ASSESSMENT OF THE AWARENESS AND PRACTICE ON MEDICAL WASTE MANAGEMENT AMONG HEALTHCARE PERSONNEL AT KENYATTA NATIONAL HOSPITAL, IN NAIROBI

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Assessment of the awareness and practice on medical waste management among healthcare personnel at Kenyatta National Hospital, in Nairobi.

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DECLARATION

This is my original thesis and has not been submitted for a degree to any other University.

Signature ……………………… Date…………………………….

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

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DEDICATION

I dedicate this work to my parents Mr. and Mrs. Njiru for their love, moral and financial support and encouragement during the period of study. I would also want to dedicate this work to my siblings for their support and help too. Dedication also goes to my husband for his continued encouragement.

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ACRONYMS AND ABBREVIATIONS

BMW-Bio-Medical Waste

WM- Waste Management

PH- Potential of Hydrogen

MW- Medical Waste

HCW-Health Care Wastes

SSI-Small Scale Incinerators

AZT-Azidothymidine

A/E- Accident and Emergency

BBP- Blood Borne Pathogen

PPE- Personal Protective Equipment

OSHA-Occupational Safety and Health Administration

KNH- Kenyatta National Hospital

UPR- Universal Precaution Rule

SPSS- Statistical packages for Social Sciences

WHO-World Health Organization

MWM- Medical Waste Management

SSI- small scale incinerators

AZT- Azidothymidine

U-POPs-Unintentionally Persistent Organic Pollutants)

NEMA-National Environmental Management Authority

UNEP-United National Environmental Programme

LOCs- Less Organized Countries

PVC-Polyvinyl Chloride

HCWM- Health Care Waste Management

CD- Compact Disk

SSC- Scientific Steering Committee

NERC- National Ethical Review Committee

KEMRI-Kenya Medical Research Institute

ABSTRACT

The proper handling and disposal of medical wastes is very imperative. There are well defined set rules for handling medical wastes worldwide. Unfortunately, laxity and lack of adequate training and awareness in the execution of these rules leads to staid health and environment apprehension. The current study was conducted to assess the level of awareness of Medical Waste Management among the health care personnel in KNH, to assess the current practices of medical waste management at KNH and to assess the factors associated with proper medical waste management. The study adopted descriptive cross-sectional design utilizing quantitative method of data collection. Simple random sampling was used to select 244 health care personnel comprising of doctors, nurses and support staff all from the casualty, orthopedic and the general surgery departments. Structured questionnaires were administered to them for quantitative data. Quantitative data were analyzed using the quantitative program for social and market research (QPSMR) and chi squares and the level of significance was set at P 0.05. Descriptive statistics were carried out to determine relative frequencies, percentages and means of variables. The results showed that the total level of awareness of medical waste management among health care personnel was 51%. The doctors scored 48%, which was the lowest score; the nurses scored 54.5%, which was the highest score while the support staff scored 51.5%. In regards to the current practices, the results showed that most of the healthcare personnel were aware of the medical waste management practices in the hospital and the practices were satisfactory. However, awareness of MWM in this institution can still be improved, especially in the segregation aspect since only 44% of the study population was aware of the correct segregation practices. Education was seen to have a significance influence on medical waste management with mean chi square results $X^2(2, N=244) = 7.4408, P = 0.03165 (p<0.05)$. The mean chi square results $X^2(1, N=244) = 9.5386, P = 0.013$ indicated a significant relationship between training and awareness on correct practices as the mean $P <0.05$. The Mean chi square results $X^2(2, N=244) = 8.0666, P = 0.0484$ indicated that there was a significant relationship between Profession and awareness on proper practices and standards of MW. It is therefore recommended that there is need to have a constant supply of the equipment and more importantly the segregation bags. Moreover, there is need to train the healthcare personnel especially the doctors as they seemed to be less aware of medical waste management.

CHAPTER ONE

INTRODUCTION

1.1CLASSIFICATION OF MEDICAL WASTE

The WHO classifies medical or healthcare waste into communal waste or general waste and special waste. Communal or general waste is all solid waste not including infectious, chemical, or radioactive waste. This waste stream can include items such as packaging materials, bedding waste water from laundries, office supplies and other substances that do not pose a special handling problem or hazard to human health or the environment (WHO, 1999). These wastes consist of several different subcategories:

1.1.1 Infection wastes

Infectious waste contains pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. This category includes cultures and stock of infectious agents from laboratory work, waste from surgery and autopsies on patients with infectious diseases, waste from infected patients in isolation wards, waste that has been in contact with infected patients undergoing hem dialysis (e.g. Dialysis equipment such as tubing and filters, disposable towels, gowns and aprons, gloves and laboratory coats) and waste that has been in contact with animals inoculated with an infectious agent or suffering from an infectious disease.(WHO,1999)

1.1.2 Pathological wastes

Pathological wastes consist of tissues, organs, body parts, human fetuses and animal carcasses, most blood and body fluids. Within this category, recognizable human or animal body parts are also called anatomical waste. Anatomical waste is also considered as an infectious waste, even though it may also include healthy body parts. (WHO, 1999)

1.1.3 Sharps

Sharps are items that could cause cuts or puncture wounds, including needles, syringes, scalpels, saws, blades, broken glass and nails. Whether or not they are infected, such items are usually considered as highly hazardous healthcare waste. (WHO, 1999)

1.1.4 Pharmaceutical wastes

Pharmaceutical wastes include pharmaceutical products, drugs, and chemicals that have been returned from wards, have been spilled, are outdated or contaminated, or are to be discarded because they are no longer required. These also include discarded items used in the handling of pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials. (WHO, 1999)

1.1.5 Genotoxic wastes

Genotoxic waste is highly hazardous and may have mutagenic, teratogenic, or carcinogenic properties. It raises serious safety problems, both inside hospitals and after disposal, and should be given special attention. Genotoxic waste may include certain cytostatic drugs, vomit, urine, or faeces from patients treated with cytostatic drugs, chemicals, and radioactive material. Cytotoxic (or antineoplastic) drugs, the principal substances in this category, have the ability to kill or stop the growth of certain living cells and are used in chemotherapy of cancer. They play an important role in the therapy of various neoplastic conditions but are also finding wider application as immunosuppressive agents in organ transplantation and in treating various diseases with an immunological basis. Cytotoxic drugs are most often used in specialized departments such as oncology and radiotherapy units, whose main role is cancer treatment; however, their use in other hospital departments is increasing and they may also be used outside the hospital setting. (WHO, 1999)

1.1.6 Hazardous wastes

These wastes consist of discarded solid, liquid, and gaseous chemicals, for example from diagnostic and experimental work and from cleaning, housekeeping, and disinfecting procedures. Chemical waste from healthcare may be hazardous or

nonhazardous; in the context of protecting health, it is considered to be hazardous if it has at least one of the following properties:

• Toxic

• Corrosive (e.g. acids of pH < 2 and bases of pH > 12)

• Flammable

• Reactive (explosive, water-reactive, shock-sensitive)

• Genotoxic (e.g. cytostatic drugs).

Nonhazardous chemical waste consists of chemicals with none of the above properties, such as sugars, amino acids, and certain organic and inorganic salts.

1. Wastes with high heavy-metal content fall under hazardous chemical waste, and are usually highly toxic. Mercury wastes are typically generated by spillage from broken clinical equipment but their volume is decreasing with the substitution of solid-state electronic sensing instruments (thermometers, blood-pressure gauges, etc.). Whenever possible, spilled drops of mercury should be recovered. Residues from dentistry have high mercury content. Cadmium waste comes mainly from discarded batteries. Certain "reinforced wood panels" containing lead is still used in the radiation proofing of X-ray and diagnostic departments. A number of drugs contain arsenic, but these are treated here as pharmaceutical waste.

2. Pressurized containers consist of full or empty containers with pressurized liquids, gas or powdered materials, including gas containers and aerosol. Many types of gas are used in healthcare and are often stored in pressurized cylinders, cartridges, and aerosol cans. Many of these, once empty or of no further use (although they may still contain residues), are reusable, but certain types, notably aerosol cans must be disposed of.

3. Radioactive wastes are wastes containing radioactive substances. These include solid, liquid, and gaseous waste contaminated with radionuclide generated from vitro analysis of body tissues and fluids, in vivo body organ imaging, tumor localization, and therapeutic procedures.

The effect of the mentioned wastes on general population can mainly be through:

1. Chronic exposure, when individuals are exposed over a prolonged time to small amounts of substances in ground water, the food chain, and the air; or

2. Acute exposure: when individuals are exposed for a shorter period to larger amounts. This is to be mainly from occupational exposure, when waste handlers come into contact with significant volumes of infectious waste and any reactive products.(WHO 1999)

Hospitals are health institutions providing patient care services. It is the duty of hospital and healthcare centers to take care of public health. This may directly be through patient care or indirectly by ensuring a clean, healthy environment for their employees and the community (Patil *et al.*, 2005). In the process of healthcare delivery, waste is generated which includes sharps, human tissues or body parts and other infectious materials (Baveja *et al.*, 2000) also referred to as "Medical Waste" or "Hospital Solid Waste". Medical wastes are defined to include all types of wastes produced by health facilities such as general hospitals, medical centers and dispensaries. Medical wastes represent a small amount of total residues generated in a community. However, such residues can potentially transmit diseases and present an additional risk to the staff of the healthcare facilities, patients and the community when the wastes are not managed properly (Silva *et al.*, 2005).

1.2 Problem statement

Medical waste management is still a major problem mostly in developing countries. Previous studies done have shown that first world countries have developed a system of waste disposal that is able to ensure proper sorting at the source and disposing them. But in Africa these facilities are lacking and therefore all types of wastes are mixed up together along the whole disposal chain from collection to transportation to disposal. (WHO, 1999) In addition, there is also an element of poor infrastructure and lack of risk awareness among the medical personnel and the sanitary staff. Kenya like many developing countries experience the problem of getting sufficient medical supply and even worse is the disposal of medical waste. This is due to lack enforcement of legislation for handling, treatment and disposal. Furthermore, there is less consideration of the risks involved while handling medical wastes, largely by all those involved, including the government, healthcare personnel

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and the general public. (MOH, 2006) Taking into account that KNH is a referral hospital with a capacity of more than 1800 beds, it produces the greatest amount of waste in Kenya and hence there is a need for proper MWM so as to minimize the risks involved.

1.3 Justification of the study

In many countries, hazardous and medical wastes are still handled and disposed together with municipal wastes, posing a great health risk to municipal workers, the public and the environment. MW must be separated from municipal waste, but in many parts of Africa it tends to be collected along with the rest of the waste stream (Kgathi *et al.*, 2001; Taru *et al.*, 2005).

Nurses and other health care personnel must also be educated on the risks in order to improve their practices with regard to MWM. Since today's nurses and doctors are required to carry out expanded roles in a variety of settings, they have to be ecologically sensitive in assessing the impact of their practices to the environment and how to provide ways to reduce the hazards.(Sristhi,2000) KNH was selected because it is the largest hospitals in the country. The study will create public awareness regarding the health risk of the medical waste; they will also make relevant recommendations to hospitals and medical centers on possible ways of determining managing MW. The document also contributes to the already existing body of academic knowledge, in that it serves as a source of information for subsequent research in this area.

1.4 Research questions

1. What is the level of awareness on medical waste management among the health care personnel in Kenyatta National Hospital.?

2. What are the current practices on medical waste management at Kenyatta National Hospital?

3. What are the factors associated with proper medical waste management.

1.5 OBJECTIVES

1.5.1 General objective

To assess the awareness and practice on medical waste management among health care personnel in Kenyatta National Hospital in Nairobi, Kenya.

1.5.2 Specific objectives

1. To assess the awareness on medical waste management among the health care personnel in Kenyatta National Hospital in Nairobi, Kenya.

2. To assess the current practices on medical waste management at Kenyatta National Hospital in Nairobi, Kenya.

3. To assess the factors associated with correct medical waste management.

CHAPTER TWO

LITERATURE REVIEW

2.1 Medical waste management

Medical Waste Management is a process that ensures proper hygiene in the health institution and safety of healthcare workers and communities (Sanitation Connection, 2002).According to (Johannessen *et al.,* 2000), there are generally four key steps to MWM: Segregation in various components, including reusable and safe storage in appropriate containers; transportation to waste treatment and disposal sites, treatment and final disposal. (Acharya *et al.,* 2000) also identified the medical waste management process to include handling, segregation, mutilation, disinfection, storage, transportation and final disposal. He suggests that these are vital steps for safe and scientific management of medical waste in any establishment. According to (Rao *et al.,* 2004), the key to minimization and effective management of medical waste is segregation (separation) and identification of the waste. They recommend that the most appropriate way of identifying the categories of medical waste is by sorting the waste into color coded plastic bags or containers. Medical waste should be segregated into containers/ bags at the point of generation. The WHO suggests that hospitals should provide plastic bags and strong plastic containers for infectious waste such as empty containers of antiseptics used in the hospital (Pruss *et al.*, 1999).

General waste such as garbage and garden refuse should join the stream of domestic refuse. Sharps should be collected in puncture proof containers. Bags and containers for infectious waste should be marked with Biohazard symbol. Highly infectious waste should be sterilized by autoclaving. Cytotoxic wastes are to be collected in leak proof containers, clearly labeled as cytotoxic waste (Acharya *et al*., 2000). Needles and syringes should be destroyed with the help of needle destroyer and syringe cutters provided at the point of generation. Infusion sets, bottles and gloves should be cut with curved scissors. Disinfection of sharps, soiled linen, and plastic and rubber goods is to be achieved at the point of generation by usage of sodium hypochlorite with minimum contact of an hour. Fresh solution should be

made in each shift. On site collection requires staff to close the waste bags when they are three quarters full either by tying the neck or by sealing the bag. The storage area needs to be impermeable and hard standing with good drainage. It should provide an easy access to waste collection vehicle (Srivastava, 2000). According to scientific standards, the infectious wastes in the tropical area can be kept in a temporary storage area for 24 hours during the hot season and up to 48 hour in cooler seasons (Pruss *et al.,* 1999).

Medical waste should be transported within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose. The trolleys have to be cleaned daily and designated to particular wards at the hospital. Offsite transportation vehicle should be marked with the name and address of carrier. Biohazard symbol should be painted and suitable system for securing the load during transport should be ensured. Such a vehicle should be easily cleanable with rounded corners. (Johannessen *et al.,* 2000) recommend that transportation of medical waste on public roads must be carried out by trained staff in a dedicated vehicle with closed containers. All disposable plastic should be subjected to shredding before disposing off to the vendor. Final treatment of medical waste can be done by technologies like incineration, autoclave, hydroclave or microwave (Rao *et al*., 2004)

Throughout the world, the health sector is one area that has witnessed significant improvement. However, it seems that the fraction of waste generated at healthcare institutions has not attracted the same level of attention as other types of wastes, particularly in developing countries, despite the fact that medical waste is labeled as hazardous waste because it poses serious and direct threat to human health (Coad, 1992;WHO, 1999; Oweis., *et al*.,2005).According to WHO (1998),85% of the hospital wastes are actually non-hazardous, 10% are non-infectious and the remaining 5% are non-infectious but hazardous consisting of chemical, pharmaceutical, radioactive materials. HCW have an important opportunity to manage the environmental effects of their practice. Their efforts may seem small, but each step builds a base of sound behavior and thinking that are necessary for the success of the health system as a whole. For instance in King George hospital in Visakhapatnam in India similar study was done to assess the awareness about

biomedical waste management and universal work precaution among health care personal who were aware about the methods, guidelines of segregation and collection of wastes into color coded bins. They concluded that in order to improve the existing conditions, it was necessary to constitute a hospital control committee to supervise all aspects of biomedical waste management. (Sharmila *et al.*,2005)

2.2 Management in Africa

In Africa the situation is more critical as reports from around the continent indicate poor MWM practices. (Leonard, 2004; Manyele, 2003) described MWM in Tanzania as being poor, further, he posited that the general awareness on issues related to medical waste management was generally lacking among generators and handlers. Even though reported medical waste management systems in Tanzania was said to be poor, more recently, moves to confront the problems posed by poor management led to the construction of 13 pilot SSI in various parts of the country. The success achieved through this program motivated the government to extend the SSI to all referral regional and district hospitals (Manyele, 2004)

In South Africa, for instance, medical waste is seen as a mounting problem. In recent times, there have been numerous press statements about medical waste being disposed of in an incorrect manner. This situation has adversely affected the poor, disadvantaged members of society. The incineration of medical waste has also caused much concern. Some studies (Groundwork, 2002), have pointed out that incinerators have been associated with a wide variety of health problems in South Africa, such as disrupting the body's hormonal, immune and reproductive systems, and even caused cancers. It is estimated that about 45% of healthcare waste generated in the Province of KwaZulu-Natal alone, for instance, cannot be accounted for, indicating that it is being illegally dumped, buried or burnt in unknown locations, thus affecting the health of the people and the environment (Leonard, 2004). The disposal of medical waste constitutes a problem in other parts of the country.

South Africa is said to lack the capacity to properly dispose of the huge amounts of medical waste being generated. There have been numerous instances where medical wastes have been dumped in residential areas. The illegal dumping of

medical wastes in disadvantaged residential areas has resulted in situations where children have been found playing with medical waste materials such as syringes. For example, the Tygerberg Hospital treated 48 children with AZT after some were pricked with needles and others ate potentially lethal pills they found in a field in Elsie's River (Leonard, 2004). Waste from medical facilities poses a risk to healthcare workers, patients and the local communities in South Africa.

2.3 Management in Kenya

In Kenya, a national plan was developed to provide viable technical options as well as a roadmap for the management of healthcare waste for 5 years. The National HCW Management Plan of Action is a document intended for use by health managers and program officers across the health sector (including those in the private health sector). The purpose of developing this plan was to provide a tool that gives health managers guidance in planning, implementing and monitoring the activities of health care waste management in health facilities. This plan describes the situation of health care waste management on the basis of a desk review and a survey which were conducted in order to document the situation of waste management in Kenya. (MOH, 2006)

2.4 Policy frameworks on management of wastes

One of the policies developed was a (National Policy on Injection Safety and Medical Waste Management, 2007)The mission statement of this policy is to ensure safety of health workers, patients, and the community and to maintain a safe environment through the promotion of safe injection practices and proper management of related medical waste. This was the first document of the Ministry of Public Health and Sanitation that is explicit on the need to address health waste management problems. The policy objectives spell out the need to advocate for support and implementation of proper management of medical waste among others. Some of the guiding principles for the implementation of this policy include; Establishment of organizational structures at all levels for all the implementation of injection safety and related medical waste, the policy also addresses the need for

environmental protection through appropriate waste disposal methods, minimization of risks to patients, health workers, communities and the environment through application of safer injection devices and sharps waste disposal methods and advocating for the strengthening of the necessary human resource capacity through training and sensitization for safe waste disposal.

One of the key policy strategies indicated in this policy is the need for appropriate financial mobilization and allocation of the components of injection safety and medical waste management for effective policy implementation. The provision of sustained supplies and equipment for waste management through strengthened logistics system addresses the need for commensurate investment in waste handling requirements. A unique strategy recommended also is the advocacy of best waste management practices through behavior change communication as a key element in the strategy.

It was also discovered that out of the quantity of waste generated in Kenya, 39% of the waste was infectious, while 61% was non-infectious. (MOH, 2006)The varying levels of waste segregation practices observed in the sampled hospitals brought out the difference which doesn't agree with the WHO health care waste proportions where 80% of the waste is considered non-infectious while 20% is infectious. The total waste produced per patient per day was estimated to be 0.525kg.

Waste burning activities that release dioxins and furans is also another issue that needs to be looked into and in Nairobi Kenya an overview of the critical issues regarding the management of municipal and medical waste was done, especially in respect of the potential danger of generating U-POPs (Unintentionally Persistent Organic Pollutants) in the process of burning such waste. (UNEP, 2000)The broader objective was to assist in the development of a comprehensive waste management strategy for the city and other urban areas in the country, in the context of the provisions of the Stockholm Convention on POPs. Municipal and medical waste was selected for study because of its large quantity as a percentage of the total waste generated, and the complex nature of issues involved in the proper management of these wastes admitted that it was unable to manage waste effectively, and of particular concern €was the proliferation of medical waste generators both in

residential and commercial premises. A report by NEMA reveals that Nairobi generates approximately 2000 tons of waste daily. Of this, 68% is municipal waste generated from households only 25% of the waste generated is currently collected (UNEP, 2000).

A major challenge for the establishment of an effective waste management system for the country is the legal framework. Environmental Management and Coordination waste Management Regulations deals with waste management by giving provisions for setting standards, licensing of waste disposal sites and control of hazardous waste. It was established that burning is the dominant method of waste disposal in the city, and this is done through industrial incinerators and in the open air. The main reason for this preferred method of disposal is its convenience in the absence of a functioning system of waste management and in the absence of adequate legal guidelines on the disposal of solid waste by the government. This pattern of practice is however also associated with several other factors such as lack of awareness on the part of the public, economic pressures and the general paucity of administrative capacity in LOCs.

The study was able to establish that the area around the Dandora dumpsite, the city's biggest waste burning site, is highly contaminated with POPs. This was established from the results of U-POPs levels in eggs sampled from the site in a different study. There is also a high likelihood of other sites, such as the KNH incinerator and open-air burning site, being POPs hotspots.

The Study findings were that: The biggest hospital in Kenya, KNH burns some of its waste in an open pit in front of the incinerator situated a short distance from residential quarters for Hospital staff; Polythene bags and plastics, including Polyvinyl Chloride (PVC) items, make up approximately 225 tons of the solid waste generated daily in Nairobi, only 1% of plastics are recycled; Open burning of Municipal waste is widely used by the residents of Nairobi, as a means of disposing solid waste; The level of public awareness on the adverse effects of waste burning activities is very low; A majority of the study's respondents could not link any ill-health to incineration activities; The dioxin-rich bottom ash from incinerators around Nairobi is normally deposited at the Dandora dumpsite; Plastics contribute 28% of

all cadmium found in municipal solid waste and approximately 32% of all lead substances that are highly toxic to humans and the environment in general; The plastics sector currently constitutes approximately 150 industries, and has an annual growth rate of 6%, currently there are about 70 firms that recycle plastics locally.(UNEP, 2000)

The findings of both the desk review and survey were then analyzed and presented to stakeholders. Previously, healthcare waste management in most public health facilities including in some private facilities has been given very little attention. The renewed impetus from the Ministry of Public Health & Sanitation and other stakeholders provided the desired opportunity of addressing the issues of health care waste management.

A holistic approach was recommended to include, clear delineation of responsibilities, occupational health and safety programs, waste minimization and segregation. This document is designed to provide viable options to address the challenges encountered in planning for health care waste management in Kenya. The recommendations proposed here were as a result of discussions and consultations with the various stakeholders under the leadership of the National Working Group on HCWM covered under the following thematic areas; Legal and regulatory framework which should be revised to provide guidance to health care managers on minimum operating requirements. (MoH, 2007)

There is also need to standardize HCWM practices in all health care facilities in the country; Financing the implementation of the HCWM plan of action in order to reduce if not eliminate infection transmission which is contracted through improper waste management practices. Capacity building should as well be done in order to bring the envisaged uniformity of practice that cuts across the entire health sector in a bid to effect the desired policy changes; the process of operational research in pollution reduction through the development or adoption of environmentally friendly technologies that is appropriate for Kenya. It is also the endeavor of this ministry to drive a monitoring and evaluation process that shall guide the implementation of the action plan.

This Plan therefore, underscores the need for serious involvement of health managers at all levels of health care service delivery system in order to invoke the desired high level commitment. It was envisaged that the implementation of this plan over the five years (2008-2012) would result in improvement of health care waste management and the general cleanliness within the health care facilities and hence reduce risks and hazards associated with poor HCWM in the community.

The public health impacts of medical waste are therefore determined by the overall waste management strategy adopted by the hospitals or health centers. Medical or Hospital Waste Management involves the management of a range of activities, which are mainly engineering functions, such as collection, transportation, operation/treatment of processing systems, and disposal of waste. However, in most cases, initial segregation and storage activities are the direct responsibility of nursing personnel. If the infectious component gets mixed with the general non-infectious waste, the entire mass becomes potentially infectious. It is the responsibility of hospitals and other healthcare institutions to ensure that there are no adverse health and environmental consequences as a result of their waste handling, treatment and disposal activities (Patil *et al.,* 2005). This present study therefore focused on the awareness and practices on MWM among healthcare personnel of a major hospital in Kenya, KNH, in Nairobi County.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study site

The study was conducted in Kenyatta National Hospital, the oldest hospital in Kenya. It was founded in 1901 with a bed capacity of 40 as the Native Civil hospital, it was renamed in 1952. At that time the settler communities were served by the nearby European Hospital (now Nairobi Hospital). It was renamed Kenyatta National Hospital after Jomo Kenyatta following independence from the British. It is currently the largest referral and teaching hospital in the country.

Kenyatta National Hospital has a capacity of 1800 beds and has over 6000 staff members. It has 50 wards, 22out-patient clinics, 24 theatres (16 specialized) and Accident & Emergency Department. The average annual Outpatient attendance is 600,000 visits while the average annual Inpatient attendance is 89,000 patients. The average length of stay is 7 Days while the annual budgetary allocation totals to KSh4.6 billion. It covers an area of 45.7 hectares. The University of Nairobi Medical School, and several government agencies are located on the campus. (Kenyatta national Hospital website)

3.2 Study design

A cross-sectional hospital based study was used. This was done within the period of April and May in 2013.

3.3 Study population

The population of the study comprised of doctors, nurses and support staff selected in KNH.

3.3.1 Inclusion criteria

All the health care providers' who are employees of KNH and have worked there for more than 6 months (i.e. doctors, nurses and support staff) and those who were willing to participate in the study.

3.3.2 Exclusion criteria

All the health care personnel who were not employees of KNH and had not worked there for more than 6 months and those who did not consent to the study.

3.4 Sampling procedure

3.4.1 Sample size determination

Size was calculated using the (Fischer's *et al.,* 1998) formulae.

$$N = Z^2 * \frac{P\,(1-P)}{d^2}$$

Where

Z – is a constant. (1.96)

α - Confidence interval

P – Anticipated population proportion, 60% level of awareness done in Kenyan hospitals, according to the survey done in 2007 on the strategic plan for biomedical waste management (MoH, 2007)

d – Absolute precision (0.05) Therefore

$1.96*0.6*0.4/\,(0.05)^2 = 370$ (sample size)

Sample size is 370 and an additional 5 % additional for non-response

TABLE 3.1 Distribution of doctors, nurses and support staff in the casualty, orthopedic and general surgery departments at KNH.

H/RESPONDENT	CASUALTY	ORTHOPEDIC	G/SURGERY	TOTAL
DOCTORS	25	6	22	53
NURSES	106	112	202	420
SUPPORT STAFF				315
TOTAL	131	118	224	788

Finite population correction-The Usage of the equation for the standard error of the mean assumes a population that is infinite and it is usually employed as it stands with populations that are infinite or are vast enough to consider them infinite for practical purposes. But for too large to sample in its entirety and too small to label as practically infinite, we must add the population correlation factor to the end of the equation.

N=   ___No_ (in this case is 370 i.e. the sample size)_____

            1+   no (which is 370)

N (the total sample population)

Therefore=370/1+370/788=246

For the casualty department the proportion for both the doctors and nurses was as follows

Doctors=25/788*100=3.2%........................8 respondents

Nurses=106/788*100=13%..........................32respondents

17

Orthopedic surgery

Doctors= 6/788*100=0.76…………………2respondents

Nurses=112/788*100=14%.............................34 respondents

General surgery

Doctors=22/788*100=3%.................................7respondents

Nurses= 202/788*100=26%..............................64 respondents

Support staff=315/788*100=40%.....................98respondents

Sampling interval was calculated as follows 788/251=3

3.4.2 Sampling procedure

A listing of eligible participants was conducted according to their respective departments. Proportionate allocation was done to determine the number to be sampled per stratum (department). In each stratum random sampling was carried out to select the required sample using the random number tables. In case the recruited participant did not give consent, the next consenting participant was included in the study. Sampling was done in repeated visiting days until the desired numbers of respondents was achieved.

3.5 Data Collection, Management and Analysis

3.5.1 Data collection

A structured questionnaire was used to collect the data. It consisted of:

1. Items regarding the demographic variables: gender, duration of work, source of information, number of trainings, level of training.

2. Knowledge items regarding biomedical waste management: categories of waste, segregation, collection, treatment, disposal, universal work precautions of biomedical waste management.

3. The practices included segregation, color coding, storage and transportation, labeling, treatment and disposal, records of the wastes, final waste disposal among others.

The questionnaires were administered face to face. The following is the way it was carried out:

Doctors: Due to the nature of their job, the investigator ensured they conducted the interviews when the doctors were having their lunch breaks or their tea breaks in the various cafeterias in the departments or tea rooms as they would call them.

Nurses: The same method as that used with the doctors was employed. The lunch breaks and tea breaks were made use of since they are also very busy.

Support staff: The interviews for the support staff were also conducted during their tea and lunch breaks since they do not work throughout. This therefore reduced contamination since data was collected off-site.

The doctors were interviewed regardless of their qualifications in terms of whether they are consultants, registrars, or general practitioners. This is because these are universal work precautions that every healthcare personnel should be aware of hence I did not control for levels of expertise. Research assistants were used to assist conduct the interviews but after intense training on the questionnaire and what to look out for. These were college students regardless of the course they are taking.

3.5.2 Data management

Data from the questionnaires was entered into computer database designed using MS-application software. Measures were put to minimize entry errors on the entry screen. Data entering process was conducted concurrently as the data collection continues. Data cleaning and validation was also performed to achieve a clean set that was then exported as a quantitative programme for social and market research (z-QPSMR). Clean sets of data were backed up in a Compact Disk (CD) and flash disc. They were also stored in hard drive disks in the computer ready for analysis. A

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back up of these data was done regularly to avoid any loss or tampering. All the filled questionnaires were arranged in folders and properly kept in lockable cabinets. They were directly accessible only to investigators. Access to computers was for authorized users only.

3.5.3 Data analysis

1. Descriptive analysis was done. Proportions, and Mean percentages to compute demographic variables.
2. Inferential statistics such as chi- square were also used.

3.6 Ethical clearance

An approval to conduct this study was sought from both the SSC at KEMRI and the ERC, prior to the study for scientific and ethical clearance, respectively. Permission was obtained from the authorities at KNH, where the study was scheduled to be conducted and informed consent was obtained from the health care providers who were willing to participate in the study. Confidentiality was enhanced throughout the study process, including the process of data collection and in reporting. Coding was used instead of the names of the participants hence protection of their privacy. Important to note also is that the investigator did not directly come into contact with the biomedical waste and hence safety was upheld as data was being collected

CHAPTER FOUR

RESULTS

4.1 DEMOGRAPHIC CHARACTERISTICS OF THE STUDY POPULATION

4.1.1 Distribution of the study population, according to profession, Gender, department, job status, duration of service and level of education

The study comprised of a total sample size of 244 health workers. Nurses were the majority with 129(53%) followed by support staff with 98(40%) and finally doctors had the least sample size of 17(7%).Distribution by Gender indicated that Female employees were the majority, recording 148(60%) and their male counterparts constituted 96(40%).

An analysis of staff by department indicated that in the Accident and Emergency department nurses recorded 32(80%)while doctors were 8(20%); orthopedic department had 34(94%) nurses and 2(6%) doctors while General Surgery had 90% nurses and 10% doctors. Since Support staff does not have specific work stations, they were not categorized by department.

In terms of employment the results revealed that 63(90%) of the total sample were permanently employed, 7(7%) were on contract while there was only 1 volunteer who constituted 0.4%.

With regards to the duration of time worked in the Hospital, 152(62%)of the total Sample had worked for more than 5 years,56(23%) had worked for between 3-4 years while 36(15%) had worked for 1-2 years.

In terms of Respondents level of education, the results revealed that majority of staff were holders of diploma certificates with a total score of 45.9%.

Table 4.1: Demographic distribution of the study population sample

		Total		Doctor		Nurse		Support staff	
		N	N%	N	N%	N	N%	N	N%
	Total	244	100	17	7%	129	53%	98	40%
PROFESSION	Doctor	17	7%	17	100%	0	0%	0	0%
	Nurse	129	53%	0	0%	129	100%	0	0%
	Support staff	98	40%	0	0%	0	0%	98	100%
GENDER	Male	96	40%	15	16%	22	23%	59	61%
	Female	148	60%	2	1%	107	72%	39	26%
DEPARTMENT	Accident & Emergency	40	16%	8	20%	32	80%	0	0%
	Orthopedic	36	15%	2	6%	34	94%	0	0%
	Gen.Surgery	70	29%	7	10%	63	90%	0	0%
JOB STATUS	Permanently	220	90%	14	6%	111	50%	95	43%
	Contract	16	7%	2	13%	11	69%	3	19%
	Intern	7	3%	1	14%	6	86%	0	0%
	Volunteer	1	0.4%	0	0%	1	100%	0	0%
LENGTH OF WORK	1-2 years	36	15%	6	17%	18	50%	12	33%
	3-4 years	56	23%	3	5%	27	48%	26	46%
	>5 years	152	62%	8	5%	84	55%	60	39%
EDUCATION LEVEL	PhD	1	0.4%	0	0%	1	100%	0	0%
	Masters	4	1.6%	3	75%	1	25%	0	0%
	BSc	23	8.2%	14	61%	9	39%	0	0%
	Higher Diploma	41	16%	0	0%	40	97%	1	3%
	Diploma	101	45.9%	0	0%	78	77%	23	23%
	KCSE	59	24%	0	0%	0	0%	59	100%
	KCPE	15	6%	0	0%	0	0%	15	100%

4.2 ASSESSMENT OF THE LEVEL OF AWARENESS ON MEDICAL WASTE MANAGEMENT

4.2.1 Assessment on awareness by the study population on correct segregation of medical wastes.

It was noted that 44% of the entire study population was aware of the correct color coding scheme to use in disposing the different types of medical wastes (Table 4.2). The results indicated that doctors (50%) were the most aware of the correct segregation practices, followed by the support staff (46%) and lastly the nurses (41%).

Out of all the medical wastes, infectious wastes were the wastes that most of the study populations were least aware of on the correct way of segregation. Only 23% of the study population were aware of the correct segregation of infectious wastes, with doctors (18%) being the least aware of the correct segregation of infectious wastes as compared to other wastes. Majority, (65%)of the study population, were aware of the correct segregation of paper/food stuff. It is important to note that as shown in the table 4.2 below, not all the study population were aware of the different medical wastes hence the differences in the totals for the different waste categories.

Table 4.2:Assesment of Medical Wastes segregation into correct color code scheme according to the study population

		Total	Doctor	Nurse	Support staff
Infectious	BASE	239	17	127	95
	N	54	3	27	24
	N%	23%	18%	21%	25%
Anatomical	BASE	210	14	109	87
	N	121	9	59	53
	N%	58%	64%	54%	61%
Chemical	BASE	185	15	94	76
	N	104	9	56	39
	N%	56%	60%	60%	51%
Pharmaceutical	BASE	170	12	91	67
	N	53	7	19	27
	N%	31%	58%	21%	40%
Paper/Food stuff	BASE	204	13	110	81
	N	133	7	73	53
	N%	65%	54%	66%	65%
Radioactive/Genotoxic	BASE	145	7	76	62
	N	40	3	16	21
	N%	28%	43%	21%	34%
Correct code% mean score		**44.00%**	**50.00%**	**41.00%**	**46.00%**

4.2.2. Assessment of reasons for failure to use the colour coding scheme for waste segregation according to the study population

The study also sought to find out why the study population did not use the colour coding scheme always. The results showed that inadequacy of the segregation papers was the major reason as to why they did not always use the colour coding scheme. (Table 4.3)

Table 4.3: Assessment of reasons for failure to use the color coding scheme always according to the study population								
	Total		**Doctor**		**Nurse**		**Support staff**	
Total Reasons were that there were:	95		4		55		36	
No coded containers	11	12%	1	25%	6	11%	4	11%
$Inadequate containers	78	82%	3	75%	48	87%	27	75%
Inaccessible containers	10	11%	2	50%	3	5%	5	14%
Any other	1	1%	0	0%	0	0%	1	3%

4.2.3 Assessment of the level of awareness of other medical waste management practices by professionals

Apart from segregation, the study also sought to find out the level of awareness of the study population on various medical waste practices such as awareness on the level at which sharps containers should be taken for incineration, the level at which the waste containers should be taken for incineration, whether they were aware that needles should never be recapped, whether they were aware of the universal precaution rule and also whether they were aware of the government plan on medical waste management. Results showed that 62% of the study population was aware of these important aspects of medical waste management. Doctors had an average of 46% on the awareness of these aspects, nurses had 68% while the support staff had 57%.

The overall awareness therefore of medical waste management was found to be 51%, with the doctors overall score being 48%, nurses scoring 54.5% and the support staff scoring 51.5%.

		Total	Doctors	Nurses	San. staff	Chisq.(x^2)	DF	P Value
Sharps inceneration	3/4 Full (N)	116	6	73	37			
	N%	47.50%	35.30%	56.60%	37.80%	9.02	2	0.011
	Not 3/4 Full	128	11	56	61			
	N%	52.50%	64.70%	43.40%	62.20%			
Emptying waste containers	3/4 Full (N)	135	6	69	60			
	N%	55.30%	35.30%	53.50%	61.20%	4.316	2	0.116
	Not 3/4 Full	109	11	60	38			
	N%	44.70%	64.70%	46.50%	38.80%			
Recapping used needles by hand	Sometimes(N)	113	9	51	53			
	N%	46.30%	52.9%	39.5%	54.1%	5.063	2	0.08
	Never(N)	131	8	78	45			
	N%	53.7%	47.1%	60.5%	45.9%			
universal precaution rule	Yes(N)	202	11	113	78			
	N%	82.80%	64.70%	87.60%	79.60%	6.697	2	0.035
	No(N)	42	6	16	20			
	N%	17.20%	35.30%	12.40%	20.40%			
Aware of Gvt Plan	Yes(N)	174	8	105	61			
	N%	71.30%	47.10%	81.40%	62.20%	15.237	2	0
	No(N)	70	9	24	37			
	N%	28.70%	52.90%	18.60%	37.80%			
% Mean Scores		62%	46%	68%	57%	8.0666	2	0.0484

4.3 ASSESSMENT OF THE CURRENT PRACTICES ON MEDICAL WASTE MANAGEMENT

4.3.1 Assessment of the current practices on waste storage, hand washing facilities and handling of wastes before treatment and disposal by the study population at KNH.

According to the results, there is special equipment for sharp waste handling and an efficient temporary storage facility at KNH according to 227(93%) of the study population .An assessment of the condition of the storage facility indicates it's in good condition according to the healthcare personnel since all factors that determine an efficient storage facility recorded over 80%, i.e. its fenced, big enough, well

ventilated and that only authorized personnel are allowed in the facilities illustrated in figure 4.1

There is also availability of a hand washing Facility and Plastic containers for disposal. Medical waste is temporarily handled before treatment and disposal according to 222(91%) of the study population. There is 1 incinerator that is in good condition at KNH with a capacity to hold <500kgs of waste. The incinerator is always in a good state according to 152(80%) of the study population. Waste takes one day before it's treated and disposed and there is an average of 11 containers in the various departments as illustrated in the table 4.5.

Table 4.5 : Availability and condition of MW Management Facilities at KNH according to the study population

		Total		Doctor		Nurse		Support staff	
	Total	244	100%	17	100%	129	100%	98	100%
Is there special equipment for sharp waste handling?	Yes	241	98.77%	17	100%	127	98.45%	97	98.98%
Is there a temporary storage facility?	Yes	227	93%	13	76%	119	92%	95	97%
Is there a hand washing facility?	Yes	241	99%	17	100%	127	98%	97	99%
Is there a specific area for health care waste disposal?	Yes	243	100%	17	100%	128	99%	98	100%
	1	71	29%	2	12%	38	29%	31	32%
Number of Incinerators	2	58	24%	4	24%	29	22%	25	26%
	3	50	20%	2	12%	18	14%	30	31%
	Don't Know	65	27%	9	53%	44	34%	12	12%
	5-30 Kgs	4	2%	0	0%	1	1%	3	3%
Capacity of Incinerators	100-175 Kgs	2	1%	0	0%	1	1%	1	1%
	200-400 kgs	22	9%	0	0%	12	9%	10	10%
	>500 Kgs	88	36%	5	29%	36	28%	47	48%
	Good	156	64%	4	24%	74	57%	78	80%
Condition of Incinerators	Fair	34	14%	1	6%	18	14%	15	15%
	Don't Know	54	22%	12	71%	37	29%	5	5%
	Base	190	100%	5	100%	92	100%	93	100%
How often Incinerators are in good/fair condition	All the time	152	80%	2	40%	72	78%	78	84%
	Sometimes	30	16%	2	40	16	17%	12	13%
	Most times	8	4%	1	20%	4	4%	3	3%

Number of containers present	**Mean Score**	**Total**		**A/E**		**Orthopedic**		**Gen Surgery**	
		11		15		9		10	
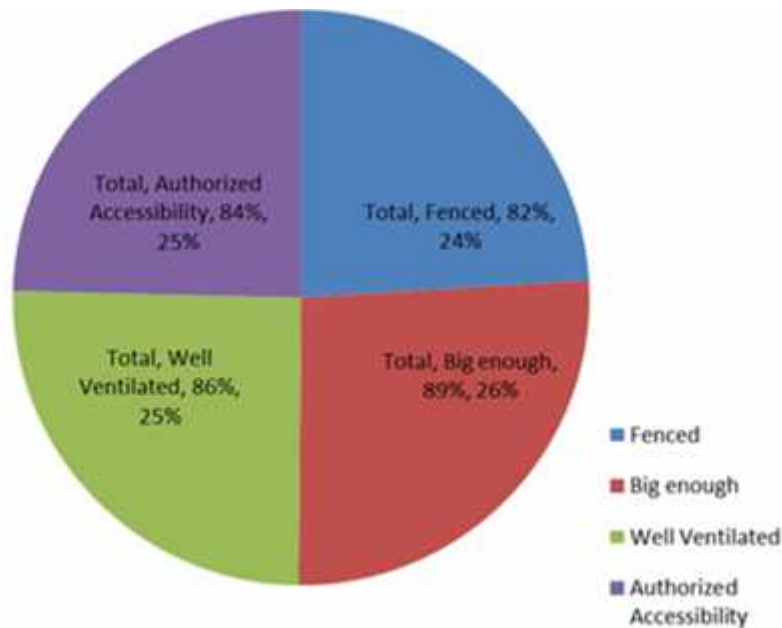
Figure 4.1 Condition of storage facilities according to the study population and their frequencies.

4.3.2: Assessment of current practices by study population in waste generation record keeping and use of equipment

According to 222 (91%) of the study population, waste is handled temporarily before treatment and disposal and this take one day before further action. According to 99 (41%) of the population, the waste handler keeps record of the waste generated. Plastic containers are used for disposal as indicated in the table 4.6. There is also a routine schedule for the collection of MW in KNH and it is done daily. Incineration is also done daily as shown in the table 4.6. Results also showed that incineration was the most common method of medical waste treatment according to almost 100% of the study population, followed by autoclaving at 60% and then burning at about 58% as indicated in the Chart 4.2. According to 86% of the study population a truck/lorry was the means of transport used to ferry medical waste in the hospital.

Table 4.6: Assessment on correct MW handling practices according to the study population

	Total		Doctor		Nurse		Support staff	
Total	244	100%	17	100%	129	100%	98	100%
Handling of waste temporally before treatment and disposal	222	91%	13	76%	116	90%	93	95%
1 day storage of waste before further action	185	83%	10	77%	98	84%	77	83%
Waste handler weighs and keeps record of waste generated	99	41%	3	18%	44	34%	52	53%
Plastic container is used for disposal	243	100%	17	100%	128	99%	98	100%
Have a Routine schedule for the collection of MW	215	88%	10	59%	111	86%	94	96%
Daily collection of MW	214	99%	10	100%	111	100%	93	99%
Daily Transportation of MW	238	98%	15	88%	125	97%	98	100%
Daily incineration of waste	198	81%	9	53%	100	78%	89	91%
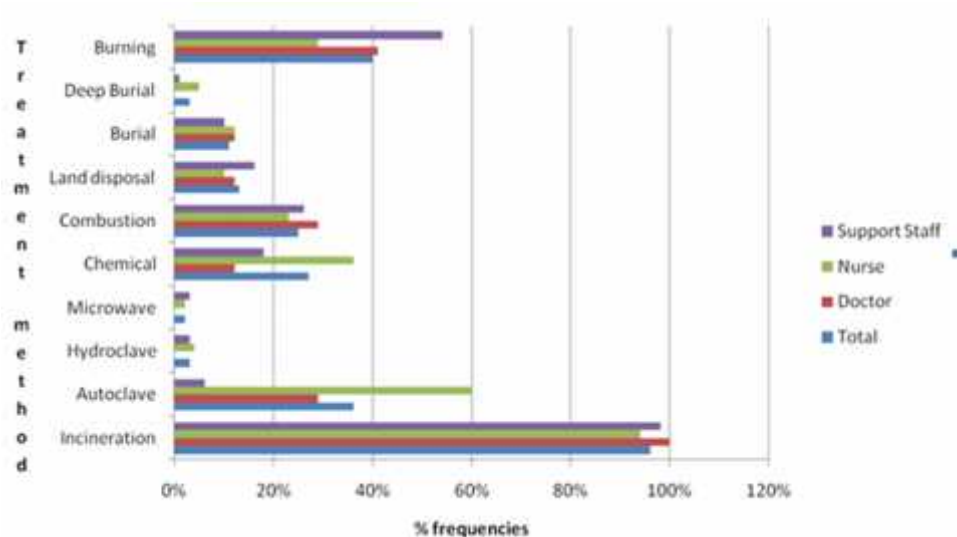
Figure 4.2 Methods used for medical waste treatment and their frequencies according to the study population.
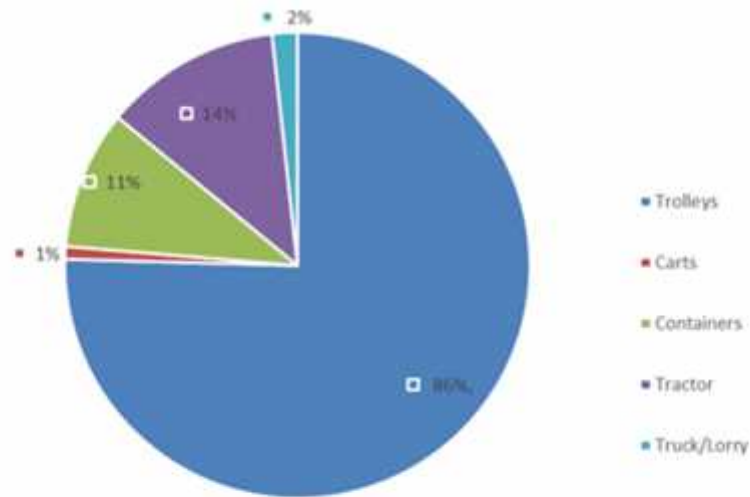
Figure 4.3 Methods used to transport medical wastes at KNH and their frequencies.

4.4 ASSESSMENT OF THE FACTORS ASSOCIATED WITH CORRECT MEDICAL WASTE MANAGEMENT.

The study also sought to assess the significance of factors thought to influence awareness levels which included level of education, training on medical waste, Years of work experience and profession.

4.4.1 Assessment of the level of Education in relationship to correct medical waste management

On medical waste management awareness levels by level of education, 55.7% constituting Diploma/Higher diploma holders stated that sharps are taken for incineration at ¾ full with PHD/Masters and those below diploma certificates rating at 37% and 43.5% respectively. However with chi square values of $X^2(2, N=244) = 5.477, P = 0.065$ the result of this category was not statistically significant as the P value was greater than 0.05.

On emptying of waste containers 46% which included PHD/Masters/BSC stated that they empty waste containers at ¾ full with Diploma/Higher diploma and those below

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diploma category rating at 50.9% and 65.2% respectively. With the chi square values of X^2(2, N=244) = 6.207, P = 0.045 the relationship was significant as the P Value was less than 0.05.

On recapping used needles by hand 65.1% constituting Diploma/higher diploma holders said that they never recap used needles by use of hands. Below diploma and PHD/Masters/BSC Certificate holders scored 45.7% and 43.5% respectively. With the chi square results of X^2(2, N=244) = 9.864, P = 0.007 the relationship was significant as the P value was less than 0.05.

On awareness of universal precaution rule and government plan on medical waste management 90.6% and 80.2% respectively of Diploma/Higher Diploma graduates were knowledgeable of these aspects. PHD/Masters/BSC certificate holders scored 73.9% and 63.0% respectively while Staff with below diploma certificates rated at 78.3% and 65.2% respectively. With X^2(2, N=244) = 8.366, P = 0.015 and X^2(2, N=244) = 7.29, P = 0.026 the relationship was significant.

On average diploma/higher diploma holders were more knowledgeable of better MW practices and standards, at 69% followed by below diploma, at 60% and finally PHD/Masters/BSC at 53%. The mean chi square results X^2(2, N=244) = 7.4408, P = 0.0316 indicated a significant relationship between level of education and awareness on correct practices as the P Value was less than 0.05.Table 4.7

Table 4.7:Awareness on MW Management by level of education

		Total	PHD/Masters/BSC	Diploma/Higher Diploma	Below Diploma	Chi sq.(x^2)	DF	P Value
Level at which sharps are incinerated	3/4 Full (N)	116	17	59	40			
	N%	48%	37%	55.7%	43.5%	5.477	2	0.065
	Not 3/4 Full	128	29	47	52			
	N%	52.5%	63.0%	44.3%	57%			
Level of emptying waste containers	3/4 Full (N)	135	21	54	60			
	N%	55%	46%	50.9%	65.2%	6.207	2	0.045
	Not 3/4 Full	109	25	52	32			
	N%	45.0%	54.3%	49.1%	34.8%			
Frequency of Recapping used needles by hand	Sometimes(N)	113	26	37	50			
	N%	46.3%	56.5%	34.9%	54.3%	9.864	2	0.007
	Never(N)	131	20	69	42			
	N%	53.7%	43.5%	65.1%	45.7%			
Aware of universal precaution rule	Yes(N)	202	34	96	72			
	N%	83%	73.9%	90.6%	78.3%	8.366	2	0.015
	No(N)	42	12	10	20			
	N%	17.2%	26%	9.4%	21.7%			
Aware of Government Plan on MW Management	Yes(N)	174	29	85	60			
	N%	71.3%	63.0%	80.2%	65.2%	7.29	2	0.026
	No(N)	70	17	21	32			
	N%	28.7%	37.0%	20%	34.8%			
% Mean Scores		**62%**	**53%**	**69%**	**60%**	**7.4408**	**2**	**0.0316**

4.4.2 Assessment of the level of training in relationship to correct medical waste management

An assessment of awareness by training indicated that 58.4% constituting those who attended training were aware that sharps should be incinerated at ¾ full with the Chi square statistics $X^2(1,N=244) = 14.755$,P = 0.00 indicating a significant relationship as the P Value was less than 0.05

On emptying of waste containers 65.7% comprising those who attended training stated that they empty waste containers at ¾ full while those who did not attend training constituted 42.1%.with the Chi square values of $X^2(1, N=244) = 13.581$, P = 0.00, this result was highly significant as the P Value was less than 0.05

On frequency of recapping used needles by hand 59.10% comprising of those who attended training said they never recap used needles by hand with the chi square result, $X^2(1, N=244) = 3.712$, P = 0.054 indicating the relationship not being significant since P>0.05

On awareness of universal precaution rule and government plan on Bio medical waste management 89.1% and 78.1% respectively comprising of trained employees were knowledgeable of these aspects. With $X^2(1, N=244) = 8.603$, P = 0.003 and $X^2(2, N=244) = 7.042$, P = 0.008, the relationship was statically significant as the P Values were less than 0.05.

On average, 70% constituting those who attended training were more knowledgeable of better MW practices and standards while those who did not attend training constituted an average mean score of 52%. The mean chi square results $X^2(1, N=244) = 9.5386$, P = 0.013 indicated a significant relationship between training and awareness on correct practices as the mean P Value was less than 0.05. See table 4.8

		Total	Yes	No	Chi sq.(x^2)	DF	P Value
Table 4.8:Awareness on MW Management by Training attendance							
Level at which sharps are incinerated	3/4 Full(N)	116	80	36	14.755	1	0
	N%	47.50%	58.40%	33.60%			
	Not 3/4 Full(N)	128	57	71			
	N%	52.50%	41.60%	66.40%			
Level of emptying waste containers	3/4 Full(N)	135	90	45	13.581	1	0
	N%	55.00%	65.70%	42.10%			
	Not 3/4 Full(N)	109	47	62			
	N%	45.00%	34.30%	57.90%			
Frequency of Recapping used needles by hand	Sometimes(N)	113	56	57	3.712	1	0.054
	N%	46.30%	40.90%	53.30%			
	Never(N)	131	81	50			
	N%	53.70%	59.10%	46.70%			
Aware of universal precaution rule	Yes(N)	202	122	80	8.603	1	0.003
	N%	82.80%	89.10%	74.80%			
	No(N)	42	15	27			
	N%	17.20%	10.90%	25.20%			
Aware of Government Plan on MW Management	Yes(N)	174	107	67	7.042	1	0.008
	N%	71.30%	78.10%	62.60%			
	No(N)	70	30	40			
	N%	28.70%	21.90%	37.40%			
%Mean Scores		**62%**	**70%**	**52%**	**9.5386**	**1**	**0.013**

4.4.3 Assessment of the duration of work experience in relationship with correct medical waste management

In terms of duration of work experience 51.3% constituting respondents with over 5 years of work experience said that sharps are taken for incineration at ¾ full and 59.2% said that sharps are emptied at ¾ full. On frequency of recapping used needles

by hand 57.20% comprising of those with over 5 years of work experience stated that used needles are never recapped.

On awareness of universal precaution rule and government plan on medical waste management 81.6% and 69.7% respectively comprising of respondents with over 5 years of work experience were knowledgeable of these aspects. However with X^2(1,N=244) = 2.30 ,P = 0.13 for level at which sharps are generated, X^2(1,N=244) = 2.30 ,P = 0.13 for level of emptying waste containers, X^2(1,N=244) = 2.041 ,P = 0.153 for frequency of recapping used needles by hand, X^2(1,N=244) = 0.413 ,P = 0.521 for awareness on universal precaution rule and X^2(1,N=244) = 0.489 ,P = 0.485 for awareness of Government plan on Medical Waste Management the chi square results did not reflect significant relationships as all the P Values were greater than 0.05

On average 59% of personnel who have 1 to 4 years of work experience were aware of correct MW standards and practices while those with over 5 years of work experience had a mean score of 64%.However the mean chi square results X^2(1, N=244) = 1.5086, P = 0.2834 indicated that there was no significant relationship between awareness and number of years served as the P Value was greater than 0.05. See table 4.9

Table 4.9Awareness on MW Management by Number of Years

		Total	1-4 Years	> 5 years	Chi sq.(x^2)	DF	P Value
Level at which sharps are incinerated	3/4 full(N)	116	38	78			
	N%	47.50%	41.30%	51.30%	2.30	1	0.13
	Not 3/4 Full(N)	128	54	74			
	N%	52.50%	58.70%	48.70%			
Level of emptying waste containers	3/4 full(N)	135	45	90			
	N%	55.30%	48.90%	59.20%	2.30	1	0.13
	Not 3/4 Full(N)	109	47	62			
	N%	44.70%	51.10%	40.80%			
Frequency of Recapping used needles by hand	Some/most times(N)	113	48	65			
	N%	46.30%	52.20%	42.80%	2.041	1	0.153
	Never(N)	131	44	87			
	N%	53.70%	47.80%	57.20%			
Aware of universal precaution rule	Yes(N)	202	78	124			
	N%	82.80%	84.80%	81.60%	0.413	1	0.521
	No(N)	42	14	28			
	N%	17.20%	15.20%	18.40%			
Aware of Government Plan on MW Management	Yes(N)	174	68	106			
	N%	71.30%	73.90%	69.70%	0.489	1	0.485
	No(N)	70	24	46			
	N%	28.70%	26.10%	30.30%			
%mean scores		**62%**	**59%**	**64%**	**1.5086**	**1**	**0.2834**

4.4.4 Assessment of the profession in relationship with correct medical waste management

The study also sort to find out the relationship between profession and awareness levels.56.6%,37.8% and 35.3% of Nurses, Sanitary Staff and Doctors respectively stated that sharps are taken for incineration at ¾ full. This was significant at X^2(2, N=244) = 9.02, P = 0.011 as the P value was less than 0.05.

On Emptying of waste at ¾ full 53.5%, 61.2% and 35.3% constituting Nurses, Sanitary Staff and Doctors respectively stated waste containers are emptied at ¾ full. However this category was significant at X^2(2, N=244) = 4.316, P = 0.116 as the P value was greater than 0.05.

On frequency of recapping used needles by hand 60.5%, 45.9% and 47.1% of Nurses, Sanitary Staff and Doctors respectively said that used needles are never recapped by hand. However this was not significant as the result, X^2(1, N=244) = 5.063, P = 0.008 indicated with P being greater than 0.05

On awareness of universal precaution rule and government plan on Bio medical waste management 87.6%, 79.6% and 82.8% of nurses Sanitary Staff and Doctors respectively were aware of universal precaution rule on MW while 81.4%, 62.2% and 47.1% nurses, sanitary Staff and Doctors respectively were aware of Government Plan on MW Management. Chi square statistics X^2(1, N=244) = 6.697, P = 0.035 for Awareness on universal precaution rule and X^2(1, N=244) = 15.237, P = 0.00 for awareness on Government Plan on MW indicated significant relationships.

On average Nurses were more aware of better MW practices and standards, at 68% followed by Sanitary Staff at 57% and finally Doctors at 46%. The Mean chi square results X^2(2, N=244) = 8.0666, P = 0.0484 indicated that there was a significant relationship between Profession and awareness on proper practices and standards of MW

Table 4.10:Awareness on MW Management Practices by Profession

Level at which sharps are incinerated		Total	Doctors	Nurses	Sanitary Staff	Chi sq.(x^2)	DF	P Value
	3/4 Full (N)	116	6	73	37			
	N%	47.50%	35.30%	56.60%	37.80%	9.02	2	0.011
	Not 3/4 Full	128	11	56	61			
	N%	52.50%	64.70%	43.40%	62.20%			
Level of emptying waste containers	3/4 Full (N)	135	6	69	60			
	N%	55.30%	35.30%	53.50%	61.20%	4.316	2	0.116
	Not 3/4 Full	109	11	60	38			
	N%	44.70%	64.70%	46.50%	38.80%			
Frequency of Recapping used needles by hand	Sometimes(N)	113	9	51	53			
	N%	46.30%	52.9%	39.5%	54.1%	5.063	2	0.08
	Never(N)	131	8	78	45			
	N%	53.7%	47.1%	60.5%	45.9%			
Aware of universal precaution rule	Yes(N)	202	11	113	78			
	N%	82.80%	64.70%	87.60%	79.60%	6.697	2	0.035
	No(N)	42	6	16	20			
	N%	17.20%	35.30%	12.40%	20.40%			
Aware of Government Plan on MW Management	Yes(N)	174	8	105	61			
	N%	71.30%	47.10%	81.40%	62.20%	15.237	2	0
	No(N)	70	9	24	37			
	N%	28.70%	52.90%	18.60%	37.80%			
% Mean Scores		**62%**	**46%**	**68%**	**57%**	**8.0666**	**2**	**0.0484**

CHAPTER FIVE

DISCUSSION

5.1 Awareness on medical waste management by the study population at Kenyatta National Hospital.

5.1.1 Waste segregation

According to the proposal by WHO, hospitals have to provide plastic bags and strong plastic containers for infectious waste such as empty containers of antiseptics used in the hospital, bags and containers for infectious waste that should be marked with a Biohazard symbol(Pruss *et al.,* 1999). Results from this study revealed that infectious wastes were the type of waste that the study population was least aware of at 23%. Only 18% of the doctors were aware of the correct segregation of infectious wastes which is in agreement to a similar study in India where they assessed the knowledge and practices of bio-medical waste management and infection control among dentists of a teaching hospital and they reported lack of awareness on medical waste management. (Management & Handling) Rules, 1998.

The radioactive/genotoxic wastes also scored a low percentage right after the infectious wastes at 28%, while the paper/ food stuff was the type of waste where majority i.e. 65% were aware of in terms of its segregation. This could be because these are wastes that they encounter often as opposed to the genotoxic wastes which they might not encounter every day hence may explain the results.

The overall awareness on segregation of wastes was found to be 44%. The doctors scored the highest score of 50%, followed by the support staff at 46% and finally the nurses at 41%. This is as opposed to a similar cross sectional study that was conducted to assess the awareness on medical waste management and universal work precaution among 134 health care personnel selected randomly out of 1300 including doctors, paramedical staff and class IV staff of King George hospital in Visakhapatnam. Data was collected by structured questionnaires. Study revealed that only 11% of doctors, 32% of paramedical and 25% of class IV staff was aware about the methods, guidelines of segregation and collection of wastes into color coded bins.

(Sreegiri *et al.*, 2009) Doctors therefore in KNH were found to be more aware of the segregation practices than the doctors in the study in King George Hospital.Separation of general waste in KNH is however practiced to an above average extent of 65%

5.1.2 Sharps disposal

Sharps are to be disposed when ¾ full and 48% of the study population were aware of that. The doctors were the least aware at 35.3% and the nurses were the most aware of this at 56.6%. This is compared to a study conducted in India where a descriptive study was conducted to assess the knowledge on preventive practice regarding needle stick injuries among 96 staff nurses at Mangalore. The result showed that 54.21 percent of participants knew that sharp disposal containers and puncture proof boxes and 55.35 percent of the nurses were aware that the sharp disposal containers are sent for incineration when the container is ¾ full. Exposure to biomedical waste increases the risk of acquiring infection. Nurses and other health care personnel must be made aware of the risks so that they can improve their practices with regard to medical waste management. As now a day's nurses are required to practice in expanded roles in variety of settings they have to be very responsible and ecologically sensitive in accessing the environment impact of their services and in providing ways to reduce the hazards. (Sristhi, 2000)

5.1.3 Not recapping used needles

Another parameter used to measure the awareness of medical waste management among the healthcare personnel was whether they were aware of the fact that used needles should never be recapped. 53.7% were aware of that with doctors scoring the lowest at 47%. 45.9% of the support staff was aware of the same and 60.5% of the nurses were aware of the same. According to the University of Colorado at Denver and health Sciences Centre, needles should never be recapped as it reduces the chances of needle-stick injuries.A similar study in India revealed that 22.92% of the respondent was aware that the wearing personal protective equipment minimizes sharp injuries. The study concluded that there were only a few staff nurses having knowledge about preventive practice regarding needle stick injuries including

not recapping used needles. A lot more needs to be done in this area at KNH so as to ensure safety while using needles and to prevent infections through recapping used needles.

5.1.4 Universal precaution rule

In this particular study at KNH, 84% of the study population were aware of the Universal Precaution rule that states 'Treat all human blood , bodily fluids and other potentially infectious materials as if they are infectious'.71% of the doctors were aware of the UWP rule, 88% of the nurses were aware of the same and 81% of the support staff was aware of the same. This is as opposed to the results of the study in India where they assessed the knowledge and practices of bio-medical waste management and infection control among dentists of a teaching hospital and they reported lack of awareness on Bio-medical Waste (Management & Handling) Rules, 1998 (Kishore et al.,2000) Also in a similar study done to assess awareness on Bio-Medical Waste Management among Health Care Personnel of Some Important Medical Centres' in Agra, the results showed that In the first stratum (apex Government hospitals), out of total 569 persons who responded to the questionnaire, only 33.21% employees were aware of Bio-medical Waste (Management & Handling) Rules, 1998.(Kishore *et al*., 2000)

5.1.5 Awareness of the government health care waste management plan 2008-2012

The awareness of the government plan on healthcare waste management was another parameter used to measure the staff members' awareness of medical waste management practices. 70% were aware of the government plan that was established in 1998. 47% of the doctors were aware of that which was the lowest score, 79% of the nurses were aware of the same and lastly 62% of the support staff was aware of the same this is in comparison to a similar study done in Accra Ghana to assess the medical waste management in the hospitals, in one of the stratum (the corporate healthcare facilities) they found that none of the healthcare providers was aware of the governments medical waste management and handling rules(1998) regulations

set. Kishore *et al*., (2000). This could only mean that the health care personnel need to be aware of what the government plan is on the same for them to implement.

5.2 Practices

Waste is generated from the various activities performed in the hospital. Wastes produced

In the hospital include general and medical wastes. General waste produced at the hospital is related to food preparation, administrative activities, and landscaping. This type of waste is similar to household and city Wastes. In the Kenyatta National Hospital different kinds of therapeutic procedures such as, chemotherapy, dialysis, surgery, delivery, resection of gangrenous organs, autopsy, 'biopsy, para-elinical exams, and injections, among others, are carried out and result in the production of infectious wastes, contaminated sharps with patients' blood and secretions, radioactive wastes and chemical materials which are considered to be hazardous wastes (pruss *et al.,* 1999). The amount of waste generated in hospitals depends upon various factors such as number of beds, types of health services provided, economic, social and cultural status of the patients and the general condition of the area where the hospital is situated (Askarian *et al.,*2004).

5.2.1 Waste storage, hand washing facilities and handling of wastes before treatment and disposal by the study population at KNH.

The place where the hospital waste is kept before transporting to the final disposal site is termed as a temporary waste storage area. This area must be well sanitised and secured in

such a way that it should be accessible only to authorised persons (pruss *et al.,* 1999). KNH has an efficient temporary storage facility that is fenced, big enough and only the authorized personnel are allowed in. The wastes are kept in this temporary storage area until it is time for off-site transport.

Medical wastes generated in the hospital are done on a daily basis collected and transported to a temporary storage area by hospital's staff. In a survey done in 2010 by the government of Kenya on medical waste management in various hospitals, results indicated that the frequency of collection of waste in most hospitals was done

once daily. Also the survey revealed that47% of hospitals visited were found to have refuse storage areas/rooms. In some of these hospitals, disused rooms, some with leaking roofs were used to store waste. Of the waste storage areas provided however, 61% of them were fenced or had restricted entry. In a similar study done in South Africa at Tygerberg Hospital to assess the medical waste management practices, results indicated that they have a well secured but poorly sanitised temporary storage area.

Most common mode of transmission of pathogens is via hands. Often infections acquired in healthcare and research settings are due to not washing your hands. (University of Colorado Denver, 2010)

At KNH there is also availability of a hand washing facility in every work station. This is a good indicator that there is emphasis on hygiene for the staff.

Waste treatment leads to a decrease in volume, weight, and risk of infectivity and organic compounds of the waste (Pruss *et al.,* 1999). During the interview, it was indicated to the

researcher that Kenyatta National Hospital uses incineration as the main method for the treatment of medical waste especially infectious and sharp wastes for the hospital. Autoclaves are used for treating part of the wastes. Kenyatta National Hospital has 1 incinerator that is in good condition with a capacity to hold <500kgs of waste. The incinerator is always in a good state. This hospital has an average of 11 containers in the various departments for disposal of medical wastes.

5.2.2 Assessment of current practices at KNH on waste generation, record keeping and use of some equipment.

Medical wastes generated in the hospital are on a daily basis collected and transported to a temporary storage area by hospital's staff. It is imperative for medical waste to be transported within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose. In Kenyattta National Hospital, a truck is used for onsite transport of waste from the sites of production (different wards) to the temporary storage area.

The staff employed for handling waste in the hospital use complete personal protective equipment, including overall gown and protective boots and gloves. It is important to note that the lack of suitable and sufficient protective equipment, the lack of knowledge regarding the correct usage of equipment and the lack of pertinent understanding of the personnel regarding the benefits of using protective equipment exposes personnel to serious dangers. (MoH, 2007)Kenyatta National Hospital has a waste handler who keeps record of the waste generated. Plastic containers are used for disposal. There is also a routine schedule for the collection of MW in KNH and it is done daily. Incineration is also done daily. In a survey done in Kenya 2007 on Medical waste management in the various hospitals, results indicated that most hospitals were treating their waste onsite. The commonest method of waste treatment was incineration at 62% using functional incinerators. Most of the wastes taken from hospitals for treatment off-site were glass waste and domestic waste while open burning, open dumping was still being practiced along with incineration. Of those taking their waste off-site, it was found out that most facilities never kept records of the waste they contract for off-site disposal. For the incinerators observed in hospitals, majority of them were in functional status while a quarter were dysfunctional; either undergoing repair or in a non-working status. Other waste treatment facilities available in these hospitals included; compost pits for non-hazardous biodegradable waste, and shredders which were found in only Kenyatta National Hospital, Mater Mission Hospital and Nairobi Hospital. Most of the hospitals did not have an alternative waste treatment option apart from incineration. (MoH Kenya, 2007)

5.3 Assessment of the factors associated with medical waste practices at KNH

Some habits come to us by default; education and peer environment certainly have a modulating role in them. Inculcating responsible behaviour at par with contemporary pool of good practices is a desirable endeavour. Although, there is an increased global awareness among health professionals about the hazards and appropriate management techniques, the level in India has been reported to be unsatisfactory. (Kishore *et al.,* 2000) In the study at KNH it was indicated that education had a

significant influence on the awareness of the healthcare personnel on medical waste management. On average diploma/higher diploma holders were more knowledgeable of better MW practices and standards, at 69% followed by below diploma, at 60% and finally PHD/Masters/BSC at 53%. The mean chi square results X^2(2, N=244) = 7.4408, P = 0.0316 indicated a significant relationship between level of education and awareness on correct practices as the P Value was less than 0.05.This is in contrast to the findings of (Mathew *et al.,* 2012)and (Yadavannavar *et al.,* 2012) A study on awareness on medical waste management among doctors in India which attempted to identify a few dimensions and determinants of the practices of medics in India regarding biomedical waste management. It has been found that over half of the respondents assessed their knowledge of MW management as 'poor'. The chasm was more evident between the graduates and the post graduates (p <0.001). This could probably be because they are freshly passed graduates.

The association between training and correct medical waste management was also evaluated and on average, 70% constituting those who attended training as more knowledgeable of better MW practices and standards while those who did not attend training constituted an average mean score of 52%. The mean chi square results X^2(1, N=244) = 9.5386, P = 0.013 indicated a significant relationship between training and awareness on correct practices as the mean P Value was less than 0.05. This is similar to a pre-experimental study conducted on effectiveness of planned teaching programme on biomedical waste management among 120 4th year B.Sc. nursing students of three nursing colleges in Bangalore. The pre-test questionnaire was given to assess knowledge. The pre-test mean score was only 49.5% whereas the post-test mean score was 86.6% and was highly significant (t = 22.56, p<0.001). The study concluded that PTP was effective in improving the knowledge of the nursing students (Vienna *et al.,* 2005)

This is also similar to another study on effectiveness of planned teaching programme on biomedical waste management among 150 staff nurses working in hospitals of Mangalore. The pre-test questionnaires were designed to assess knowledge. The pre-test knowledge score was 13.25, whereas the post-test mean score was 32.75 and highly significant at the level of p<.001. The post-test mean

score increased to 32.75% (p<.001) which shows the effectiveness of PTP. (Ruby et al., 2006)

The number of years healthcare personnel has worked in the hospital did not indicate any significance to good medical waste management. On average 59% of personnel who have 1 to 4 years of work experience were aware of correct MW standards and practices while those with over 5 years of work experience had a mean score of 64%.However the mean chi square results X^2(1, N=244) = 1.5086, P = 0.2834 indicated that there was no significant relationship between awareness and number of years served as the P Value was greater than 0.05.

On average Nurses were more aware of better MW practices and standards, at 68% followed by Sanitary Staff at 57% and finally Doctors at 46%. The Mean chi square results X^2(2, N=244) = 8.0666, P = 0.0484 indicated that there was a significant relationship between Profession and awareness on proper practices and standards of MW. This is similar to a cross sectional study conducted to assess the awareness on medical waste management and universal work precaution among 134 health care personal that were selected randomly out of 1300 including doctors, paramedical staff and class IV staff of King George hospital in Visakhapatnam. The study revealed that only 11% of doctors, 32% of paramedical and 25% of class IV staff was aware about the methods, guidelines of segregation and collection of wastes into colour coded bins. (Sreegiri et al., 2009).

CHAPTER SIX

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

Based on the results of this study the following conclusions were drawn:

6.1.1 Awareness of medical waste management

The overall awareness of medical waste management was found to be 51%, with the doctors overall score being 48%, nurses scoring 54.5% and the support staff scoring 51.5%. Awareness of medical waste management in this institution can be improved, especially in waste segregation since the score was<50%. Emphasis should be especially on the infectious wastes since only 23% of the study population was aware of the correct way of segregating these particular wastes.

Nurses should be trained more on segregation of wastes as they were the least aware of the proper segregation method. Since nurses are required to carry out a variety of roles in variety of settings they have to be very responsible and ecologically sensitive in accessing the environment impact of their services and in providing ways to reduce hazard. They need to be informed about current available technology to deal with medical wastes. Sound knowledge and safe practices among them, are to be strengthened. Most of the staff was aware of the safety precaution rules and risks involved in handling medical wastes.

In general, doctors scored the least in the awareness of medical waste management and the nurses scored the most. The overall mean score was an average score of 51% which means a lot needs to be done to take the score higher.

Therefore there is need for training them more to ensure the proper medical waste management practices. Also doctors are the head of most departments in the hospital hence there is need for them to lead from the front in demonstrating awareness on these very important aspects of medical waste management.

Training, level of education, profession and duration of service in the institution seemed to have significant influence on the proper medical waste management.

6.1.2 Practices.

The methods used for treatment, disposal and collection are the recommended methods hence the hospital has taken the right steps in that regard.

The staff in the hospital practice the right hand hygiene as noted from the study and also the practice of putting on the right equipment and garments for work which is very important in handling medical wastes.

6.2 Recommendations

1. There is need to have a constant supply of the equipment, more importantly the segregation bags to ensure that there is strict adherence to the regulations set and also to prevent injuries during the staff interaction with the wastes. This also could be emphasized by the fact that segregation scored the lowest in the awareness section which could only mean that the staff need to be trained more on segregation and also the risk involved in handling the wastes so that they understand clearly why they ought to follow the segregation rules.

2. Another recommendation is for regular training sessions and seminars on medical waste management for the healthcare personnel.

3. There is need to have a dedicated waste manager. The supervisor in charge of general services and has waste management as part of his job schedule.

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APPENDIX 1: MAIN QUESTIONNARE *(KIAMBATISHO CHA KWANZA (MAHOJIANO YENYEWE)*

A SURVEY TO UNDERSTAND THE AWARENESS AND PRACTICES ON BIOMEDICAL WASTE MANAGEMENT AMONG HEALTH CARE PERSONNEL IN KENYATTA NATIONAL HOSPITAL(*UTAFITI KUWEZA KUFAHAMU KWA UNDANI UJUZI NA MAZOEA YA UDHIBITI WA TAKA MATIBABU KATI Y WAFANYAKAZI KATIKA HOSPITALI KUU YA KENYATTA)*

QUESTIONNAIRE NO: *(NAMBARI YA MAHOJIANO)*

DATE INTERVIEW *(TAREHE YA MAHOJIANO)*

*Start time (**kuanza**):*

End time*(kuisha):*

Minutes *(dakika):*

GENDER *(jinsia)* (Observe and circle the appropriate gender) *(chunguza jinsia na uweke mviringo kwa jinsia iliyo sawa)*

M	1	F	2

SECTION 1 :(sehemu ya kwanza)

Q.1   What is your profession? (*Taaluma yako ni gani?*)

Profession- *taaluma*	CODE	
Doctor- *Daktari*	1	Ask Q.2
Nurse-*muuguzi*	2	
Sanitary Staff *msaaidizi wa wafanyakazi*	3	Skip to Q.3

Q.2 Which department in the hospital do you operate in?(*unafanya kazi katika idara gani katika hospitali hii*)

DEPARTMENTS(**IDARA**)	CODE	
Accident & Emergency(*ajali na dharura*)	1	CONTINUE
Orthopedic(*idara ya mifupa*)	2	
Gen. Surgery(*jumla ya upasuaji*)	3	
Obs. & Gyn(*kitengo cha uzazi na magonjwa ya wanawake*)	4	TERMINATE
Specialized Surgica*l(kitengo cha upasuaji maalumu*)	5	
Anesthesia Theatres(kitengo cha anesthesia)	6	
Rehabilitative Services(* kitengo cha huduma*)	7	
Dental(* kitengo cha meno*)	8	
Any other *(kitengo kingine)* ………………….		

Q.3 What is your current job status? (***Hali yako ya kazi kwa sasa ni gani***)

STATUS(*hali ya kazi*)	CODE	
Permanently(*kazi ya kudumu*)	1	CONTINUE(*endelea*)
Contract(*mkataba*)	2	TERMINATE(*funga mahojiano*)
Trainee/ Intern(*mfunzwa*)	3	
Volunteer(*kujitolea*)	4	

Q.4How long have you worked in this particular institution?(*Umefanya kazi katika hospitali hii kwa muda gani*)

PERIOD(*muda)*	CODE	
1-6 months*(miezi)*	1	TERMINATE*(funga mahojiano)*
1-2 years*(miaka)*	2	CONTINUE*(endelea)*
3-4 years(*miaka)*	3	
>5 years(*miaka)*	4	

Q.5What is the highest level of education you have achieved so far?*(Ngazi ya juu ya elimu uliyoipitia hadi sasa ni ipi)*

LEVEL OF EDUCATION(ngazi ya elimu)	CODE
Phd	1
Masters	2
BSc	3
Higher Diploma*(diploma ya juu0*	4
Diploma*(diploma)*	5
KCSE *(cheti cha shule ya sekondari)*	6
Other (*nyingine) (*Please Specify)……………………………….	

SECTION 2(sehemu ya pili) Awareness (mwamko)

Q.6What types of wastes do you mainly generate in this department/hospital for the support staff?*(Ni aina gani ya takataka ya matibabu inapatikana katika idara ama hospitali hii (uliza hospitali kwa msaidizi wa wafanyakazi)*SHOW CARD

WASTES(*takataka ya matibabu*)	CODE	
Infectious wastes (Blood and body fluids)*(takataka za kuambukiza)*	1	
Anatomical wastes (human tissues, body parts, fetusetc.)*(taka za anatomia)*	2	
Sharp wastes*(taka za kudunga)*	3	Skip to Q.8*(enda namba nane)*
Chemical wastes (e.g. reagents, solvents etc.)*(taka za kemikali)*	4	
Pharmaceutical wastes (e.g. outdated meds)*(taka za dawa zilizo haribika)*	5	
Radioactive wastes and genotoxic wastes*(taka mionzi)*	6	
Papers/Food stuff*(taka ya chakula na karatasi)*	7	
Others (Please specify) *(yeyote nyigine)*………………………..		

Q.7And in what colour coded container do you dispose these waste?(*rangi ya chombo unachoweka taka zilizotajwa hapa chini ni kipi)* (SHOW CARD)

WASTES(TAKA)	RED(nyeku ndu	YELLOW(manj ano)	BLACK(nye usi)
Infectious wastes (Blood and body fluids) *(takataka za kuambukiza)*	1	1	1
Anatomical wastes (human tissues, body parts, fetusetc.)	2	2	2

(taka za anatomia)			
Chemical wastes (e.g. reagents, solvents etc.) *(taka za kemikali)*	4	4	4
Pharmaceutical wastes (e.g. outdated meds) *(taka za dawa zilizo haribika)*	5	5	5
Radioactive wastes and genotoxic wastes*(taka mionzi)*	6	6	6
Paper/ Food Stuff*(taka ya chakula na karatasi)*	7	7	7
Others (please specify) *(yeyote nyigine)*……………………… ………..	9	9	9

Q.8 You mentioned that sharps are generated in your department, at what point are the sharp containers taken for incineration?*(Umesema kwamba taka za kudunga ama zinazalishwa katika kitengo hiki,ni baada ya muda upi zinapelekwa kwenye incinerator)*

LEVEL*(kiwango)*	CODE
Completely Full*(kabisa kamili)*	1
¾ Full(*kamili)*	2
½ Full *(kamili)*	3
¼ Full(*kamili)*	4
Don't Know*(sijui)*	99

Q.9 How often do you recap used needles by hand?

Sometimes*(wakati mwingine)*	1
Most of the time*(wakati mwingi)*	2
Never**(kamwe)**	3

Q.10 Which disease do you know are a potential for transmission through bio-medical waste handling?*(ni magonjwa yapi unayoyafahamu yaliyo na uwezekano wa maambukizi kupitia taka ya matibabu)*

DISEASE*(ugonjwa)*	CODE
HIV/ AIDS*(ukimwi)*	1
Hepatitis C	2
Hepatitis B	3
Don't Know*(sijui)*	99

Q.11 Are you aware of the Universal Precaution Rule*(je unajua zima kazi hadhari utawala yoyote)*

Yes*(ndio)*	1
No (*la*)	2

Q.12 Do you know of any strategic plan by the government addressing biomedical waste management*(je unafahamu mpango mkakati wowote*

ambao serikali imeuweka ikizungumzia kuweza kusimamia taka za

matibabu)

Yes*(ndio)*	1
No *(la)*	2

SECTION 3 (sehemu ya tatu) Practices(mazoea)

Waste Storage and Handling(taka uhifadhi na utunzaji)

Q.13   Is there a temporary storage premise large enough to handle the waste

generated *(je kuna muda kuhifahi nguzo kubwa ya kuweza kuhifadhi taka*

za matibabu zinazozlishwa)

Yes*(ndio)*	1
No*(la)*	2
Don't Know *(sijui)*	99

Q.14   Do you handle waste temporarily before treatment and disposal? *(Je*

mna mahali pa kushughuikia taka za matibabu kwa muda kabla ya

matibabu na utupaji)

Yes*(ndio)*	1	**Ask Q.15**
No *(la)*	2	**Skip to Q.16**

Q.15   If yes how long before further action?*(kama ndio ni baada ya muda*

upi kabla ya hatua kuchukuliwa)

1 day(*siku moja*)	1
2 days(*siku mbili*)	2
3 days(*siku tatu*)	3
4 days(*siku nne*)	4
5 days(*siku tano*)	5

Q.16   Does the waste handler weigh and keep record of the waste generated

(je anayeshughulikia taka za matibabu anapima na kuweka rekodi ya taka

matibabu zinazozalishwa)

Yes(*ndio*)	1
No(*la*)	2
Don't Know(*sijui*)	99

Q.17   Is there a hand washing facility(*je kuna kituo cha kunawia mikono*)

Yes(*ndio*)	1
No(*la*)	2
Don't Know(*sijui*)	99

Q.18   Is the storage facility…………..?(*Je kuna kituo cha kuhifadhi*

kime)…………………

	Yes(ndio)	No(la)	Don't Know(sijui)
Fenced(*zingirwa)*	1	2	3
Big Enough(*kubwa sana)*	1	2	3
Well Ventilated(*na hewa safi naya kutosha)*	1	2	3
Accessible only for the authorized personnel(**ingiwa na wale walioruhusiwa pekee**)	1	2	3

Waste Segregation Practices (taka ubaguzi na mazoea)

Q.19   How often do you use the color coding scheme to dispose the non-infectious wastes and the infectious wastes.(*mara ngapi mnatumia ubaguzi wa chombo cha kuwekea taka matibabu kuhifadhia takataka za kuambukiza na zisizo za kuambukiza)*

All the time*(wakati wote)*	1	**Skip to Q.21***(enda swali iishirini na moja*
Sometime*(wakati mwingine)*	2	**Continue***(endelea)*
Rarely*(kwa nadra)*	3	
Not at all*(si wakati wote)*	4	

Q.20   **…**and why don't you use the colour coding scheme all the time?(*na mbona hamtumii mpango huu wa ubaguzi taka kwa kutumia vyombo vya rangi tofauti*)

No material(***hakuna vifaa***)	1
Inadequacy(***upungufu***)	2
Not Accessible(***kutopatikana***)	3
Any Other(*sababu nyingine*)(please specify)(*elezea*)	

Q.21   What type of containers do you use to dispose the above wastes mentioned (*na ni vyombo vya aina gani mnavyovitumia kuondoa taka matibabu zilizotajwa hapo mbeleni*)

Plastic(***plastiki***)	1
Metal(***chuma***)	2
Any other(***eleza nyingine yeyote***) (please specify)…………………………………	

Q.22   At what level do you normally empty the waste containers?*na nibaada ya muda upi mnaondoa taka kwenye vyombo hivi?*)

½ *(Nusu)*	1
¾ *(tatu robo)*	2
Full(***jaa pooni***)	3

Q.23   What is the number of containers present for waste collection in this section? **SKIP TO Q24 FOR SUPPORT STAFF.***(mna vyombo vingapi vya kuchukulia taka matibabu katika sehemu hii)*

```
┌──────────┐
│          │
│          │
└──────────┘
```

Q24 Is there special equipment for sharp waste handling in the health facilities? (*Je katika kituo hiki, kuna vifaa maalum vya kutunziataka za kudunga ama zilizo kali)*

Yes*(ndio)*	1
No*(la)*	2
Don't Know*(sijui)*	99

Collection, Treatment and Disposal(ukusanyaji matibabu na utupaji wa taka matibabu)

Q25 Do you have a routine schedule for the collection of biomedical waste? (*je mna mpangiio wowote wa kutibu taka matibabu)*

Yes(*ndio*)	1	**Ask Q.26(uliza swali nambari kumi na sita)**
No(*la*)	2	**Skip to Q.27(ruka mpaka swali 27)**
Don't Know(*sijui*)	99	

Q26 If so, how often *(kama ni ndio,ni mara ngapi)*

Daily(*kila siku*)	1
Weekly(*kwa wiki*)	2
Monthly(*kwa mwezi*)	3

Q27 What methods of treatment do you normally use?(*Na mnatumia njia zipi za kutibu taka)*

Incineration(*incineration ya taka matibabu*)	1
Autoclave(*Autoclave ya taka matibabu*)	2
Hydoroclave(*hydoclave ya taka matibabu*)	3
Microwave(*microwave taka matibu*)	4
Chemical(*kemikali*)	**5**
Combustion(*mwako*)	6
Land disposal(*ardhi ovyo wa taka matibabu*)	7
Burial(*kuzika*)	8
Deep Burial(*kuzika kwaundani sana ardhini*)	9
Burning(*kuchoma*)	10
Any other *(eleza njia yeyote nyingine)* (please specify)…………………………………………………………………… ……	

Q28 What means do you use to transport the wastes? (*Mnatumia njia ipi kusafirisha taka matibabu)*

Wheeled Trolleys*(tairi kitoroli)*	1
Carts*(mikokoteni)*	2
Containers*(vyombo)*	3
Any other*(elezea njia nyngine yeyote)* (Please Specify)	

Q29 How often do you transport the wastes? *(Mnasafirisha taka matibabu mara ngapi)*

Daily*(kila siku)*	1
Weekly*(kila wiki*)	2
After every 2 weeks*(kila baada ya wiki mbili)*	3
Monthly*(kila mwezi)*	4

Q30 Is there a specific area for health care waste disposal? *(je kuna mahali malum pautupaji wa taka)*

Yes *(ndio)*	1
No*(la)*	2
Don't Know*(sijui)*	99

Q31 How often do you incinerate wastes? (*Ni kwa mara ngapi mna incinerate taka matibabu)*

Every day(kila siku)	1
Once every 2 days*(mara moja kila siku mbili)*	2

Once every 4 days(*mara moja kila siku nne*)	3
Once a week(*mara moja kwa wiki*)	4
Don't Know(*sijui*)	**99**

Q32 How many incinerators do you have?(*mna incinerator ngapi katika hospitali hii*)

1(*moja*)	1
2(*mbili*)	**2**
3 and above(*tatu kwenda juu*)	**3**
Don't know(*sijui*)	**99**

Q33 what is the capacity of the incinerators? *Na uwezo wa incinerator hizo ni upi?*

5-30 kgs/hr(*kilo kwa lisaa*)	1
35-75 kgs/hr(*kilo kwa lisaa*)	2
100-175 kgs/hr(*kilo kwa lisaa*)	3
200-400 kgs/hr(*kilo kwa lisaa*)	4
500 kgs/hr and above(*kilo mia tano kwenda juu*)	5
Don't Know(*sijui*)	**99**

Q34 In what conditions are the incinerators (*na incinerator hizi ziko katika hali gani*)

Good(*nzuri*)	1
Fair(*hali iliyo ya haki*)	2
Average(*wastani*)	3
Bad(*mbaya*)	4
Worst(*mbaya zaidi*)	5

Q35 And how often are they always in this condition *(na incinerator hizi huwa katika hali hii……)*

All the time*(wakati wote)*	1
Sometimes*(wakati mwingine)*	2
Most of the time*(wakati mwingi)*	3
Rarely*(kwa nadra)*	4

Exposures (yatokanayo)

Q36 Have you ever had any injuries while handling biomedical waste?*je umewahi kupata jeraha lolote katika kukutana kwako na taka matibabu)*

Yes*(ndio)*	1
No*(la)*	2

Q37 Do you use self-sheathing needles?*(je, mnatumia sindano iliyonakifuniko chake binafsi)*

All the time*(wakati wote)*	1
Sometimes*(wakati mwingine)*	2
Rarely*(kwa nadra)*	3
Not at all*(la hasha)*	4

Q38 Are you aware of any formal accident and injury reporting system*(je unafahamu njia rasmi ya kuripoti ajali yoyote inayohusiana na taka matibabu)*

Yes*(ndio)*	1
No*(la)*	2

Q39 Have you ever been vaccinated against Hepatitis B?(*je umewahi kupata chanjo ya hepatitis B)*

Yes*(ndio)*	1
No*(la)*	2

Q40 How often do you put on your personal protective equipment when handling biomedical wastes *(je unavaa mavazi ya kujikinga wakati unapoingiliana na taka matibabu………………)*

All the time*(wakati wote)*	**1**
Sometimes*(wakati mwingine)*	**2**
Rarely*(kwa nadra)*	**3**
Never(kamwe)	**4**

Q41 Do you always wash your hands with soap and water during the following? Tick where appropriate?*(je, wewe huosha mikono zako na maji na sabuni wakati unapofanya yafuatayo)*

		Yes	No
A	Immediately, or as soon as feasible, after removal of gloves or other PPE(personal protective equipment)*(mara tu unapotoa kinga ama vifaa vingine vya kujikinga)*	1	2
B	Whenever you leave the work area*(wakati unapoondoka mahala kituo chako cha kazi)*	1	2
C	Whenever you go on break*(wakati unapoenda kupumzika kidogo)*	1	2
D	Before eating*(kabla ya kula)*	1	2
E	Following contact with blood or other potential infectious materials*(baada ya kukutana na damu ama vifaa*	1	2

vinavyoweza kuambukiza magonjwa)		

Q42 What are the 3 greatest limitations you face in your interaction with biomedical wastes? *(taja changamoto tatu unazokutana nazo unapokutana na taka matibabu)*

1	
2	
3	

Q43 How would you describe the control of waste by this institution? (*Unaweza kueleza udhibiti wa taka upo katika hali gani katika hospitali hii)*

Good(*nzuri)*	1
Fair(*hali iliyo ya haki)*	2
Poor(*mbaya)*	3

t

Q44 On a scale of 1-10 how would you rank the following statements as motivating factors for better biomedical waste management in this institution where 1 is most important and 10 is least important *(.katika kipimo cha kutoka moja mpaka kumi, panga taarifa zifuatazo kama sababu hamasisho za kusaidia kuendeleza usimamizi wa taka matibabu katika taasisi hii ambapo moja ni sababu muhimu zaidi na kumi ni sababu isiyo muhimu)*

Get more human resources (**kupata raslimali zaidi**	1	2	3	4	5	6	7	8	9	1

ya binadamu)										0
Have more training on biomedical waste management(*mafunzo zaidi kuhusiana na usimamizi wa taka matibabu*)	1	2	3	4	5	6	7	8	9	1 0
Have a continuous supply of equipments and materials for provision of improved handling bio medical wastes (*kuwa na kuendelea usambazaji wa vifaa kwa kuendeleza usimamizi wa taka matibabu*)	1	2	3	4	5	6	7	8	9	1 0
Get more funding for biomedical waste management(*pata fedha zaidi za kuendeleza usimamizi wa taka matibabu*)	1	2	3	4	5	6	7	8	9	1 0

Training(mafunzo)

Q45 Have you had any training on biomedical waste management by this institution?
je, umewahi kuhusika katika masomo yoyote yaliyotolewa na hospitali hii kuhusu kudhibiti taka matibabu)

Yes*(ndio)*	1
No*(la)*	2

Q46 If yes, how many times? *Kama ndio, mara ngapi?*

Q47 How long ago were you trained?*masomo haya yalifanywa muda upi uliopita?*

Q48 Have you been trained on biomedical waste by any other institution?*Je umewahi kupitia masomo yeyote kuhusiana na kudhibiti taka matibabu na taasisi ingine isipokua hospitali hii)*

Yes *(ndio)*	1
No*(la)*	2

Q49. If yes,what is the name of this institution? *(Kama ndio, taja jina la taasisi hiyo)*

……………………………………………………………………………………………
…………………………………

AWARENESS AND PRACTICE OF BIOMEDICAL WASTE MANAGEMENT IN KNH *(UFAHAMU NA MAZOEA YA UDHIBITI WA TAKA MATIBABU KATIKA HOSPITALI KUU YA KENYATTA)*

My name is Mercy Wanjiku and I am currently an MSC student in Medical Epidemiology at JKUAT which works in collaboration with KEMRI. I am working on my thesis whose title is as stated above. I seek to get feedback from you on the questions set so as to enable me get accurate information for quality analysis and conclusions of the study. Please accord the research assistant 20-30 minutes of your time to conduct the interview. Thank you*. (Jina langu ni Mercy Wanjiku na kwa sasa ninasoma katika chuo kikuu cha Jomo Kenyatta ambacho kinashirikiana na KEMRI ambapo nasomea Masomo ya juu ya Epiemiologia. Ninafanya pendekezo kuhusu ujuzi na mazoea ya udhibiti wa taka matibabu. Naomba kupata maoni yako kutokana na maswali yafuatayo ili niweze kupata taarifa sahihi ya kuweza kupata uchambuzi wenye ubora na hitimisho la utafiti.Tafadhali mpe msaidizi wa utafiti dakika kama ishirini ama therathini hivi aweze kukuhoji kuhusiana na mambo ambayo nimeyataja hapo awali. Asante.*

APPENDIX 2: INFORMED CONSENT *(KIAMBATISHO CHA PILI)*

This particular study is aimed at assessing the awareness and practices on the biomedical waste (BMW) management & universal work precautions (UWP) among the health care personnel and also observing & documenting the prevailing health care waste management system in Kenyatta National Hospital. (*Utafiti huu una lengo la kuweza kujua kwa undani kuhusu ujuzi na mazoea ya udhibiti wa taka matibabu na pia utawala kati ya wafanyakazi. Utafiti pia unalengo la kujua kwa undani kuzingatia na kumbukumbu za udhibiti wa taka matibabu katika hospitali hii.)*

The objectives of the study are (*Malengo ya utafiti huu ni kama yafuatayo)*

1. To determine the level awareness on biomedical waste management among the health care personnel in KNH.*(kufahamu kwa undani kiwango cha ufahamu wa udhibiti wa taka matibabu kati ya wafanyakazi katika hospitali kuu ya Kenyatta)*

2. To determine the practices on biomedical waste management at KNH.*(kufahamu kwa undani mazoea ya kudhibiti taka matibabu katika hospitali kuu ya Kenyatta)*

3. To determine the factors associated with biomedical waste management.*(kufahamu kwa undani mambo yanayohusiana na udhibiti wa taka matibabu)*

Procedures to be followed.(taratibu za kufuatwa)

If you accept to participate in this study, you will be asked to answer questions which shall be read to you from a questionnaire. The questionnaire should take approximately 20 to 30 minutes (*ukikubali kuhusika katika utafiti huu ama mahojiano haya, utaulizwa maswali ambayo yatasomwa na msaidizi wa utafiti kutokana na maswali yaliyopo. Mahojiano haya yatachukua takriban dakika ishirini ama thelathini hivi)*

Risks(hatari)

Questions are not invasive or personal and it is necessary for you to answer them truthfully as the information is vital in providing reliable results.*(maswala haya si ya kibinafsi na ni vyema ukiyajibu kwa ukweli kwani yale utakayo tupa ni muhimu sana katika kupeana matokeo ya kuaminika)*

Benefits (faida)

The findings from this study may help policy makers and relevant stakeholders to direct focus to biomedical waste management and provide the necessary interventions required to curb the challenges faced by the healthcare personnel and also the hospital management as they plan on the practices of proper biomedical waste management.(***Matokeo ya utafiti huu yatasaidia watunga sera na wadau husika kuweza kulenga kudhibiti taka matiibabu na hivyo kuweza kupeana hatua muhimu zinazohitajika ili kukabiliana na changamoto zinazowakumba wafanyakazi na wakubwa wa usimamizi wa hospitali wanapopanga kuhusu udhibiti wa taka matibabu)***

Privacy and Confidentiality Statement (taarifa ya faragha na usiri)

Participation in this study comes with a strict confidentiality policy. Participant confidentiality shall be maintained by secure storage of data sheets and use of an anonymous coding system. No information about you or provided by you shall be disclosed to others without your written permission except, if necessary, to protect your rights, or is required by the Law.

The procedures by which any information you provide to us will be processed will not involve revealing your identity. There will be no use of names rather codes will be used and hence protection of will be ensured. (***Kuhusika katika utafiti huu kutahakikisha faragha na usiri .haya yatahakikishwa kwakuhufadhi data na kutumia mfumo wa code ambao utakua hautumii majina ya wahusika .Hakuna habari yeyote uliyotupa itakayo patiwa mtu mwingine ila kwa ruhusa yako ambayo itakua taarifa uliyoiandika ili kuhakikisha haki yako imezingatiwaama kama habari hiyo itahitajika kortini)***

Consequences of Withdrawal (Matokeo ya kujiondoa katika mahojiano haya)

Your participation in this study in the form of an interview is completely voluntary. There shall be no penalties or loss of benefits to you which you may otherwise be entitled to should you choose to refuse to participate, or at any point revoke your consent or withdraw from the interview. Important to note however is that if your withdrawal from the interview, your contribution will not be used for analysis since it will not be counted as a complete questionnaire.*(kuhusika kwako katika utafiti huu ni kwa hiari yako na hakuna faini ama kupoteza faida kwako ikifanyika kwamba ukose kuhusika na utafiti huu wakati wa mahojiano. La muhimu kujua ni kwamba usipokamilisha kujibu maswala yote, majibu yako hayatatumika katika uchambuzi wa utafiti huu manake dodoso hiyo haitahesabiwa kama iliyo kamili)*

Additional Information (Maelezo ya ziada)

You are encouraged to clarify any issues or ask any questions at any point during participation. If you have any other questions or would like to acquire further information any other time, you can contact me by calling me at +254 720 526 198 or email at wanjikunjiruh@gmail.com.

If you have any questions or concerns regarding the study and would like to contact someone other than the researcher(s), you are advised to contact the following :*(unaulizwa kuweza kufafanuliwa kuhusu mambo ambayo ungependa kufafanuliwa ama kuuliza swali ata wakati mahojiano yanapoendelea)kama kuna swali lolote unaweza kunipata kwa maelezo yafuatayo)*

The Principal investigator :(Mtafiti mkuu)

Mercy Wanjiku Njiru

Cell number *(nambari ya simu)*: 0720 526 198

Email (*barua pepe)*: wanjikunjiruh@gmail.com

Physical address *(anwani ya kimwili)*: Uthiru next to kobil petrol station, Nairobi-Nakuru highway.

OR *(ama)*

The Chairman*, (mwenyekiti)*

KEMRI Ethical Review Committee,KEMRI *(kamati ya kimaadili na mapitio)*

P. O. Box 54840 – 00200, Nairobi.

Telephone numbers: 020-2722541, 0722205901, 0733400003

Email :*(barua pepe)*erc@kemri.org

OR *(ama)*

University of Nairobi, College Health sciences *(chuo kikuu cha Nairobi, chuo cha afya na sayansi)*

P.O BOX *(anwani)* 19676 code 00202

Tel:*(Nambariya simu)* (254-020)2726300 Ext 44355

Ref. No *(Nambari ya kumbukumbu).* KNH-ERC/R&R/655

OR

Kenyatta National Hospital *(Hospitali kuu ya Kenyatta)*

P.O.BOX *(Anwani)* 20723 code (kodi) 00202

Tel *(Nambari ya simu)*: 726300-9

OR

The below mentioned are my supervisors, one from KEMRI and the other from JKUAT. This is because JKUAT works in collaboration with KEMRI in the ITROMID department hence proposals have to pass through the KEMRI ethical committee. (*Waliotajwa hapa chini ni wasimazi wakuu wangu katika utafiti wangu. Mmoja ni wakutoka Jomo Kenyatta na mwingine ni wakutoka KEMRI*

kitengo cha ITROMID na mapendekezo yote lazima yapitie kamati ya kimaadili na mapitio ya KEMRI)

Dr. Charles Mutai

Director KEMRI *(Mkurugenzi KEMRI)*

Email address *(barua pepe)*;cmutai@kemri.org

Cell phone *(nambari ya simu)*: 0724476744

OR (ama)

Prof .Gikunju

Lecturer JKUAT *(Mhadhiri JKUAT)*

Cell phone *(nambari ya simu)*: 0722808671

I have read the above information and have had the opportunity to ask questions and all of my questions have been answered to my satisfaction. I have understood the study and consent to participate as has been explained. (*Nimesoma taarifa iliyo juu na nimeweza kuuliza maswali niliyokua nayo na yakajibiwa kwa utoshelezi. Nimeelewa utafiti huu unahusu nini na nimekubali kuhusika kama nilivyoelezewa)*

Name of Interviewee *(jina la mhusika)* ………………………………………

 Signed *(sahihi)*………………………………………………………………....

Name of interviewer *(jina la mtafiti)*………………………………………….

Signed *(sahihi)*………………………………………………………………….

APPENDIX 3 ETHICAL REVIEW COMMITTEE APPROVAL

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel (254) (020) 2722541, 2713349, 0722-205901, 0733-400003; Fax: (254) (020) 2720030
E-mail: director@kemri.org   Info@kemri.org   Website:www.kemri.org

KEMRI/RES/7/3/1

March 11, 2013

TO: Ms. MERCY WANJIKU NJIRU (PRINCIPAL INVESTIGATOR)
           STUDENT No. 306 – 1041/2011

THROUGH: DR. JENNIFER ORWA,
           ACTING DIRECTOR, CTMDR,
           NAIROBI

Dear Madam,

RE: SSC PROTOCOL No. 2375 – REVISED (*RESUBMISSION*): AWARENESS AND
           PRACTICE ON BIOMEDICAL WASTE MANAGEMENT AMONG HEALTH CARE
           PERSONNEL IN KENYATTA NATIONAL HOSPITAL (*2012*)

Reference is made to your letter dated February 06, 2013. The ERC Secretariat acknowledges receipt of the revised proposal on 8th February, 2013.

This is to inform you that at the Committee determines that the issues raised at the 210th ERC meeting of 26th November 2012 are adequately addressed.

Consequently, the study is granted approval for implementation effective this 11th March 2013 for a period of one year. Please note that authorization to conduct this study will automatically expire on March 10, 2014.

If you plan to continue data collection or analysis beyond this date, please submit an application for continuation approval to the ERC Secretariat by January 26, 2014. The regulations require continuing review even though the research activity may not have begun until sometime after the ERC approval.

You are required to submit any proposed changes to this study to the SSC and ERC for review and the changes should not be initiated until written approval from the ERC is received. Please note that any unanticipated problems resulting from the implementation of this study should be brought to the attention of the ERC and you should advise the ERC when the study is completed or discontinued.

Work on this project may begin.

Sincerely,

DR. ELIZABETH BUKUSI,
ACTING SECRETARY,
KEMRI ETHICS REVIEW COMMITTEE

In Search of Better Health

APPENDIX 4 SCIENTIFIC STEERING COMMITTEE APPROVAL

KENYA MEDICAL RESEARCH INSTITUTE

P.O. Box 54840-00200, NAIROBI, Kenya
Tel (254) (020) 272255, 2713349, 0722-205901, 0733-400003; Fax (254) (020) 2720030
E-mail: director@kemri.org   info@kemri.org Website www.kemri.org

ESACIPAC/SSC/100706   17th October, 2012

Mercy Njiru

Thro'
Director, CTMDR   *Forwarded*
NAIROBI   *28.11.2012*

REF: SSC No. 2375 (2nd Revised) – Awareness and practice on
biomedical waste management among healthcare personnel in
Kenyatta National Hospital in Nairobi, Kenya.

I am pleased to inform you that the above mentioned proposal, in
which you are the PI, was discussed by the KEMRI Scientific
Steering Committee (SSC), during its 195th meeting held on 2nd
October, 2012 and has since been approved for implementation by
the SSC.

Kindly submit 4 copies of the revised protocol within 2 weeks from
the date of this letter i.e,31st October, 2012 to SSC for onward
transmission to ERC office.

We advise that work on this project can only start when ERC
approval is received.

Sammy Njenga, PhD
SECRETARY, SSC   *19/11/12*

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APPENDIX 5 ETHICAL COMMITTEE APPROVAL BY KNH

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355
Ref: KNH-ERC/A/6

KNH/UoN-ERC
Email: uonknh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke
Link:www.uonbi.ac.ke/activities/KNHUoN

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi
10th January 2013

Mercy Wanjiku Njiru
Reg. No.TM/306/1041/2011
JKUAT

Dear Mercy

RESEARCH PROPOSAL: AWARENESS AND PRACTICES ON BIOMEDICAL WASTE MANAGEMENT AMONG HEALTHCARE PERSONNEL IN KENYATTA NATIONAL HOSPITAL IN NAIROBI, KENYA (P508/09/2012)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and approved your above revised proposal. The approval periods are 10th January 2013 to 5th January 2014.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used
b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation
c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal).
f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
g) Submission of an executive summary report within 90 days upon completion of the study
This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.kw/activities/KNHUoN

"Protect to Discover"

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APPENDIX 6 EAST AFRICAN MEDICAL JOURNAL APROVAL LETTER

EAST AFRICAN MEDICAL JOURNAL
(ORGAN OF KENYA MEDICAL ASSOCIATION)
Established in 1923

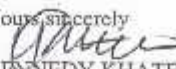Editor-in-Chief: PROF. W. LORE, MD, FRCP

Our Ref:
MS035/13

29ᵗʰ August 2013

Ms. Mercy Wanjiku Njiru
Institute of Tropical Medicine
Jomo Kenyatta University of Agriculture and Technology
P.O. Box 62000-00200.
Nairobi, Kenya

Dear Ms. Wanjiku,

RE: Awareness and Practice on biomedical waste management a...

healthcare personnel in Kenyatta National Hospital.

I am pleased to inform you that the above-referenced manuscript authored by yo...
Mutai C. and Gikunju J. has been accepted for publication in the East African M...
Journal. The galley proofs will be forwarded for your approval in due course. (...
you therefore not discuss your paper with the medical or lay press until we publis...

Yours sincerely

KENNEDY KHATETE
EDITORIAL MANAGER
EAST AFRICAN MEDICAL JOURNAL
P. O. Box 41632 - 00100
NAIROBI - KENYA

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