 60%-70% of injuries, were not reported (Nsubuga and Kosgerugin, 2004). This picture was similar in the developed countries where findings of other studies (Cutter and Jordan, 2004; Haiduven *et al.*, 1999) on underreporting indicate that up to 80% of injuries were not reported.

Focus group discussions with nurses revealed that the reason why they did not report the injury included; cumbersome reporting procedure, not aware of the procedure, and some indicated that it was time consuming. The most common reason cited for not reporting was that the respondents did not consider the patient to be of high risk, followed by the needle was sterile, and that the reporting mechanism was too long. All occupational exposure should be reported so that accurate risks assessment, appropriate preventive measures and post exposure prophylaxis can be undertaken. Failure to report sharps injuries according to

institutional and national protocol indicates a disregard to personal safety, management policy and guidelines (Ngesa, 2008).

4.3. Implications of the study findings

The findings suggest that most respondents suffered a needle prick and that they were injured 1-2 times in the course of their practice at the hospital. These were reported incidents of which the real cases could be higher due to recall bias on the part of the respondents. This means there could be more cases that were not reported in this study, therefore a stringent surveillance mechanism to complement improved reporting systems needs to be implemented to address the frequency of sharps injuries and establish root causes.

The results also suggest that most respondents suffered moderate sharps injuries. In the event of severe injuries, there is a predisposition to the risk of acquiring blood borne infections such as HIV/AIDS. The respondents who suffer sharps injuries experience anxiety and worry on the implications of injuries on their lives and career. They spend considerable time seeking for treatment after exposure which would have been used in attending to the sick. The hospital may also lose workforce or incur high costs in treating health workers due to sharps injuries. The low reporting rate of sharps injury occurrence among health workers at the hospital suggests that the workers perceive the current reporting mechanism as ineffective, as earlier mentioned, the real cases of sharps injuries could be higher if they were all reported and documented.

The study findings suggest that the factors that contribute to occurrence of sharps injuries at the hospital include: working in the critical care section, medical wards, and education level secondary and below, the high incidence of sharps injuries among the job cadre of nurses who are mostly involved in procedures that use medical sharps, unsafe practices such as

recapping which is discouraged in health practice due to the risks associated with it. This would not be the case if a holistic change from the ordinary sharps to devices those with safety features would be done to reduce cases of sharps injuries.

The hospital has put in place several measures to control and manage incidents of sharps injury which have been effective to a certain degree, although these measures need to be evaluated and improved by putting in place several corrective measures as recommended in this research.

4.4. Further research

This study identified the following areas for further research;

i. Factors leading to non-reporting of occupational injuries among health workers at the hospital
ii. The extent of occupational risks among healthcare waste handlers at the hospital
iii. The level of compliance by the hospital to the national healthcare waste management standards, regulations and policies

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusion

This study concludes that; there was a high occurrence of medical sharps injuries among healthcare workers at the hospital. Furthermore there are several risks associated with handling healthcare sharps among healthcare workers at the hospital, which include; needle pricks that could result to cases of occupational infections such as HIV/AIDS.

The factors that contribute to occupational injury by healthcare sharps at the hospital include; unsafe practices such as recapping of needles, working in the critical care section and the medical department, working in the job cadre of a nurse or nursing student, healthcare workers with an education level of secondary education and below, lack of reporting of sharps incidents or near misses.

The hospital has partly adopted the use of safety engineered devices; however there is low reporting of sharps injuries, low utilization of post exposure prophylaxis and inadequate supply of safety boxes.

5.2. Recommendations

Several recommendations to be implemented at the hospital were identified as discussed below. Special attention should be given to the nurses, cleaners, the critical care section and the department of medicine at the hospital when addressing the mentioned issues.

There is need for health workers in sections such as the critical care section and department of medicine to be fully trained on the use of safety engineered devices such as auto-retractable needles or blunt tipped suture needles to reduce incidents of sharps injuries.

The infection control nurses should evaluate the effectiveness and efficiency of the continuous medical education program and consider using a new approach to change the attitude of handling medical sharps among health workers from engaging in unsafe practices to that of taking personal responsibility and accountability.

The public health department should ensure adequate supply of safety boxes, proper use, timely collection of used medial sharps in puncture proof containers such as safety boxes that should be ¾ full when emptying and safe transportation in a covered vehicle for incineration.

All the heads of departments should improve the reporting of sharps injuries by designing a log form that captures information on the demographic data of the employee, date and time of injury, type of sharp, procedure involved, part of body involved, where it occurred and how the exposure incident occurred.

The log forms can be entered in a data base and be used for surveillance of injuries in the hospital. The data obtained should be analyzed in order to understand root causes, conduct surveillance and prevent further occurrence of injury.

The infection control nurses should ensure that those who are injured and require post-exposure prophylaxis go through counseling and are followed up to enhance adherence to the same.

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5.4. Appendices

Appendix 1: Informed Consent

Dear Respondent,

Please read and understand before signing the consent form below.

Title: Factors contributing to Occupation Injury Risks by Healthcare Sharps among Healthcare Workers at Kenyatta National Hospital, Nairobi, Kenya.

By: Kennedy Simiyu Wafula (Bsc):-Kenyatta University, Nairobi, Kenya)

This descriptive cross-sectional study aims at establishing the factors that contribute to occupational health risks of handling healthcare sharps among health workers at Kenyatta National Hospital, Nairobi, Kenya. This 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 health workers. The results of this research might assist the hospital to identify suspected cases of adverse health effects of health-care sharps and provide a basis for introducing control measures. It may also be useful in for assessing the efficacy of existing infection control measures and routine preventive measures taken by the hospital.

This study and its procedures have been approved by the Graduate School board, the school of Public Health, Kenyatta University and the Ethics and Research committee of Kenyatta National Hospital. The procedure includes voluntary participation and responding honestly and accurately. All information given will be confidential and anonymous. Structured questionnaires which comprise closed and multiple choice questions, interview schedule 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 Kenyatta University as part of the requirement for the degree of Master of Public Health.

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:……

Department:……

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: Questionnaire

Please indicate your answer with a tick (√).

1. Gender.
   - ☐ Male
   - ☐ Female
2. What is your highest education level?
   - ☐ Secondary
   - ☐ Diploma
   - ☐ Degree
   - ☐ Masters
   - ☐ Doctorate
3. What is your job cadre?
   - ☐ Nurse
   - ☐ Medical doctor
   - ☐ Surgeon
   - ☐ Student (specify)……...
   - ☐ Laboratory technician
   - ☐ Clinical officer
   - ☐ Public health officer
   - ☐ Public health technician
   - ☐ Cleaner
   - ☐ Any other (specify……..
4. Were you trained in infection control during your professional training?
   - ☐ Yes
   - ☐ No
5. How long have you worked in the above job cadre at the hospital?
   - ☐ ‹1 Year
   - ☐ 1-5 Years
   - ☐ 5-10 Years
   - ☐ 10-15 Years
   - ☐ 15-20 Years
   - ☐ 20-25 Years
   - ☐ 25-30 Years
   - ☐ »30 Years
6. How long do you work (on a daily basis) at the hospital?
   - ☐ < 1 Hour
   - ☐ 1-4Hour
   - ☐ 5-8 Hours
   - ☐ >8 Hour

7. Are you given clear work procedures/guidelines in your job cadre?
   - ☐ Yes
   - ☐ No
8. What types of sharps do you handle in the course of your job?
   - ☐ Needle
   - ☐ Blade
   - ☐ Scalpel

- ☐ Slide
- ☐ Broken Glass(e.g. vials/Ampoules)
- ☐ Broken Thermometer
- ☐ Any other (specify……..
- ☐ Not applicable

9. Which of the following sharps are fitted with safety features?
    - ☐ Needles
    - ☐ Blades
    - ☐ Scalpels
    - ☐ Slides
    - ☐ Other (specify)…….
10. Do you use syringes with the autorectractable needles?
    - ☐ Yes
    - ☐ No
11. Have you been involved in any accident/risk related to handling healthcare sharps?
    - ☐ Yes
    - ☐ No (then go to question number 22)
12. Which of the following incidents/accidents/risks, have you been involved in the course of your work?
    - ☐ Needle prick
    - ☐ Cut
    - ☐ Bruise
    - ☐ Abrasion
    - ☐ Infection related to sharps injury (specify)
    - ☐ Blood splash
    - ☐ Glove tear while handling sharps
    - ☐ Any other (specify)……..
13. What type of sharp instrument caused the accident/injury mentioned in question 12 above?
    - ☐ Needle
    - ☐ Blade
    - ☐ Scalpel
    - ☐ Slide
    - ☐ Broken Glass(e.g. vials/Ampoules)
    - ☐ Broken Thermometer
    - ☐ Any other (specify……..
    - ☐ Not applicable
14. How would you classify the incident /risk mentioned in question 12 above?
    - ☐ Superficial/Mild (no bleeding)
    - ☐ Moderate (skin punctured, some bleeding)
    - ☐ Severe (profuse bleeding)
    - ☐ Fatal (led to disability)
15. During what procedure or activity did the incident /accident mentioned in question 12 above occur?
    - ☐ Recapping
    - ☐ Disposal
    - ☐ Suturing
    - ☐ Passing with hand
    - ☐ Collection from basin/receptacle
    - ☐ Cutting
    - ☐ Disassembly/ detaching
    - ☐ Inflicted by other person using the device

- ☐ Sharps in unexpected areas e.g. locker, linen etc
- ☐ Any other (specify)……

16. Which part of your body was affected by the incident/accident mentioned in question 12 above?
    - ☐ Left hand
    - ☐ Right hand
    - ☐ Left foot
    - ☐ Right foot
    - ☐ Face
    - ☐ Other (specify)…….
17. How many times in the course of your practice at the hospital have you experienced the accidents/risks mentioned in question 12 above?
    - ☐ O
    - ☐ 1-2
    - ☐ 3-4
    - ☐ 5-10
    - ☐ >10
18. Did you seek for Post exposure prophylaxis?
    - ☐ Yes
    - ☐ No
19. If the answer to question 18 above is NO, then why did not you seek for it (PEP)?
    ……..
20. Did you report the incident /Accident that occurred?
    - ☐ Yes
    - ☐ No
21. If the answer to question 20 above is No, then why did you not report the incident/accident?
    ……...

    ……
22. Are there standard guidelines for handling used disposable healthcare sharps?
    - ☐ Yes
    - ☐ No
    - ☐ Don't know
23. Where do you dispose used healthcare sharps after procedures?
    - ☐ Safety boxes
    - ☐ Plastic bags
    - ☐ Left on the floor
    - ☐ Plastic containers (specify)…….
    - ☐ Left on the operating table
    - ☐ Mixed with other wastes
    - ☐ Other (specify)…….
24. What personal protective equipment/ material does the hospital provide for your use?
    - ☐ Masks
    - ☐ Gloves
    - ☐ Aprons
    - ☐ Overalls
    - ☐ Lab coats
    - ☐ Safety boots
    - ☐ Safety goggles

- ☐ Creams (specify)……
- ☐ Other (specify)……

25. Are the personal protective equipments provided adequate for use all the time?
    - ☐ Yes
    - ☐ No (explain briefly) …….
26. How often do you use the personal protective equipment/ material listed in question 24 above?
    - ☐ Always
    - ☐ Occasionally
    - ☐ Rarely
    - ☐ Not at all
27. What would you consider as the contributing factor(s) to the incident/accident mentioned in question 12 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)

28. Have you been vaccinated against Hepatitis B?
    - ☐ Yes
    - ☐ No
29. If the answer to question 28 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 fear injections
    - ☐ Fear of side effects of the vaccination
    - ☐ Any other reason (state)……
30. Have you ever contracted any occupational related infection at the hospital?
    - ☐ Yes
    - ☐ No (proceed to question 33 below)
31. Which one of the following infection did you contract in the course of your occupation/job at the hospital
    - ☐ Hepatitis B
    - ☐ Hepatitis C
    - ☐ Tetanus
    - ☐ HIV/AIDS
    - ☐ Any other (specify)……..
32. What steps did you take to handle the infection(s) in question 31 above?

    ……

33. What measures has the hospital management put in place to control occupational related infections caused by HBV, HCV and HIV?
    - ☐ Eliminating unnecessary sharps

- ☐ Vaccination
- ☐ Providing post-exposure testing
- ☐ Providing post-exposure prophylaxis
- ☐ 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
- ☐ Establishing an occupational safety and health committee
- ☐ Establishing a needle stick committee
- ☐ Any other (specify)……..

34. What measures would you suggest the hospital management puts in place to better control occupational risks of healthcare sharps?.....

Appendix 3 Observation guide

Research Checklist for Observing Occupational Risks Related to Exposure to Medical sharps	**Department/ Section/unit**	**Date**
Key Aspect	**Observation (s)**	**Remark(s)**
1. Type of medical sharps generated		
2. Disposal method for the medical sharps		
3. Housekeeping		
4. Exposure controls in place such as; a) Universal (or standard) precautions b) Hand washing c) Covering cuts and abrasions d) Elimination of unnecessary injection e) Elimination of sharps from IV piggybacks		
5. Use of safe injection devices ; a) Injection devices b) IV insertion devices c) Phlebotomy devices d) Sutures e) Lancets f) No recapping of needles		
6. Availability and use of Personal protective equipment (PPE) a) Gloves available whenever risk of exposure to blood (non-latex gloves for allergic workers) b) Masks c) Face shield d) Gowns e) TB respirators f) Other(s)		

7. Procedure for evaluating the circumstances surrounding an exposure incident to analyze for preventive measures		
8. Post-exposure evaluation,counseling,and follow-up including prophylaxis within 2 hours of exposure		
9. Recordkeeping: log book and use of data for prevention a) Type and brand of device involved in exposure incident b) Department or work area where exposure occurred c) An explanation of how exposure occurred d) Other important information to track: job classification of exposed workers, procedure involved, and whether the device causing the injury was a safety or conventional design.		
10. Other relevant aspect (s)considered		

Appendix 4: Approval Letter to Conduct Research at KNH

KENYATTA NATIONAL HOSPITAL
Hospital Rd. along, Ngong Rd.
P.O. Box 20723, Nairobi.
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP", Nairobi.
Email: KNHplan@Ken.Healthnet.org

22nd July 2010

Ref: KNH-ERC/ A/540

Mr. Kennedy Simiyu Wafula
Reg. No.157/12634/05
School of Public Health
Kenyatta University

Dear Mr. Wafula

RESEARCH PROPOSAL: "FACTORS CONTRIBUTING TO OCCUPATIONAL INJURY RISK BY HEALTHCARE SHARPS AMONG HEALTH WORKERS AT KENYATTA N. HOSPITAL, NAIROBI-KENYA" (P200/6/2010)

This is to inform you that the KNH/UON-Ethics & Research Committee has reviewed and **approved** your above cited research proposal for the period 22nd July 2010 to 21st July 2011.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimens must also be obtained from KNH/UON-Ethics & Research Committee for each batch.

On behalf of the Committee, I wish you a fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of the data base that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH/UON-ERC

c.c. Prof. K. M. Bhatt, Chairperson, KNH/UON-ERC
The Deputy Director CS, KNH
The HOD, Records, KNH
Supervisors: Dr. A Augustine Afullo, Dept.of Public Health, Kenyatta University
Dr. Margaret Keraka,Dept. of Public Health, Kenyatta University

Appendix 5: Location of Study area

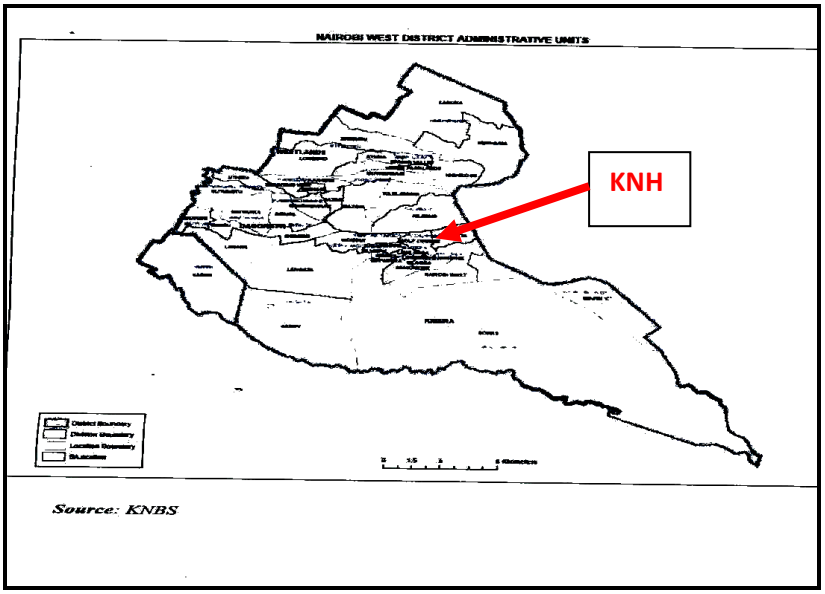

Figure 16: Location of Kenyatta National Hospital, Nairobi West District