OUTCOMES OF PREVENTIVE AND CONTROL MEASURES OF MEDICAL SHARPS INJURIES AMONG HEALTHCARE WORKERS AT SUB-COUNTY FACILITIES IN MOMBASA, KENYA

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Outcomes Of Preventive and Control Measures Against Medical Sharps Injuries Among Healthcare Workers at Sub-County Facilities in Mombasa, Kenya

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DECLARATION

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

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This thesis has been submitted for examination with our approval as University Supervisor.

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DEDICATION

The thesis is dedicated to my family, for their unceasing love and supports especially my husband who has always been by my side and children who have had to tolerate an ever busy mummy and also to THE ALMIGHTY ALLAH for being there for me in good times and hard times too, love you all

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ABBREVIATIONS AND ACRONYMS

A & E Accident and Emergency

AIDS Acquired Immunodeficiency Syndrome

BLS Bureau of Labour Statistics

CDC Center for disease control

HIV Human Immunodeficiency Virus

HBV Hepatitis B Virus

HCV Hepatitis C Virus

HCW Health Care Workers

HCP Health Care Practitioners

NIOSH National Institute of Occupational Safety and Health

NSI Needle Stick Injuries

OPIM Other potentially Infectious Material

OSH Occupational Safety and Health

PEP Post Exposure Prophylaxis

SPSS Statistical Package for Social Science

WHO World Health Organization

DEFINITION OF TERMS

Engineering controls: Engineering controls protect workers by removing hazardous conditions or by placing a barrier between the worker and the hazard.

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.

HealthCare workers: All people delivering health care services, including students, trainees, laboratory staff and mortuary attendants, who have direct contact with patients or with a patient's blood or body substances.

Hierarchy of Controls: This is a system used in industry to minimize or eliminate exposure to hazards they include; administrative controls, engineering controls, personal protective equipment and work practice controls.

Medical sharps: Any object, needles, scalpel, broken glass used in the healthcare setting that can penetrate the skin including.

Medical sharps injury: A sharps injury is an incident, which causes a needle, blade (such as scalpel) or other medical instruments to penetrate the skin. It is sometimes called a percutaneous injury

Needle stick injury: Accidental penetration of the skin stab caused by needles.

Needleless System: A device that does not use a needle for: The collection of bodily fluids or withdrawal of body fluids after initial venous or arterial access is established.

Personal Protective Equipment (PPE): A part of standard precautions for all healthcare workers to prevent skin and mucous membrane exposure, PPE include protective laboratory clothing, disposable gloves, eye protection and face masks.

Post-exposure prophylaxis: A short term antiretroviral treatment to reduce the likelihood of HIV infection after potential exposure**.**

Recapping: The replacing of a protective sheath on a needle after use.

Risk: A combination of the likelihood of an occurrence of a hazardous event and the severity of the injury.

Safety device: A non-needle sharp or a needle device with a built-in safety feature or mechanism that effectively reduces the risk of an exposure incident.

ABSTRACT

Globally, over two million Healthcare workers suffer needle-stick injuries (NSI) per year leading to Hepatitis B, C and HIV infections. In Kenya 58% of healthcare workers have suffered these injuries. Main objective of this research was to determine the outcomes of control measures against medical sharps and needle-stick injuries amongst Health Care workers (HCW) at Sub-County hospitals in Mombasa County and specifically types of controls measures available, health workers adherence to safety guidelines, knowledge and training on control measures and the prevalence of needle-stick injuries at the sub-county hospitals. A descriptive cross sectional research design was utilized and focused on nurses, Clinical Officers, Lab Technologists, Public health officers, dentists, waste handlers/support staff that were selected via stratified random sampling. Questionnaire, Interviews and a checklist was also used to collect data. The Data analysis was done by use of Statistical Package for Social Sciences (SPSS), version 22.0. This study found that availability of sharps installed with safety features reduced sharps injuries but were not readily available. The use of sharp disposal containers was one of the most commonly used method of sharps disposal (95.7 %.) and had significant reduction in exposure to sharp injuries. A minority, 39.1% of those with professional training were exposed to sharp injuries. 50% of those without professional training had injuries indicating that training back in college had insignificant importance in preventing sharps injuries [X^2 (DF= 2, N= 117) = 0.0545, p= 0.05]. 91.3% of professional trained healthcare workers also exhibited adherence where they were found to use safety boxes as a proper way of disposing used sharps [X^2 (DF= 2, N= 117) = 0.045, p= 0.05]. Personal protective equipment such as safety boots had a positive impact in reducing exposure where only 36.8% of those using safety boots were exposed to sharp injuries compared to 54.1% of those without safety boots being exposed to sharp injuries [X^2 (DF= 1, N= 117) = 0.02, p= 0.05]. While others such as hand gloves had insignificant importance. In conclusion, despite the availability of engineering control measures the outcome did not positively determine if the control measures available are adequate to prevent needlestick injuries at the Hospitals. The management should therefore ensure sustainable supply and use of new and effective engineering devises, safe disposal of medical sharps, ensure availability of safety guidelines and facilitate regular training, reporting and surveillance of sharps injury cases at the three sub-county health facilities.

CHAPTER ONE

INTRODUCTION

1.1 Background

The healthcare delivery structure in Kenya is organized across six levels of care. At the lowest end is the community level (Level 1), dispensaries (Level 2), and health centers (Level 3) all offering the primary care services. Next are the county referral health services (Level 4 and 5) and at the highest level is the national referral health services (Level 6) (MoH, 2018). Healthcare facilities (HCFs) can provide services which are diagnostic, preventive, curative, and prognostic for the community. However, while they are providing these services, healthcare workers (HCWs) are exposed to blood and body fluids through splashes, medical or occupational sharps and needle-stick injuries(Cui et al; 2018). This research therefore focuses on sub-county (level 4) healthcare facilities, healthcare workers and the preventive and control measures against medical sharp injuries in these facilities.

Medical sharps injuries have been recognized as one of the occupational hazards among healthcare workers and are caused by different types of needles and sharps, such as scalpels and broken glass containers. Medical sharps injuries and cause about 2 million HBV, 900, 000 HCV and 170, 000 HIV infections among health-care workers each year globally, although immunization is available to prevent hepatitis B illness, no immunization is available to prevent HCV or HIV (WHO, 2018). 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 (Fatma et al; 2017).

Globally, 3 million healthcare workers are exposed to blood borne pathogens through the percutaneous route annually, 90% of which occur in the developing countries

(WHO, 2016). The Centers for Disease Control and Prevention (CDC) estimates that 385, 000 of these needle-sticks and other medical sharps injuries occur per year among hospital workers in the United States (CDC, 2016). Other Authors have estimated the annual rate in the United States to be between 500,000 and 800,000 (Weldesamuel, et al; 2019). It is estimated that over 100,000 Needle-stick injuries occur annually in the United Kingdom alone and 500,000 annually in Germany (Kaweti et al; 2016). 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% (Bekele et al; 2015).

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 (Hossein et al; 2016). 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 (Jared et al; 2019).

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. 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 (Braun, 2017). 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

American are the result of occupational exposure (Jared et al; 2019) and 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 (Nawafleh et al; 2019).

Sub-Saharan countries in Africa have a heavy burden of HIV/AIDS and other blood borne infectious diseases and high usage of injections (USAID, 2015). 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(Cooke et al; 2017).

In developing countries, where the prevalence of HIV-infected patients is the highest in the world, the number of needle stick injuries is also highest. 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 (Jared et al; 2019). 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 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 (Auta et al; 2017). A cross sectional survey in Mauritius found that needle-stick injuries were the most common type of injury sustained by nurses (Chieko et al; 2017). 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 (Auta et al; 2017) 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 (Jaakkola, 2015).

Hospital workers in Tanzania were observed working in hazardous environments and most of them were not aware of the health and safety issues (Chalya et al, 2015). In Uganda, a cross-sectional study found an annual incidence rate of 3.94 needle-stick 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.

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, et al, 2017). In another cross sectional study, Taegtmeyer, 2018, reported that an estimated incidence of 0.97 Needlestick injuries per healthcare worker per year. 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, 2018). 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, 2018). The mentioned studies demonstrate that medical sharps injuries occur in different countries and pose serious occupational health risks to healthcare workers.

1.2 Statement of the problem

Exposure of needle stick injuries is a global problem. Every day while caring for patients, healthcare workers are at risk of exposure to blood borne pathogens due to medical sharp injuries potentially resulting in infections such as HIV or hepatitis B and C. These exposures, while preventable, are often accepted as being a part of the job (CDC, 2016). Most healthcare workers in Kenya face risk of hospital acquired infections, there are an estimated 100 HIV, 1000 HCV, and over 6,000 HBV infections that occur yearly among HCWs due to sharps injury (Glennah et al; 2015),

The HCWs in Mombasa County face a community threat with a HIV prevalence standing at a high 8.1% compared to the national 6.3% (MCIP, 2018).

Kenya has 58% of health workers at risk of injuries from injection and medical sharps equipment coupled with improper management of healthcare waste which is estimated to be in 70% of the health facilities (MoH, 2018) this is due to inadequate access and utilization of preventive and control measures for sharps injury. For instance, about 71% & 58% of medical waste handlers across Kenya lack appropriate PPE (USAID, 2018). This study will seek to find out the outcome of the preventive and controls measures currently in use at the Sub-County hospitals in Mombasa County and the level of protection they offer to the healthcare worker.

1.3 Justification

The Sub-County hospital in the country has a large population of healthcare workers. They also have various departments and represent all the variables presented in the study. Actual and potential losses are due to needle stick injuries and cause enormous problems globally and nationally. The latest reports available shows an increase in the number of health care workers (HCWs) accessing Post Exposure Prophylaxis (PEP) antiretroviral drugs due to occupational exposures such as needle-stick injuries that put the workers at risk of infection by blood-borne pathogens such as Hepatitis and HIV (MOH, 2018). The HIV prevalence in Mombasa County stands at a high 8.1% compared to the national 6.3% which call for more precaution when handling blood and other bodily fluids (MCIP, 2018).

This study is justified by first and foremost, addressing the health and Safety of the employee, its findings are hoped to prevent or alleviate suffering of the health care personnel. Secondly, since the hospital incurs expenses and loss of manpower as a result of needle stick injuries and exposure to blood borne pathogens the study will help in reducing costs due to hospitalization, and provision of PEP to its employees. It

will also provide the policy maker with evidence to improve strategies of integrating proper engineering control measures in the medical practice add to existing knowledge about sharps injury prevention and control to healthcare workers and can serve as a reference material for further research. No study on outcomes of control measures against needle-stick injuries has been carried out in the Sub-County hospitals namely Tudor, Likoni and Port Reiz Health facilities in Mombasa County.

1.4 Objectives of the study

1.4.1 General Objectives

To evaluate the outcome of preventive and control measures against medical sharps injuries amongst healthcare workers at Sub-County hospitals in Mombasa.

1.4.2 Specific Objectives

i. To identify preventive and control measures of medical sharps injuries amongst healthcare workers at Sub-County Hospitals in Mombasa County
ii. To determine the healthcare workers level of knowledge and awareness on medical sharps injuries at Sub-County Hospitals in Mombasa County.
iii. To determine the level of adherence to guidelines on medical sharps injuries control among the healthcare workers.
iv. To establish the prevalence of exposure to medical sharps injuries at Sub-County Hospitals in Mombasa County.

1.5 Research questions

i. What are the different types of preventive control measures available at the Sub-County Hospitals?
ii. What is the level of knowledge and awareness of the health care workers on the medical sharps control measures in place?

iii. Do the health workers adhere to the control measures guidelines in place at Sub-County Hospitals?

iv. What is the prevalence of needle-stick and medical sharps injuries at Sub-County Hospitals?

1.6 Scope of the study

The scope of this study focuses on Sub-County Hospitals in Mombasa County of the coastal region in Kenya. Mombasa County is segregated into 7 divisions, 18 locations and 30 sub-location and hosts 6 constituencies namely Mvita, Changamwe, Jomvu Kuu, Likoni, Kisauni and Nyali. Sub-County hospitals are health facilities located in Mombasa County namely Tudor, Likoni and Port Reiz, in the second largest city of Kenya which caters for patients from all over the coastal region.

This study focused on HCW from different job cadre which includes Nurses, Clinical Officers, Lab Technologists, Dentists /Doctors, Public Health Officers and Technicians, Waste Collectors and Cleaners Support Staff were targeted for primary data collection. Observational surveys and questionnaires were used to determine types of control measures available, knowledge, training and awareness to control measures against sharps and NSI, adherence to the safety guidelines, determine the prevalence of needle stick injuries in the hospitals for the duration of service, health records of reported cases were also used as secondary sources of data in addition to some primary data from the questionnaire. The study was limited to outcome of controls measures in preventing medical sharps and needle-stick injuries amongst HCW at the Sub-County Hospitals in Mombasa County, Kenya.

1.7 Limitations

The challenge faced is getting the interviews with the respondents since the divisional Hospitals are busy hospital and some of the HCW work in sifts, getting them was a

challenge however, we rescheduled the interviews to suit their available time and place. The respondents were required to recall incidents of needle and sharps injuries in the past history which presented its self as a challenge. It is therefore highly possible that the respondents may not have recalled all the incidents. However, the research focused on the events from the last three years of which they could easily remember. The resources for conducting the research were limited only to the three sub-county healthcare facilities. Better outcomes of preventive and control measures would have been realized by covering the Coast General Hospital since they attend to majority of the patients in the county and with a bigger number of various health care workers. The generalization of findings from this research may only be limited to healthcare workers in similar setups.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The literature review is under the following subheadings: Types of medical sharps prevention and control measures, exposure to needle stick-injuries and blood-borne pathogens, knowledge on medical sharps prevention and management Guidelines, adherence to control preventive and control measures guidelines, prevalence of NSI and related studies. The literature data search utilized a combination of key words and phrases from these subheadings.

2.1.1 Types Of preventive and Controls Measure for medical sharps injury.

Medical Sharps injuries are preventable and the overall goal should be their elimination. 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, 2018). Appropriate measures to minimize the risks of medical sharps injuries would also 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 Needle-stick and sharps injuries (Tarigan et al; 2015).

Controlling exposures to occupational hazards is the fundamental method of protecting workers; a hierarchy of controls has been used as a means of determining how to implement feasible and effective control solutions. Engineering controls are favored over administrative and personal protective equipment (PPE) for controlling existing worker exposures in the workplace because they are designed to remove the hazard at the source, before it comes in contact with the worker (CDC, 2018).

Engineering Controls include all control measures that isolate or remove a hazard from the workplace, such as sharps disposal containers and self-sheathing needles, needleless systems, needles that retract, or blunt immediately after use (CDC, 2018).

Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection. The initial cost of engineering controls can be higher than the cost of administrative controls or PPE, but over the longer term, operating costs are frequently lower, and in some instances, can provide a cost savings in other areas of the process (WHO, 2017).

2.1.1.1 Sharps Disposal Containers

Improper management of discarded needles and other sharps can pose a health risk to the public and health care workers. For example, discarded needles may expose HCW and waste workers to potential needle stick injuries and potential infection when containers break open inside garbage trucks or needles which are mistakenly sent to recycling facilities. Housekeepers also risk injury if loose sharps poke through plastic garbage bags (US Environmental management, 2016).

The correct and consistent use of sharps disposal containers in the health care environment and placement of disposal boxes in all patient and treatment rooms have shown to decreases the frequency of sharps injury (Reddy et al; 2017). Cost-benefit

studies show that when the increased costs of materials management are compared with the decrease in injury compensation costs, sharps disposal containers are cost effective even when both direct and indirect costs of injury reduction are considered (Cooke, 2017).

2.1.1.2 Auto-lock Retractable Needles

A retractable or safety syringe acts in the same manner as a traditional syringe. However, after the complete amount of fluid has been injected into a patient, the needle of the syringe quickly retracts protecting the user form accidental needle sticks and when drawing blood there is safety syringe that enacts a safety barrel over the exposed needle, protecting the user from harm(BD safety, 2019).The Centers for Disease Control and Prevention (CDC, 2018) estimates that 57 percent of needle sticks go unreported and with so many accidents happening to nurses, doctors, and phlebotomists (specialists who draw blood), it is important that safety needles become more common and eventually replace traditional syringes (BD safety, 2019).

2.1.1.3 Self-Sheathing Needles

The basic principle of the self sheathing needle is that the needle is removed from the patient and a barrel around the outside of the main casing slides forward and protects the exposed needle. After the barrel is in the forward position, it is locked in place providing a guard around the used needle. The barrel is moved by an internal spring that is released when the syringe is fully depressed, or all of the fluid is drained from the reservoir (BD safety, 2019).

2.1.1.4 Blunting Suture Needles

Suture needles are the third highest cause of reported percutaneous injuries in US hospitals and the top cause of percutaneous injuries in the surgical setting. The OSH,

2018 revised Blood-borne Pathogens standard, in response to the Needle-stick Safety and Prevention Act of 2000, requires the use of safer devices, such as blunt-tip suture needles, when clinically appropriate, to reduce the risk of needle-stick injury and subsequent pathogen transmission to personnel.

Published studies show that using blunt-tip suture needles reduces the risk of needle-stick injuries from suture needles by 69% although blunt-tip suture needles currently cost some 70 cents more than their standard suture needle counterparts, the benefits of reducing the risk of serious and potentially fatal blood-borne infections for health care personnel support their use when clinically appropriate (Santos et al; 2018). There is a difference in costs of blunt- and sharp-tip suture needles which is balanced by the economic savings associated with needle-stick injury prevention (Mannocci et al; 2016).

2.1.2 Exposure to Needle stick injuries and blood-borne infections

OSHA estimates that 5.6 million workers in the healthcare industry and related occupations are at risk of occupational exposure to blood-borne pathogens these are pathogenic microorganisms that are present in human blood and can cause disease in humans. They include Human Immunodeficiency Virus (HIV), (HBV), Hepatitis C Virus (HCV), and others (Hossein et al; 2016).

Globally, the prevention and control of infections are fundamental pillars of medical care in all health care settings. The changing pattern of infections and the emergence of multi-drugs resistance microbes highlight the need for all HCW to comprehend and put into practice evidence-based infection prevention and control practices that will protect patients and HCP from HAIs (MoH-GoK, 2018).

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. 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 (Jared et al; 2019). In Kenya there are an estimated 100 HIV, 1000 HCV, and over 6,000 HBV infections that occur yearly among HCWs due to sharps injury (Glennah et al; 2015),

2.1.2.1 HIV/AIDS

HIV, the virus that causes AIDS, is one of the world's most serious health and development challenges. According to the World Health Organization (WHO, 2018), there were approximately 35 million people worldwide living with HIV/AIDS in 2013, an estimated 2.1 million individuals worldwide became newly infected with HIV in 2018. A 2018 UNAIDS report shows that 19 million of the 35 million people living with HIV today do not know that they have the virus. HIV remains the major concern for occupation-related, infection transmission from sharps injuries, primarily because, while there are effective treatments that can reduce or delay the transition from HIV to AIDS, there is no vaccination or cure for Hep B or C(Fatma et al; 2017). They estimated the risk that a HCW may transmit HIV to one of their patients is between 0.0024% (about 1 in 42,000 procedures) to 0.00024% (about 1 in 420,000 procedures) taking into account the nature of the persons work, probability of sharp object injury and the probability that an HIV infection could be transmitted to the patient (Auta et al; 2018).

2.1.2.2 Hepatitis B

Hepatitis means "inflammation of the liver," and can be caused by a number of agents or conditions including drugs, toxins, autoimmune disease, and infectious agents including viruses (Chieko et al; 2017). Hepatitis B virus (HBV) infection is the major infectious blood-borne occupational hazard to healthcare workers (Oregon-OSHA, 2016). The Hepatitis Branch of the Centers for Disease Control (CDC) estimates that there are approximately 8,700 infections in healthcare workers with occupational

exposure to blood and other potentially infectious materials in the United States each year. These infections cause over 2,100 cases of clinical acute hepatitis, 400-440 hospitalizations and approximately 200 deaths each year in healthcare workers which may result from both acute and chronic hepatitis (Auta et al; 2018). The use of hepatitis B vaccine, engineering and work practice controls, and personal protective equipment will prevent almost all of these occupational hepatitis B infections (WHO, 2016). Efforts to reduce blood exposure and minimize puncture injuries in the workplace setting will reduce the risk of transmission of all blood-borne hepatitis viruses (OSHA-USA, 2017).

2.1.2.3 Hepatitis C

Hepatitis C is a liver disease caused by the hepatitis C virus (HCV). It is the most common chronic blood-borne infection globally and is mainly transmitted through large or repeated direct percutaneous exposures to blood (Oregon-OSHA, 2016). Most people who are chronically infected are not aware of their infection because they are not clinically ill. Infected people can infect others and are at risk for chronic liver disease or other HCV related chronic diseases and currently there is no vaccine against hepatitis C (OSHA-USA, 2017). In contrast to HBV, the epidemiologic data for HCV suggest that environmental contamination with blood containing HCV is not a significant risk for transmission in the health-care setting (Fatma et al; 2017).

2.1.2.4 Post Exposure Prophylaxis

As we observed above, the risk of getting any of the three diseases (HIV, HBV, or HCV) from a needle-stick injury in the healthcare setting is very small. However, the actual risk and the perceived risk may differ. That is, an injured worker may be affected by the concern that they will become infected, even if the risk is very low. The fraction of cases treated with prophylactic measures is one indication of the

perceived risk, both by medical personnel treating the condition and injured worker (CDC, 2016).

Percutaneous and mucous membrane exposures to blood occur and will continue to occur in the healthcare setting.HBV infection is the major infectious risk that occurs from these exposures, and needle-sticks from HBsAg positive individuals will infect 7% to 30% of susceptible healthcare workers (Grimmond et al; 2017). Pre-exposure vaccination is the most effective method for preventing such infection. However, it can be expected that some individuals, who initially decline vaccination, will experience an exposure incident. Fortunately, effective post-exposure prophylaxis exists for HBV exposures if appropriate protocols are followed (CDC, 2016).

2.1.3 Knowledge, Training and Awareness

There are different factors that cause needle stick or sharp wounds, types of devices and method attempted, accessibility and proper disposal, lack of information (Jahangiri et al; 2016) but one of the most important element of a sharps injury prevention program is the education, training and awareness of healthcare personnel in sharps injury prevention (CDC, 2018). Needle-stick wounds, safeguards have to be put in place to attempt to lessen the risk of injury these include the policy of universal precautions and needle safer devices protecting the care provider from patient's blood and body liquids (Mehta et al; 2016).

A study by Maken, et al 2016, shows NSI rates among employees of a clinical research center before and after implementation of training in universal precautions, more than 95 % of employees had received training, and compliance with universal precaution protocols was mandatory in order to maintain employment. The targeted population comprised HCWs includes nurses, doctors, lab technicians, housekeeping, and other, the authors reported a statistically significant, consistent annual decrease in NSI per 1000 patient discharges, from 18.4 to 11.6 in a three years period.

Furthermore, patient hours of care required per patient per day increased by 16 % in three years period, suggesting that the number of injuries reported decreased while exposure-time increased.

2.1.4 Adherence to Preventive and Control Measures Guidelines

Infection prevention and control is just one segment of a ministry's Occupational Health and Safety Program. Policies and procedures relating to infection control should be consistent with the rest of the ministry's Occupational Health and Safety Program. To improve the quality of hospital care based on their efficacy in reducing the occurrence of infections due to medical sharps that compromise patients outcomes, adherence to infection prevention and control, guidelines is critical and to infection control which leads to high costs to the hospital and the patient as well as increased social suffering for the patient and family (Alice et al; 2015).

Despite the guidelines and notification procedures for healthcare workers, non-reporting still occurs, and this prompts certain questions: Why are cases not reported? Are healthcare workers aware of the applicable safety precautions? Are these precautions followed appropriately? Are healthcare workers aware of the procedures and guidelines that should be followed in the event of a sharps injury? And finally, are these guidelines applied? (Kaweti et al; 2016). Contrary to an expected drop in needle sticks injuries with greater use of Safety engineered devises, studies suggest that the incidence of needle sticks may have increased, the needle stick rate prior to implementation of Special safety engineered devices (SEDs) was 1.9 per 100 healthcare workers this is in a study published in Netherlands in 2018. After SED deployment, the incidence of needle stick injuries increased to 2.2 per 100 healthcare workers. The most common causes reported for needle sticks in the study were difficulties in awareness on operating the safety device and continued improper disposal of needles (Schuurmans et al; 2018).

A cross sectional study focusing on management of blood and fluids and compliance to universal precaution by nurses was conducted at Kenyatta National Hospital, Nairobi (Alice, 2018). 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 at Kenyatta National Hospital.

2.1.4.1 Government Controls- legal framework on health and safety

Kenya promulgated a new Constitution in August 2010. This includes a chapter on the Bill of Rights, which provides for the rights and fundamental freedom of all citizens. Although the Constitution does not address OSH specifically, it provides for the rights of every person to fair labor practices, reasonable working conditions, and a clean and healthy environment.

The Occupational Safety and Health Act (OSHA) is an act of parliament to provide for the safety, health and welfare of all persons lawfully present at workplaces. The Act states that every occupier shall carry out appropriate risk assessments in relation to the safety and health of persons employed and on the basis of these results, adopt preventive and protective measures to ensure that under all conditions of their intended use, all chemicals, machinery, equipment, tools and process under the control of the occupier are safe and without risk to health. To safeguard the safety and health of employees, it is a requirement that all organizations with more than 20 workers should have safety committees which should comprise of representatives from the management (OSHA, 2018).

2.1.4.2 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, 2018).

The Waste Management Regulations 2018, 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, 2017). 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 , 2017). 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. 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.

2.1.5 Prevalence of NSI

According to the WHO, 2016, 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. It is estimated that 100,000 needle-stick injuries occur annually in the UK alone and 500,000 annually in Germany and in 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 (Weldesamuel et al; 2019) more than 90% of these infections occur in developing countries (WHO, 2016). Needle-stick and other sharps injuries are a serious hazard in any medical care situation caused by different types of needles and sharps.

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 (Auta A et al; 2018). While several studies report that injuries occur frequently to nurses, physicians and technicians, housekeeping and other support staff are also at risk (Kasatpibal et al; 2016).

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 (CDC, 2019). 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, 2017). 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 (Motaarefi H et al; 2016), the ILO also notes that about 4 percent of the GDP is lost because of work-related diseases and injuries (ILO, 2017).

The results of a WHO 2018 assessment conducted in developing countries showed that the proportion of health care facilities that do not use proper waste disposal methods range from 18% to 64%. EPInet data for 2018 reports a rate of approximately 27 needle-stick injuries (NSIs) per 100 beds in teaching hospitals. 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 (Hossein et al; 2016).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 (Jared et al; 2019). 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(Rishi et al; 2017).

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 (Jared et al; 2019). 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 (Jaakkola, 2015).

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, 2017). In another cross sectional study by Glennah et al; 2015, 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 with 58% of health workers having reported these injuries (MoH, 2018) this is due to inadequate access and utilization of preventive and control measures for sharps injury.

2.2 Critique of the existing literature relevant to the study

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, 20018).Every day while caring for patients, healthcare workers are at risk to exposure to blood borne pathogens potentially resulting in infections such as HIV or

hepatitis B and C as a result of needle stick and sharps injuries (Fatma et al; 2017) these exposures, while preventable, are often accepted as being a part of the job. There are an estimated 100 HIV, 1000 HCV, and over 6,000 HBV infections that occur yearly in Kenya among HCWs due to sharps injury (Glennah et al; 2015).

The HCWs in Mombasa County face a community threat with a HIV prevalence standing at a high 8.1% compared to the national 6.3% (MCIP, 2018). 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 (Braun,2017). Hospitals in Kenya have not done enough to control the medical sharps and needle sticks injuries in healthcare workers in the workplaces.

2.3 Research gaps

The literature review has no findings on studies on outcomes of preventive and control measures against medical sharps injuries in the healthcare facilities in Mombasa County and very few studies in the country. With Kenya's heath sector still facing various challenges to meet the expectations of the healthcare personnel and the general public, further studies need to be conducted to address the working conditions of HCP in public healthcare facilities.

2.4 Conceptual Framework

The researcher developed a model to explain the various factors that could influence the occurrence of injury by medical sharps. In this model, shows the independent and intervening variables that may influence the outcome which could be occurrence or non occurrence of sharps injury. The conceptual framework is presented below.

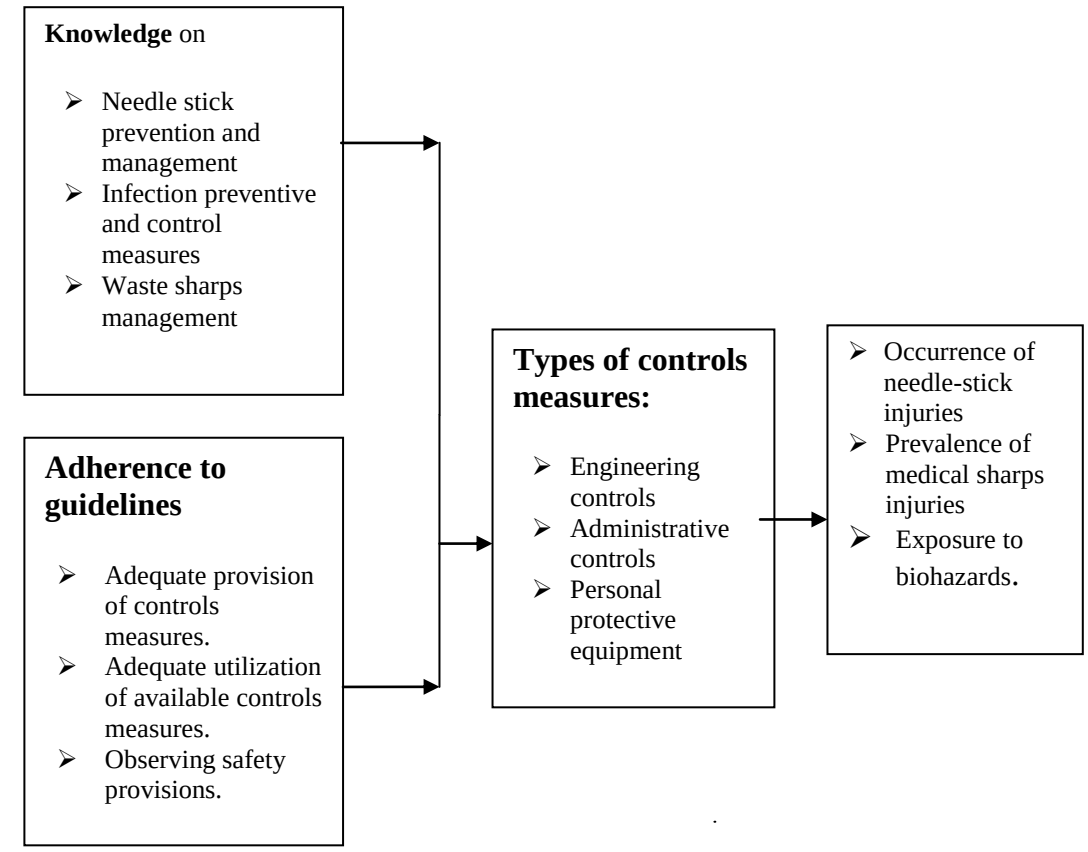

Figure 2.1: Conceptual Framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Research Design

This study utilized a descriptive cross sectional study design conducted by means of pretested, structured, self administered questionnaires, interviews and observation checklist. In this study, the sub-county hospitals were the study site and the healthcare workers at the hospitals directly handling sharps, being the study population, were randomly selected. The study focused on types of engineering controls, knowledge and trainings of HCW, adherence to the guidelines, and the outcome of controls measures in preventing medical sharps and needle-stick injuries amongst health care workers.

3.2 Study Area

The scope of this study focuses on Sub-County Hospitals in Mombasa County of the coastal region in Kenya. Mombasa County is segregated into 7 divisions, 18 locations and 30 sub-location and hosts 6 constituencies namely Mvita, Changamwe, Jomvu Kuu, Likoni, Kisauni and Nyali. Sub-County hospitals are health facilities located in Mombasa County namely Tudor, Likoni and Port Reiz, in the second largest city of Kenya which caters for patients from all over the coastal region. The location of the facilities is shown in Appendix 4.

3.3 Eligibility criteria

Based on the inclusion and exclusion criteria, health care workers who directly handling sharps were found eligible to be included in the study while pharmaceutical technologists, medical records, students and new recruits were excluded.

3.4 Target Population

In Mombasa County there are 3 Sub-county hospitals namely Likoni, Tudor and Port Reiz health facilities (eHealth, 2015). The study population included 202 healthcare workers in these facilities, include Nurses, Clinical Officers, Lab Technologists, Dentists /Doctors, Public Health Officers And Technicians, Waste Collectors and Cleaners Support Staff directly providing services to patients in these health facilities and handle sharps during procedures and disposal, hence being at risk of exposure to sharp related injuries at the sub county hospitals in Mombasa.

3.5 Sample Size Determination and Sampling Technique

The study was conducted in Mombasa County which consists of 6 Sub-counties, Kisauni, Nyali, Changamwe, Jomvu, Mvita and Likoni and has 3 Sub-County Hospitals. The study was conducted among health Care Workers (HCW) directly providing services to patients in these health facilities and handle sharps during procedures and disposal, hence being at risk of exposure to sharp related injuries. Sampling of the health care workers (HCW) was done using stratified random sampling technique. First, each sub-county was proportionately allocated the sample size according to the population of the health facilities using the simple random method. Next, the sampling of HCW was conducted within the subject facilities after proportionately allocating them according to the population of each job cadre.

Sample size was determined using the formula as used by Fisher, (Mugenda and Mugenda, 2017) for sample size with a population of over 10,000 as below;

$$\boldsymbol{n = {Z^2 pqD}/{d^2}}$$

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, 2018)

$q = 1 - p$ (The proportion in the population not at risk)

$d =$ The level of significance set at 0.05

$D =$ The desired effect which is 1.

$$n = (1.962\ x\ 1.962)\ x\ 0.58\ x \frac{(1 - 0.58)}{0.05x\ 0.05} = 375$$

If the target population is $\leq 10{,}000$. The final sample size will be;

$n_{f=}$The desired sample size when the population is less than $10{,}000$

$N =$The estimate of the population size$= 202$

n_f= n/ (1+n/N), 375/ (1+1.856) n=131

The Job Cadre of the study population were stratified randomly distributed per cadre as shown in Table 3.1

Table 3.1: Job cadre of the study population

Job Cadre	Population	Sample size
Nurses	**78**	**51**
Laboratory technologists	**30**	**19**
Clinical officers	**48**	**31**
Doctors and Dentists	**11**	**7**
Public health officers and technicians	**8**	**5**
Waste handlers/ Support staff	**27**	**18**
Total	**n= 202**	**n= 131**

The demonstrated findings in chapter four are those derived from 117 out of the 131 administered questionnaires with a response rate of 89.4%. This is similar to other related studies (Mangasi, 2016).

$$\textbf{Specific sample size} = \frac{\textbf{Sample size of each facility} \times \textbf{ total sample size}}{\textbf{Total population}}$$

The sampled facilities were then distributed as shown in Table 3.2

Table 3.2: Sample distribution per sub-county health facility

Facility	Population per facility	Specific sample size
Port Reiz	92	60
Tudor	68	44
Likoni	42	27
Total	**202**	**131**

$$\textbf{Specific sample size} = \frac{\textbf{Specific job cadre in the facility} \times \textbf{sample size}}{\textbf{Total of the specific job cadre population}}$$

The samples were distributed as shown in Table 3.3

Table 3.3: Sample size per facility per cadre

	Job Cadre						
Facility	**Nurses**	**Lab tech**	**C.O**	**Dentists**	**PH**	**Waste Handlers**	**Total**
Port Reiz	35	13	22	5	3	13	**92**
Tudor	26	10	16	4	3	9	**68**
Likoni	17	7	10	2	2	5	**42**
Total	**78**	**30**	**48**	**11**	**8**	**27**	**202**

3.4 Data Collection Instruments

A structured questionnaire comprising closed and open ended questions was administered. A checklist was used for Observing Occupational Risks Related to exposure to medical sharps including needle stick and adherence to guidelines and standard operating procedures and policies on medical sharps and needle-sticks

handling and disposal. Questionnaire instruments were administered to determine the range of engineering controls measures used, knowledge and awareness and adherence to guidelines at Sub-County hospitals. Secondary data was obtained by use of relevant hospital registers, handbooks, manuals and policy guidelines and incidents occurrence books.

3.5 Data Collection Procedure

Data collection was conducted upon receiving approval from the County Director of Health, Mombasa and the Ethical Review Committee. The primary data collection methods involved structured interviews, structured questionnaires and observational surveys by use of a checklist, questionnaires were administered after obtaining HCWs consent and interviews were done on the different cadre of health workers within the selected sample frame at the Sub-County hospital. Socio-Demographic characteristics such as age, gender, Education, Training, occupation, service period, job cadre department of HCW and information regarding working experience as HCW was recorded. In addition, respondents were asked about the frequency of exposure to needle stick injuries that they had incurred throughout there working time before the start of this study.

3.6 Pilot Test

The pilot study is a smaller version of a proposed study conducted to develop or refine the methodology, such as treatment, instrument or data collection process. To ensure data quality, three research assistants were trained at Msambweni Hospital in Kwale County 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. The questionnaires were pretested in English language on 10 randomly picked healthcare workers at

Msambweni Hospital. The results of the pilot study were used to modify the final draft of the questionnaire.

3.7 Ethical Consideration

Upon approval of this research proposal, the researcher acquired clearance for data collection from the local ethics review committee sitting at Pwani University Kilifi. Confidentiality was practiced in the data collection and storage. Participant's health status was also considered and kept anonymous. Furthermore, prospective participants were informed of the aim of the study and were allowed to voluntarily take part without being subjected to any pressure.

3.8 Data Processing and Analysis

The data was collected through questionnaires and was processed by editing, coding and entering into the computer. Microsoft Access database was used to enter data collected from all the respondents. The cleaned data was exported to SPSS version 22.0 and MS Excel for analysis. Descriptive statistics such as frequencies and percentages were used to analyze data. Chi-square was used to test significance of association to determine the statistical significance between independent variables such as types of engineering controls, knowledge and trainings of HCW, adherence to the guidelines, and the Outcome of controls measures in preventing medical sharps and needle-stick injuries amongst health care workers at the Sub-County Hospitals. The results are presented in pie charts, bar charts and tables.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

In this chapter the analyzed results using SPSS Version 22.0 are presented using descriptive statistics and tabulated by means of frequency tables, pie charts, histograms. Reliability among the multiple measures of the variables was measured using Chi square and discussed under four main parts. These are: (i)Social demographics, (ii)Medical sharps control measures,(iii) Knowledge and awareness of sharps handling, (iv) Adherence to medical sharps control guidelines, and prevalence and exposure to medical sharps. The sub-sections were derived from the four sectioned questionnaire specifically designed for this study.

4.2 Results

The demonstrated findings are those derived from 117 out of the 131 administered questionnaires with a response rate of 89.4%. This goes with other related studies (Mangasi, 2016). The participants were derived from all the targeted job cadres, namely: Nurses, Clinical Officers, Lab Technologists, Dentists /Doctors, Public Health Officers and Technicians, Waste Collectors (Cleaners, Support Staff). Sampling of the health care workers (HCW) was done using stratified random sampling technique. The sampling of HCW was conducted within the three facilities after proportionately allocating them according to the population of each job cadre.

4.2.1 Social Demographics of the Study Population

There were 117 respondents out of the 131 targeted making 89.3% response rate. Out of the 117 respondents, 38.5 % (45) were male and 61.5% (72) female. The majority

of the participants were in the 21-30 years age bracket at 39.3% (46), followed by the 31-40 group at 35.9(42). There were 17 (14.5%) respondents between 41-50 years of age, 12 (10.3%) aged over 50 years. The marital status for those who reported as being single, married, divorced stood at 17.9% (21), 78.6% (92), 3.5% (4) respectively. The respondents were predominantly diploma holders (52.3%) an indication of the academic qualification for most healthcare personnel at Sub-County healthcare facilities. Others were Bachelor's degree holders (14.1%), and Certificate holders at 13.4% (14). The housekeeping personnel had mainly primary (10.1%) and secondary (6.7%) level of education.

Table 4.1 provides a summary of the traits under social and other demographics of the study population.

Table 4.1: Social and other demographics study population

Variable	Trait	Frequency (N)	Percentage (%)
Gender	Male	45	38.5
	Female	72	61.5
	Total	**117**	**100**
Age (years)	21-30	46	39.3
	31-40	42	35.9
	41-50	17	14.5
	Above 50	12	10.3
	Total	**117**	**100**
Marital Status	Single	21	17.9
	Married	92	78.6
	Divorced	4	3.4
	Total	**117**	**100**
Educational Level	Primary	13	10.1
	Secondary	9	6.7
	Certificate	14	13.4
	Diploma	63	52.3
	Bachelor's degree	18	14.1
	Total	**117**	**100**

Up to 40.2% (47) of the participants were from the nursing workforce. Others were clinical officers (25.6%), Lab technicians (14.5%), public health officers (3.4%), Dentist (4.3 %) and cleaners at 12.0% (14). Majority of the workers had spent between 1-10years at 28.2%, 11-20years 11.1%, 21-30 years at 14.5% and over 30years at 6.8%. Majority 65% (76) worked between 5-8 hours while 35 %(41) worked for more than 8hours daily.

Table 4.2 provides a summary of the job description of the study population.

Table 4.2: Job Description

Variable	Response	Frequency (N)	Percentage (%)
Job Cadre	Nurses	47	40.2
	Lab technicians	17	14.5
	Clinical officer	30	25.6
	Public health officer	4	3.4
	Cleaner	14	12.0
	Dentists	5	4.3
	Total	**117**	**100**
Duration of employment	< 1	46	39.3
	1-10	33	28.2
	11-20	13	11.1
	21-30	17	14.5
	>30	8	6.8
	Total	**117**	**100**
Hours worked daily	5-8 hours	76	65
	>8 hours	41	35
	Total	**117**	**100**

4.2.2 Medical Sharps Injuries Preventive Control Measures

A majority 100% (117), had access to engineering control measures for sharp injuries and they included retractable needles 14.5% (17), Needle stick sheath 13.7% (17), Sharp disposal containers 95.7 %(112) while auto lock syringes at 14.5 %(17).

Table 4.3 provides a summary of the Engineering control measures available at the sub-county hospitals.

Table 4.3: Engineering control measures available

Variable	Response	Frequency (N)	Percentage (%)
Retractable needles	Available	17	14.5
	Not available	100	85.5
	Total	117	100
Needle stick sheath	Available	16	13.7
	Not available	101	86.3
	Total	117	100
Sharps Disposal Containers	Available	112	95.7
	Not available	5	4.3
	Total	117	100
Auto lock syringe	Available	17	14.5
	Not available	100	85.5
	Total	117	100

All respondents, (117) had access to administrative control; where 89.7 %(105) had proper waste management system in place, 87.2 %(102) had access to vaccination against blood borne pathogens which can be immunized. 117 had access to post exposure services, personal protective equipment policy in place at their workstations, 84.6 %(99) had infection control training and awareness while 81.2 %(95) had safety guidelines at the workplace.

Table 4.4 shows the chi square relationship between the Access to retractable needles and the exposure to sharps injuries.

Table 4.4: Access to retractable needle and exposure to sharps injuries

Chi-square Tests

	Value	Df	Significance
Pearson Chi-Square	1.418	2	.0296

In the present study only 20% of the respondents who had access to retractable needles were exposed to sharp related injuries while 45.5% of those without access to retractable needles were exposed to sharp injuries significance of [X^2 (DF= 2, N= 117) = 0.0296, p= 0.05].

Table 4.5 shows the chi square relationship between the availability of guidelines and impact on recapping of used sharps.

Table 4.5: Availability of guidelines and impact on recapping of used sharps

Chi-Square Test

	Value	Df	Sig level
Pearson Chi-Square	.794	2	.0512

Availability of guidelines had no impact on recapping of used sharps. For instance, recapping rate of 72.2% and 88.9% was found to apply for those provided with guidelines and those not provided with respectively [X^2 (DF= 2, N= 117) = 0.0512, p= 0.05].

Table 4.6 shows the chi square relationship between use sharps disposal and exposure to sharp injuries.

Table 4.6: Sharps disposal containers and exposure to sharps injuries.

Chi-square Test

	Value	Df	Sig level
Pearson Chi-Square	1.478	2	.0219

The use of sharp disposal containers was one of most commonly used method and had significant reduction in exposure to sharp injuries where 38.5% of those utilizing the containers, where as 75% of those without sharp disposal containers were exposed to injuries with significance at [X^2 (DF= 1, N= 117) = 0.0219, p= 0.05].

Table 4.7 provides a summary of the administrative control measures available at the sub-county hospitals.

Table 4.7: Administrative Control measures available

Variables	Response	Frequency(N)	Percentage (%)
Proper medical sharps management	Put in place	105	89.7
	Not in place	12	10.3
	Total	117	100
Vaccination	Put in place	102	87.2
	Not in place	15	12.8
	Total	117	100
Post exposure services	Put in place	117	100
	Not in place	0	0
	Total	117	100
PPE Policy	Put in place	117	100
	Not in place	0	0
	Total	117	0
Infection control training and awareness	Put in place	99	84.6
	Not in place	18	15.4
	Total	117	100
Safety guidelines and committees	Put in place	95	81.2
	Not in place	22	18.8
	Total	117	100

It was established that 100% (117) of the participants had access to personal protective equipment where 78.6% (92) had access to facial masks, 100% had gloves at the

workplace,41.9% (49) had access to overalls, 47.9%(56) were provided with lab coats, 18.8% (22) had safety boots while only 7.7% (9) had access to Goggles. Table 4.8 below provides a summary of Personal Protective Equipments available at the Hospitals.

Table 4.8: Personal Protective Equipment available

Variable	Response	Frequency(N)	Percentage (%)
Personal Protective Equipment	Available	117	100
	Total	117	100
Masks	Available	92	78.6
	Not available	25	21.4
	Total	117	100
Gloves	Available	117	100
	Not available	0	100
	Total	117	100
Overalls	Available	49	41.9
	Not available	68	58.1
	Total	117	100
Lab coats	Available	56	47.9
	Not available	61	52.1
	Total	117	100
Safety boots	Available	22	18.8
	Not available	95	81.2
	Total	117	100
Goggles	Available	9	7.7
	Not available	108	92.3
	Total	117	100

4.2.3 Knowledge, Training and Awareness of Sharps Handling

Majority of the healthcare workers had undergone professional training on infection control 65% (76) while 35% (41) did not have professional training on infection control. Frequency of on-job training on infection control, 36.8% (43) was done yearly, 23.9% (28) twice yearly, 12.8% (15) every four months, 10.3% (12) every

three months while 16.2% (19) had no on job training on infection control. On control measures training, 80.3% (94) had undergone training while 19.7 % (23) had not been trained. 40.2% (47) of respondents had knowledge of retractable needles use, 25.6 %(30) were conversant with needle stick sheath use, 11.3% (13) were aware of needles system, 12 % (14) had knowledge on blunt suture needles while all (100%) respondents were well versed with disposal containers. Most respondents 76.1% (89) had accidents/incidents reporting system, 19.7% (23) had no reporting system while 4.7% (5) as shown in the table 4.9 below.

Table 4.9: Knowledge and Awareness of sharps control measures

Variable	Response	Frequency (N)	Percentage (%)
Professional infection control training	Trained	76	65
	Not trained	41	35
	Total	**117**	**100**
Frequency of on-job training	Once a year	43	36.8
	Twice a year	28	23.9
	Thrice a year	15	12.8
	Quarterly	12	10.3
	Not at all	19.2	16.2
	Total	**117**	**100**
Training on control measures	Trained	94	80.3
	Not trained	23	19.7
	Total	**117**	**100**
Familiarity with Retractable needles	Aware	47	40.2
	Not aware	70	59.8
	Total	**117**	**100**
Needle stick sheath	Aware	30	25.6
	Not aware	87	74.4
	Total	**117**	**100**
Sharp disposal containers	Aware	117	100
	Not aware	0	0
	Total	**117**	**100**
Needless systems	Aware	13	11.1
	Not aware	104	88.9
	Total	**117**	**100**
Blunt suture needles	Aware	14	12
	Not aware	103	88
	Total	**117**	**100**
Accident/incident reporting system	Available	89	76.1
	Not available	23	19.7
	Don’t know	5	4.3
	Total	**117**	**100**

Table 4.10 shows frequency of on-job training on infection control and sharps injury at work.

Table 4.10: Frequency of on-job training on infection control and Sharps injury at workplace

Chi- square Table

	Value	Df	Sig level
Pearson Chi-Square	1.478	4	.0477

The trend was different for the frequency of on-job training with 47% of the health care workers reporting to undergo infection control training at least twice a year [X^2 (DF= 4, N= 117) = 0.047, p= 0.05].

Table 4.11 shows the chi-square relationship between the training on control measures against sharps injuries and sharps injury at work.

Table 4.11: Training on Control Measure against sharps injuries and Sharps injury at workplace

Chi- square Table

	Value	Df	Sig. level
Pearson Chi-Square	.014	2	.0102

75% of those who had never received any form of on-job training were exposed to sharp injuries while only 16.7% of those who received refresher training at least twice a year had injuries [X^2 (DF= 2, N= 117) = 0.0102, p= 0.05].

Table 4.12 shows the chi square relationship between those with professional training and sharps injury at work.

Table 4.12: Professional Training of HCW and Sharps injury at workplace.

Chi-square Test

	Value	df	Significance level
Pearson Chi-Square	.115	2	.0545

A minority, 39.1% of those with professional training were exposed to sharp injuries. 50% of those without professional training had injuries indicating that training back in college had insignificant importance in preventing sharps injuries [X^2 (DF= 2, N= 117) = 0.0545, p= 0.05].

4.2.4 Level of Adherence to Medical Sharps Control Guidelines

Most of the respondents (65%) had professional training on infection control at college level. 41 out of the 117 (35%) had no formal training on infection prevention and control upon commencement of employment. 36.8% (43 out of 117) reported to receive on-job training at least once every year, 23.9% twice a year, 12.8% thrice a year, while 10.3% four times every year. 16.2% of the respondents reported never to have received any on-job training in the course of their employment. 80.3% of participants indicated to have been trained on preventive control measures at some point. On the other hand, 95.7% reported to have been practicing hand washing.

63.2% (74 out of 117) indicated to have been provided with medical sharps handling guidelines at their respective workstations. 89 out of 117 (76.1%) respondents indicated to comprehend the available reporting system in case of exposure through sharps injury. 23.6% reported that there are no reporting systems while 4.3% pointed not to be aware of any reporting systems. A majority 84.6% (99) indicated that they don’t recap the sharps after using them while 18 out of the 117 reported that they still

recap needles and other sharps after use. 58.1% reported to be handling metal sharps and another 37.6% to be handling both glass and metal sharps. Only 4.3% indicated to handle bones as sharps. 8.5% of the respondents reported to be using plastic containers for sharps disposal while the majority 87.2% use safety boxes. Notably, 4.3% pointed to have used plastic bags at some point for sharps disposal. As shown in the table 4.13 below

Table 4.13: Level of adherence to medical sharps handling guidelines

Variable	Response	Frequency (N)	Percentage (%)
Professional infection control training	Trained	76	65
	Not trained	41	35
	Total	**117**	**100**
Frequency of on-job training	Once a year	43	36.8
	Twice a year	28	23.9
	Thrice a year	15	12.8
	Quarterly	12	10.3
	Not at all	19.2	16.2
	Total	**117**	**100**
Training on control measures	Trained	94	80.3
	Not trained	23	19.7
	Total	**117**	**100**
Practice hand washing	Practice	112	95.7
	Do not practice	5	4.3
	Total	**117**	**100**
Sharps handling guidelines	Provided	74	63.2
	Not provided	43	36.8
	Total	**117**	**100**
Accident/incident reporting system	Available	89	76.1
	Not available	23	19.7
	Don't know	5	4.3
	Total	**117**	**100**
Recapping of used sharps	Recaps	18	15.4
	Does not recap	99	84.6
	Total	**117**	**100**
Types of sharps handled	Metals	68	58.1
	Bones	5	4.3
	Metal and glass	44	37.6
	Total	**117**	**100**
Sharps disposal	Safety boxes	102	87.2
	Plastic bags	5	4.3
	Plastic containers	10	8.5
	Total	**117**	**100**

Table 4.14 shows the chi-square relationship between Frequency of on-job training on infection control and recapping of the needle before disposal

Table 4.14: Frequency of on-job training on infection control and Recapping of the needle before disposal

Chi-square Test

		Value	Df	Sig level
Pearson Chi-Square		8.320	4	.087

About half of those who don't receive on-job training at all admitted to recapping of used sharps at [X^2 (DF= 4, N= 117) = 0.087, p= 0.05].

Table 4.15 shows the chi square relationship between availability of sharps disposal guidelines and how sharps are disposed.

Table 4.15: Availability of sharps disposal guidelines and sharps disposal

Chi Square

		Value	Df	Sig level
Pearson Chi-Square		2.276	2	0.058

Respondents who reported sharp injuries, there was no significant difference between those who were provided with sharp handling guidelines and those who were not [X^2 (DF= 2, N= 117) = 0.058, p= 0.05].

Table 4.16 shows chi-square relationship between professional infection control training and how sharps are disposed.

Table 4.16: Professional infection control training and how sharps are disposed

Chi-square Test

	Value	Df	Significance level
Pearson Chi-Square	5.960	2	.045

In this study 91.3% of professional trained healthcare workers also exhibited adherence where they were found to use safety boxes as a proper way of disposing used sharps [X^2 (DF= 2, N= 117) = 0.045, p= 0.05].

Table 4.17 shows chi square relationship between proper medical sharps management and sharps injury at work place.

Table 4.17: Proper medical sharps management and Sharps injury at workplace

Chi-square Test

	Value	Df	Significance level
Pearson Chi-Square	.112	2	.0782

Respondents who indicated that there was proper sharps management, 33% had exposure to sharp injuries, while those who indicated that there was no proper sharp management 41.7% had exposure to sharp injuries [X^2 (DF= 2, N= 117) = 0.0782, p= 0.05].

4.2.5 Prevalence and Level of Exposure to Medical Sharps Injuries

Findings from the study revealed that 43% of the respondents have been exposed at least once to blood borne pathogens through sharp injuries. 57% reported never to have been injured at any point in the course of their practice. 41 out of 50 (82%) indicated to have been injured during surgical and/or other procedures while 9 out 50 (18%) at disposal of used sharps. 36 out of the 50 cases were reported while 28% of those exposed never reported.

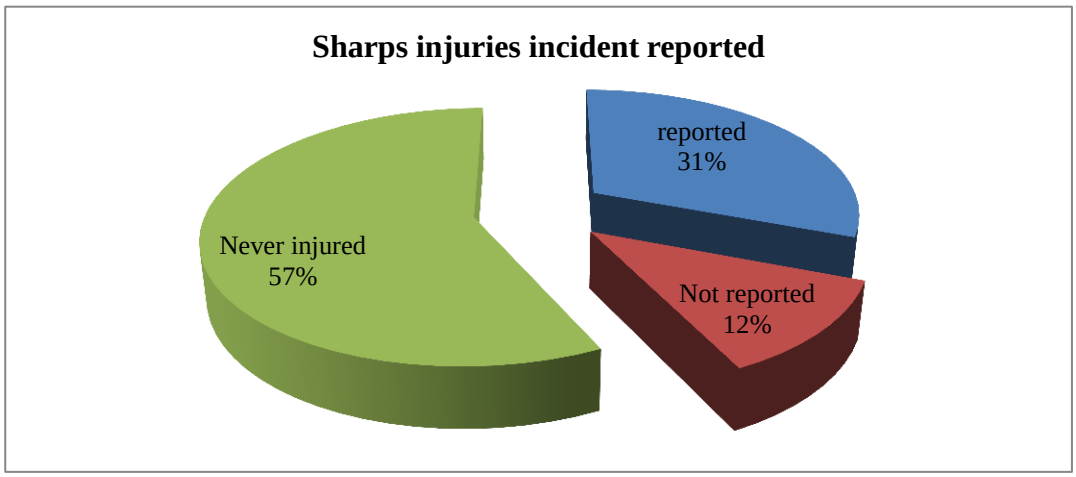

Figure 4.1: Sharps injuries incident reported

Figure 4.2: Sharps injury at workplace

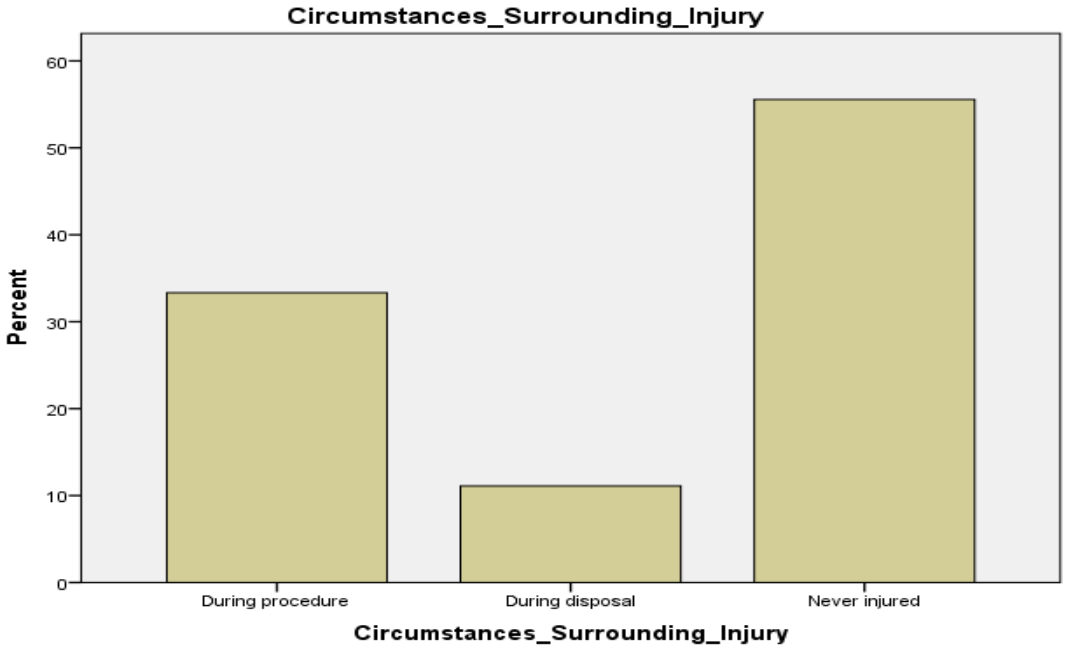

Figure 4.3: Circumstances surrounding injuries

4.3 Discussion

The health care workers knowledge and Training on medical sharps and needle stick injury prevention, and adherence to guidelines of medical sharps prevention is key to medical sharp injury prevention and control. This study shows the status of the Health care workers knowledge, training and awareness on sharps injuries prevention and control, and adherence to guidelines of medical sharps prevention and control in the three sub county healthcare facilities in Mombasa County. This was revealed by using Chi Square ($X2$) at significant level of 0.05 to evaluate the various parameters, namely: range of control measures available, knowledge and awareness on medical sharps injuries and level of to adherence to guidelines on medical sharps injuries control.

4.3.1 Types of medical sharps preventive and control measures available

Access and utilization of various control measures had varied outcomes in relation to medical sharp injuries occurrence. One of the best ways to protect against needle-stick injuries is use of safety devices (Cooke et al; 2017). These devices are a suitable and important tool in the reduction of needle-stick injuries, and the implementation of safety devices should result in an improvement in medical staff's health and safety (Cullen, 2016).

The commonly used and readily available form of engineering control was sharp disposal containers in form of safety boxes at 95.7%. This was similar when compared to other studies on impact of introduction of sharps boxes and of education programs on pattern of NSI in a tertiary care center in India which showed that there was a reduction Proportion of NSI by improper disposal from 69% to 38% after 1995, and to 18% (Richard, 2015). The new generation devices have demonstrated enhanced safety in performing procedures associated with high risk of blood borne transmission of pathogens (Higginson, 2016). In the present study Needles with needle stick-sheath

awareness was associated with reduced medical sharp injuries where only 25.6% of those using them were exposed to injuries whereas those who did not utilize needles with needle stick sheath 74.4% were exposed to sharp injuries, this is in accordance with a study which reported 74% to 89% reduction in the needle stick injuries with the usage of safety engineered devices (Mendelson MH, 2016).

In the present study only 14.5% of the respondents who had access to retractable needles were exposed to sharp related injuries while 85.5% of those without access to retractable needles were exposed to sharp injuries significance of [X^2 (DF= 2, N= 117) = 0.0296, p= 0.05]. These findings were supported by the results of recent studies in USA and Canada, (Clarke, 2015) however, the supply of these retractable needles was not regular and sometimes they used normal needles hence the exposure to injury, while those with no access were exposed more on normal needles.

Sharps disposal containers that are functional, accessible, secure from patient and or visitor tampering, visible, and convenient to use will decrease the risk of percutaneous sharps injury (Reddy, 2017). The use of sharp disposal containers was one of most commonly used method and had significant reduction in exposure to sharp injuries among the 95.7% of those utilizing the containers, where as 4.3% of those without sharp disposal containers were exposed to injuries with significant at [X^2 (DF= 2, N= 117) = 0.0219, p= 0.05]. Availability of guidelines had no impact on recapping of used sharps. For instance, recapping rate of 72.2% and 88.9% was found to apply for those provided with guidelines and those not provided with respectively [X^2 (DF= 2, N= 117) = 0.0512, p= 0.05].

Personal protective equipments (PPE) provide a barrier between the worker and the hazard. It can only prevent exposure to blood or other body fluids, but it cannot protect workers from sharps and needle-stick injuries. It should only be used when workers' exposure to sharps injuries cannot be eliminated by safe work practices and

engineering controls. Personal protective equipment is the least effective control measure. Combining training, use of safety devises, and policy implementation could substantially reduce the burden of needle-stick injuries.

4.3.2 Knowledge, Training and Awareness

In the current study majority of health care workers with at least diploma level of education belonging to job cadre namely Nurses, Lab Technologists, Clinical Officers, Public Health Officers had professional infection prevention and control training back in college.

The frequency of on-job training 47% of the health care workers reporting to undergo infection control training at least twice a year [X^2 (DF= 4, N= 117) = 0.047, p= 0.05] this is in accordance with a study conducted in the Dominican Republic on HCW who reported to have received two or more training sessions were less likely to experience a needle-stick injury (Moro, 2017).

Majority of the healthcare workers had undergone professional training on infection control 65% (76) while 35% (41) did not have professional training on infection control in this study knowledge of the participants regarding universal precaution guidelines is of low level when compared to other studies, Kasatpibal et al (94%), Auta et al (88%), but the knowledge was almost similar to the studies conducted in Pakistan and Saudi Arabia (Maken et al; 2016).

Clarke, 2015 found that the likelihood of NSI is three times higher among nurses with less adequate knowledge and resources. A minority, 39.1% of those with professional training were exposed to sharp injuries. 50% of those without professional training had injuries indicating that training back in college had insignificant importance in preventing sharps injuries [X^2 (DF= 2, N= 117) = 0.0545, p= 0.05]. In the present

study it was observed that those who demonstrated knowledge of the risk of blood borne pathogens transmission in case of used sharps injuries were at 95.7%.

To reduce NSI in the health care workers there is a need to invest resources into educating employees on the proper use of devices as these factors contributed to a significant proportion of injuries among HCW. Moreover, the training needs to be customized for each type of cadre of the health care worker. Frequency of training showed some relationship with exposure to sharp injuries. For instance, 75% of those who had never received any form of on-job training were exposed to sharp injuries while those who received refresher training at least twice a year only 16.7% had injuries [X^2 (DF= 2, N= 117) = 0.0102, p= 0.05]. Higginson, 2016 found that combining training with an intervention and use of safety devices may further decrease the number of needle-stick injuries.

4.3.3 Level of adherence to medical sharps control guidelines

In a study (Jagger et al 2017), reported that one third of injuries occurred during re-capping of the needle. The recapping of needle is strictly prohibited under the Occupation Safety and Health Administration (OSHA) blood borne pathogen standard. Recapping of sharps being a critical risk to sharp injuries was practiced more by those who get lower frequency of on-job training. About half of those who don't receive on-job training at all admitted to recapping of used sharps at [X^2 (DF= 4, N= 117) = 0.087, p= 0.05], this is in accordance with a study in Malaysia hospital which revealed that the causes of NSI in 58% of cases were caused by needle injuries and 27.2% cases were due to recapping (Ramphal, 2015).

For those who reported sharp injuries, there was no significant difference between those who were provided with sharp handling guidelines and those who were not [X^2 (DF= 2, N= 117) = 0.058, p= 0.05]. Correspondingly, availability of guidelines had slight effect on how sharps were disposed. For instance, 77.8% of those not provided

with sharps handling guidelines used safety boxes while 94.4% of those provided with the guidelines also used the safety boxes.

Respondents who indicated that there was proper sharps management, 33% had exposure to sharp injuries, while those who indicated that there was no proper sharp management 41.7% had exposure to sharp injuries. Significant [X^2 (DF= 2, N= 117) = 0.0782, p= 0.05]. Use of safety boxes protects support staff, waste handlers and waste transporters (Jagger, 2016) this shows that proper waste management system is important in reducing sharp injuries. In this study 91.3% of professional trained healthcare workers also exhibited adherence where they were found to use safety boxes as a proper way of disposing used sharps [X^2 (DF= 2, N= 117) = 0.045, p= 0.05] this is in accordance with the international guidelines which reports that the safest way to dispose of a used needle is to immediately place it in a sharps disposal container to reduce the risk of needle sticks, cuts and punctures from loose sharps (Ramphal, 2015).

The prevalence of NSIs in the present study revealed that 43% of the respondents have been exposed at least once to blood borne pathogens through sharp injuries this was similar when compared to other studies conducted internationally in India (41%) (Jan s et al 2015), and significantly lower than Iran (Fereidouniz et al, 2018) (63.3%), Pakistan (70.6%) (Sultan et al; 2015).

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study concludes that; the sharps disposal containers were a commonly used and readily available form of engineering control in form of safety boxes. However, lack of reliable supplies of sharps installed with safety features lead to exposure to sharp injuries. Frequency of on-job training on infection control had no effect on knowledge of risks of sharps injuries Furthermore professional training back in college had insignificant importance in preventing sharps injuries on the risks of infection with blood borne pathogens. Availability of sharps handling guidelines had no impact on neither recapping of used sharps or exposure to sharps injuries. Recapping of sharps being a critical risk to sharp injuries was still practiced by health care workers with lower frequency of on-job training. The hospital has partly adopted the use of safety engineered devices but there is inadequate supply of needles with safety features, furthermore there is low level of knowledge and training on risks of sharps injuries, low adherence to guidelines on sharps handling.

Preventive and control measures availability.

Access and utilization of various control measures had varied outcomes in relation to medical sharp injuries occurrence. The commonly used and readily available form of engineering control was sharp disposal containers in form of safety boxes at 95.7%.

The sub county health facilities in Mombasa County are not adequately and unsustainably supplied with medical sharps fitted with safety features at the Sub-County hospitals. Individual control measures, that is engineering, administrative, and

personal protective when applied alone have no significant impact on reducing exposure to medical sharps injuries unlike when applied wholesomely.

Knowledge, Training and Awareness

There is insufficient on-job training on infection prevention and control where increased frequency of refresher training on safety improves level of knowledge and awareness hence with overall reduction of sharps incidents and accidents.

Adherence to control measures against sharps and NSI

Level of adherence to preventive control measures was found to be quite low and significantly affected the outcomes of the available control measures. About 33% did not comply with hand washing guidelines and thus low level of adherence established at both management level and personnel level where enforcement and practice respectively were found to be deficient. With a prevalence of about 43%, medical sharps injuries at Sub-County hospitals in Mombasa County are of great concern as established in this study.

5.3 Recommendations

Based on the findings of this study, it is recommended that:

- The management of the facilities should ensure adequate and sustainable supplies of medical sharps fitted with safety features.
- Proper sharps waste management should be enforced by adequately providing and establishing effective engineering controls such as incinerators in all health facilities in the county, also by promoting safety guidelines on handling, transportation, and disposal of used medical sharps.

- In order to significantly reduce the prevalence of medical sharps injuries, training should be customized for each type of cadre of the health care worker without discrimination and frequent monitoring and evaluation and should be done across all job cadres.
- The management should ensure employees adopt a safety culture when carrying out their professional duties to ensure adherence to safe practices when handling medical sharps.
- By Combining use of safety equipments, and policy implementation this could substantially reduce the burden of needle stick injuries.
- Further research should be carried out in the area of medical sharp injuries and the health risks it presents to the health care workers at their work area of the hospitals.

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APPENDICES

Appendix I: Questionnaire

QUESTIONNAIRE ON OUTCOME OF PREVENTIVE AND CONTROL MEASURES AGAINST MEDICAL SHARP INJURIES AMONG HEALTH CARE WORKES AT THE SUB COUNTY HOSPITALS MOMBASA

SECTION A: DEMOGRAPHIC CHARACTERISTICS

Please indicate your answer with a tick (√).

1. Sex.

   a. Male.....[ ]
   b. Female.....[ ]

2. Age …….

3. What is your marital status?

   a. Single…….[ ]
   b. Married……..[ ]
   c. Separated ……..[ ]
   d. Divorced…….[ ]

4. What is your highest education level?

   a. Secondary ……...[ ]
   b. Certificate……....[ ]
   c. Diploma …….....[ ]
   d. Degree …….[ ]
   e. Masters ……[ ]

5. What is your job cadre?

a. Nurse.....[ ]
b. Medical doctor.....[ ]
c. Dentist.....[ ]
d. Laboratory technician..... [ ]
e. Clinical officer..... [ ]
f. Public health officer..... [ ]
g. Public health technician..... [ ]
h. Cleaner..... [ ]

Any other (specify…….

6. How many years have you worked in the above job cadre at the hospital?

a. ‹1 Year..... [ ]
b. 1-5 Years..... [ ]
c. 5-10 Years..... [ ]
d. 10-15 Years..... [ ]
e. 15-20 Years..... [ ]
f. 20-25 Years..... [ ]
g. 25-30 Years..... [ ]
h. »30 Years..... [ ]

SECTION B: TYPES OF CONTROL MEASURES

7. What Control measures for needle stick injuries do you have in the Hospital?

a. Engineering controls…….....[ ]

b. Administrative controls……..[ ]

c. Personal Protective Equipments……[ ]

8. What personal protective equipment/ material does the hospital provide for your use?

a. Masks ……..[ ]

b. Gloves ……[ ]

c. Aprons ……....[ ]

d. Overalls ……..[ ]

e. Lab coats ……[ ]

f. Safety boots ……...[ ]

g. Safety goggles ……[ ]

9. What engineering control measures have you been provided with in your workstation?

a. Retractable needles……..[ ]

b. Needle stick sheath.....[ ]

c. Sharps disposal containers.....[ ]

d. Needleless systems.....[ ]

e. Blunt suture needles.....[ ]

10. Which of the engineering control measures do you most frequently use in your workstation?

a. Retractable needles……..[ ]

b. Needle stick sheath.....[ ]

c. Sharps disposal containers..... [ ]

d. Needleless systems..... [ ]
e. Blunt suture needles..... [ ]

11. Which of the following sharps are fitted with safety features?

a. Needles..... [ ]
b. Blades..... [ ]
c. Scalpels..... [ ]
d. Slides..... [ ]
e. Other (specify)…….....

SECTION C: KNOWLEDGE AND TRAINING

12. Were you trained in infection control during your professional training?

a. Yes..... [ ]
b. No..... [ ]

13. When was your last Training?

a. 3 months ago.....[ ]
b. 6 months ago.....[ ]
c. 12 month ago.....[ ]

14. Were you trained on different types of control measures available against needlestick and sharps injuries?

a. Yes..... [ ]
b. No..... [ ]

15. Which engineering control measures are you familiar with?

a. Retractable needles……..[ ]
b. Needle stick sheath.....[ ]
c. Sharps disposal containers.....[ ]
d. Needleless systems..... [ ]
e. Blunt suture needles..... [ ]

16. How regular do you get training on medical sharps control measures?

a. Very often……[ ]
b. Moderately often……..[ ]
c. Slightly often……[ ]
d. Not often…….....[ ]
e. Not at all……[ ]

17. Have you had training on hand washing (infection control)?

a. Yes.....[ ]
b. No.....[ ]

18. How long do you work (on a daily basis) at the hospital?

a. < 1 Hour.....[ ]
b. 1-4Hour.....[ ]
c. 5-8 Hours.....[ ]

d. >8 Hour.....[ ]

19. Do you work over time?

a. Yes…….....[ ]

b. No……..[ ]

20. How many hours a week?

a. < 1 Hour.....[ ]
b. 1-4Hour.....[ ]
c. 5-8 Hours.....[ ]
d. >8 Hour.....[ ]

21. How many times have you had a sharp/needlestick injury since you started practicing?

a. Never.....[ ]
b. Once.....[ ]
c. Two times .....[ ]
d. More than two times .....[ ]
e. Don't remember.....[ ]

22. If you had a sharps/needle stick injury, briefly explain the circumstances in which the injury or injuries occurred

…….....
.....
.....

23. If you had a sharps/needlestick injury did you report the incident?

a. Yes.....[ ]
b. No.....[ ]

If no, give reasons

a. Did not know what to do.....[ ]
b. Reporting mechanisms too cumbersome.....[ ]
c. Not aware of reporting procedures/ relevant policy.....[ ]
d. Did not have time.....[ ]
e. Did not consider the patient to be of high risk.....[ ]
f. Other reasons (specify).....[ ]

24. Did you experience any complication following a sharps/needlestick injury?

a. Yes.....[ ]
b. No.....[ ]

25. What is the institution procedure of reporting percutaneous exposures entail?

……

……
……

26. After undertaking a procedure do you recap the needle before disposal?

a. Never.....[ ]
b. Sometimes.....[ ]
c. Always.....[ ]

27. If you suffer a sharps/needlestick injury and the needle in question has been used on a patient with HIV, hepatitis B or hepatitis C how likely that you will get infected?

a. Likely.....[ ]
b. Very likely.....[ ]
c. Unlikely.....[ ]
d. Inevitable.....[ ]
e. Possible but unlikely.....[ ]
f. Very remote.....[ ]

28. What measures has the hospital management put in place to control occupational related infections caused by HBV, HCV and HIV?

a. Eliminating unnecessary sharps.....[ ]
b. Vaccination.....[ ]
c. Providing post-exposure testing.....[ ]
d. Providing post-exposure prophylaxis.....[ ]
e. Providing safe medical devices..... [ ]
f. Providing barrier products such as gloves and pads.....[ ]
g. Conducting education and awareness on occupational safety and infection Prevention control.....[ ]
h. Developing and availing guidelines on precautions.....[ ]
i. Proper management of medical sharps.....[ ]
j. Establishing an occupational safety and health committee.....[ ]
k. Establishing a needle stick committee.....[ ]
l. Any other (specify)…….....

SECTION D: ADHERENCE AND AWARENESS OF CONTROLS

29. What types of sharps do you handle in the course of your job?

a. Needle Blade Scalpel……[ ]
b. Slide ……[ ]
c. Broken Glass(e.g. vials/Ampoules) ……[ ]
d. Broken Thermometer ……...[ ]
e. Any other (specify……
f. Not applicable …… [ ]

30. Which of the following sharps are fitted with safety features?

a. Needles …….....[ ]
b. Blades ……[ ]
c. Scalpels …… [ ]
d. Slides …… [ ]
e. Other (specify)…….

31. Where do you dispose used healthcare sharps after procedures?

a. Safety boxes ……[ ]
b. Plastic bags ……...[ ]
c. Left on the floor ……[ ]
d. Plastic containers (specify)……[ ]
e. Left on the operating table ……[ ]
f. Mixed with other wastes ……..[ ]

Other (specify)……

32. How often do you contact with patients with HIV, HBV, HCB?

a. Daily……[ ]

b. Weekly…….[ ]

c. Monthly……...[ ]

d. Don't know…….....[ ]

33. Do you use engineering control devices when you know your patient has HIV, hepatitis B and C?

a. Yes ……[ ]

b. No…….....[ ]

34. Are there standard guidelines for handling used disposable healthcare sharps?

a. Yes …….[ ]

b. No ……..[ ]

c. Don't know ……[ ]

35. Are you given clear work procedures/guidelines in your job cadre?

a. Yes..... [ ]

b. No..... [ ]

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

……

……

Appendix II: Consent Form

INFORMED CONSENT

Dear Respondent,

Please read and understand before signing the consent form below.

Title: OUTCOME OF CONTROL MEASURES IN PREVENTING MEDICAL SHARPS INJURIES AT SUBCOUNTY HOSPITAL IN MOMBASA

By: Aisha Hamid Mohamed:Jomo Kenyatta University Of Agriculture And Technology.

This descriptive cross-sectional study aims at establishing the outcome of control measures in preventing medical sharps injuries at Sub-County hospitals in Mombasa Kenya.

This study specifically aims to determine the outcome of controls measures against medical sharps and needle-stick injuries amongst health care workers at Sub-County hospital in Mombasa County. This study will focus in finding out the types of controls measures available, determine health workers adherence tosafety guidelines available, determine the knowledge on control measures anddetermine the prevalence of needle-stick injuries at the Sub-County hospitals.

The results of this research might assist to guide the hospitals in the improvement in the controls level of protection at the Hospitals which will in turn boost the control implementation process.

It will also assist to identify suspected cases of adverse health effects of health-care sharps and provide a basis for introducing and improving control measures and assist

in 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 Jomo Kenyatta university of Agriculture and technology and the Ethics and Research committee of Pwani University Kilifi. 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 checklists 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 toJomo Kenyatta university of Agriculture and technology as part of the requirement for the degree of Master of occupational 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 III: Observation checklist

Research Checklist for Observing Occupational Risks Related to Exposure to Medical sharps including needle stick and adherence to policies and procedures on sharps.	**Department**	**Date**

Key Aspect	**Observation (s)**	**Remark(s)**
1. Type of medical sharps generated		
2. Disposal method for the medical sharps		
3. Housekeeping procedure on medical sharps		
4. Use of safe injection devices, lancets, recapping of needles		
5. Availability and use of Personal protective equipment (PPE) eg gloves, Other(s)		
6. Procedure for evaluating the		

circumstances surrounding an exposure incident to analyze for preventive measures	
7.Post-exposure evaluation,counseling, and follow-up including prophylaxis within 2 hours of exposure. Records /number of HCW's on PEP.	

Appendix IV: Location of study area

Appendix V: Types of engineering control

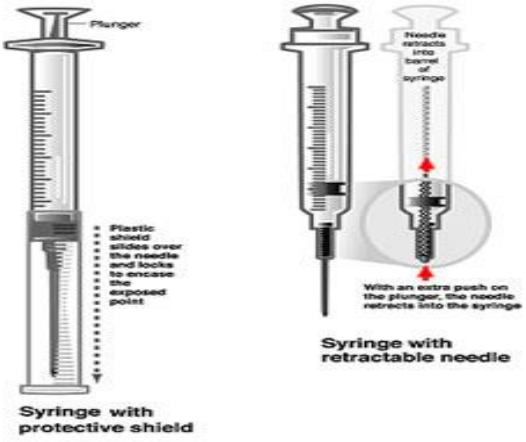

Figure: I -Retractable needle syringe: Medilab

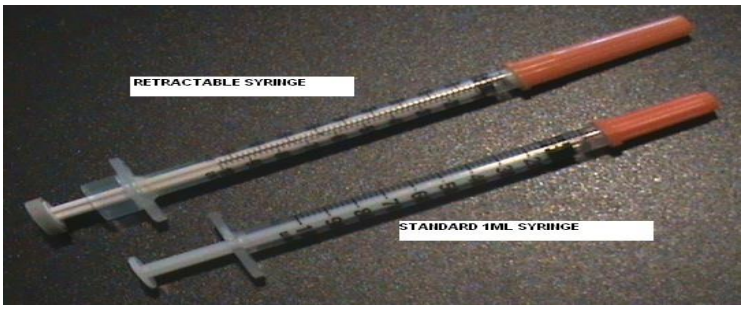

Figure: III-Retractable syringe and a standard 1ml syringe- source: Calvary

Figure: IV-Sharps disposal containers -Source: Medilab

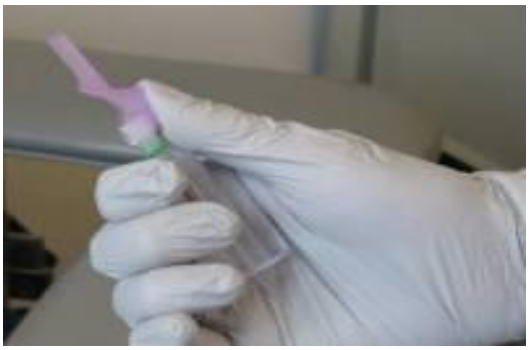


Figure 1: Blunt-tip Suture Needle

Figure: V - Self sheathing needles –**Figure: VI -**blunt suture needles

Source: (Medilab)

Appendix VI: Certificate of ethical review

NACOSTI ACCREDITED

ERC/MSc/012/2016

Pwani UNIVERSITY

ETHICS REVIEW COMMITTEE

ACCREDITTED BY THE NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION (NACOSTI, KENYA)

CERTIFICATE OF ETHICAL APPROVAL

THIS IS TO CERTIFY THAT THE PROPOSAL SUBMITTED BY:

AISHA HAMID MOHAMED

REFERENCE NO:
ERC/MSc/012/2015

ENTITLED:
Outcomes of control measures in preventing medical sharps injuries at Subcounty hospitals in Mombasa

TO BE UNDERTAKEN AT:
MOMBASA COUNTY

FOR THE PROPOSED PERIOD OF RESEARCH

HAS BEEN **APPROVED** BY THE ETHICS REVIEW COMMITTEE

AT ITS SITTING HELD AT PWANI UNIVERSITY, KENYA

ON THE 21ST **DAY OF MARCH 2016**

CHAIRMAN SECRETARY LAY MEMBER

PTO

Pwani UNIVERSITY
Ethics Review Committee,
Pwani University, www.pu.ac.ke, email: r.thomas@pwaniuniversity.ac.ke, tell: 0719 182218.
The ERC, Giving Integrity to Research for Sustainable Development

NACOSTI ACCREDITED

ERC/MSc/012/2016

NOTICE:

This decision is subject to the information available at the time of APPROVAL. The Committee may on its own motion and/or by application by a Party, review its decision on the grounds of discovery of new and important information which was not reasonably within its knowledge at the time of decision or on account of mistake or error apparent on the face of the record, or for any other sufficient reason, provided the researcher shall be given prior opportunity to be heard.

Ethics Review Committee,
Pwani University, www.pu.ac.ke, email: r.thomas@pwaniuniversity.ac.ke, tell: 0719 182218.
The ERC, Giving Integrity to Research for Sustainable Development