

**KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTH CARE WORKERS ON
WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS, IN KHOMAS
REGION, NAMIBIA**

**A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE DEGREE OF**

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ABSTRACT

Knowledge, attitude and practice of health care workers have a greater impact on proper waste segregation globally. Therefore, in this paper it was essential to explore the knowledge, attitude and practice of HCWs on waste segregation in Namibia. The aim of the study was to explore the knowledge, practice and attitude of health care workers on waste segregation at Windhoek Central Hospital (WCH) and Intermediate Hospital Katutura (IHK), Khomas region and to propose interventions for improving waste segregation. The objectives of the study were to examine health care workers' knowledge on waste segregation in public training hospitals, Khomas region, to explore and describe health care workers' attitude towards correct waste segregation and to assess health care workers' practice on compliance with the waste segregation. Participants of the study were doctors including interns, nurses, ward assistants and cleaners. Their knowledge and attitudes were assessed. Sample for each professional category of participants were as follow: Doctors n=20, nurses n=53, ward assistants n=7 and cleaners n=20. In total they were n=100. Furthermore, the wards were assessed by use of checklist and this underpinned how HCWs practiced waste segregation. Samples in this case were 7 wards out of 14.

A quantitative, descriptive, cross-sectional study was employed that included the use of a checklist and self-administered questionnaires. Probability stratified random sampling method was used in this study to ensure proportional representation of HCWs categories. Simple random sampling was used in selecting the wards to be assessed. The Epi-info software version 3.5.1 was used to analyse quantitative data for both objectives. Data analysis involved checking and editing the collected data, cleaning and analysing them. Frequency distribution tables, descriptive statistics like measure of central tendency and measures of variability were employed.

The research findings were reported according to the main aspects of the study. Research findings indicated that respondents were health care workers aged between 23 and 64 years old from two public training hospitals, Khomas region. The mean ages of all respondents were 37.4 (SD 13.0) years, Median 36.5 and Mode 28. 89 (89.9%) of health care workers reported that health care wastes were hazardous, while only 8(8%) health care workers who did not know. The results indicated that 17(85.0%) doctors, 39(73.6%) nurses, 7(100.0%) ward assistants and 16 (80.0%) cleaners knew where to put papers and papers plates. 11(55.0%) doctors, 47(88.7%) nurses, 6(85.7%) ward assistants and 13(65.0%) cleaners knew where to put soiled linens. Meanwhile, 19(95.0%) doctors, 51(96.2%) nurses, 6(85.7%) ward assistants and 20(100.0%) cleaners knew where to put infectious and biohazardous wastes. The study further revealed that 4(20.0%) doctors, 41(77.4%) nurses, 5(71.4%) ward assistants and 15(75.0%) cleaners knew where to put left over food. Incorrect disposal was observed in 2 (28.6%) wards, while such observation was not seen in 5 (71.4%) wards.

However, the study also has some limitations as follow; some HCWs who were initially selected randomly happened to fall sick in the assessment day; hence they could not meet the inclusion criteria. The researcher experienced difficulties with some doctors, as they had to postpone the assessment dates due to their busy schedules. It was concluded that training of personnel was not adequate and did not cater for all different level of health care workers.

The study recommended that training for all health care workers categories on waste segregation should be done on the regular basis. The Ministry of Health and Social Services (MOHSS) to employ Environmental Health Practitioners to be in charge of overall waste management in the hospitals. Furthermore, adequate monitoring and evaluation of waste segregation processes in the two training hospitals should be ensured.

Keywords: Knowledge, attitude, practice, health care workers, waste segregation, training hospitals

List of abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ANHOPS	Association of National Health Occupational Physicians
BMW	Bio-Medical Waste
COHSASA	Council for Health Services Accreditation in Southern Africa
HAIs	Healthcare-associated infections
HCRW	Health Care Risk Waste
HCW	Health care waste
HCWs	Health care workers
HCWM	Health Care Waste Management
HIV	Human Immunodeficiency Virus
IHK	Intermediate Hospital Katutura
KAP	Knowledge, attitudes and practices
MOHSS	Ministry of Health and Social Services
NGO	Non- Governmental Organizations
NIMBY	Not in my back yard syndrome
NQA	Namibia Qualification Authority
UNAM	University of Namibia
UNICEF	United Nation Children's Fund
WCH	Windhoek Central Hospital
WHO	World Health Organization

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DECLARATION

I, **Anna Ndapandula Haifete**, hereby declare that knowledge, attitude and practice of health care workers on waste segregation at two public training hospitals, in Khomas region, Namibia, is a true reflection of my own study, that it has not been submitted for any degree in Namibia or University of Namibia.

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.....
Anna Ndapandula Haifete

.....
Date

DEDICATION

This work is dedicated to all health care workers at Windhoek Central Hospital and Intermediate Hospital Katutura who have volunteered their time and energy to respond to the questionnaires. Special thanks go to my parents who taught me hardship and guidance throughout my life as well as my family for their patience and for having been there for me during my study.

CHAPTER 1

INTRODUCTION AND BACKGROUND TO THE STUDY

1.1 INTRODUCTION

Waste segregation is a proper manner of disposing of wastes in the hospitals according to its type; for example biological waste and is separated according to the colour coded plastic bags, to protect oneself and those who are around from infections, diseases and injuries (MOHSS, 2010). Waste segregation is the essence of waste management and should be done at the source of generation of biomedical waste, for example all patient care activity areas, diagnostic services areas, dressing rooms and treatment rooms. The responsibility of segregation should be with the generator of biomedical waste such as doctors, nurses and paramedical personnel (Neupane, 2010). This is possible, once health care workers possessed correct knowledge, positive attitude and safe practices on waste segregation. Cleaners who have responsibility of removing generated wastes from the wards also need to know and be trained in waste segregation. Namibia is among the top ten cleanest and safest country in Africa as it has adopted innovative way of utilizing local communities and private contractors for solid waste collection and disposal from hospitals and individual businesses after waste segregation at the sites (Urban travel African Guide, 2015; Mwakikagile, 2015). However, lack of knowledge, attitude and practice of health care workers in hospitals may jeopardize this effort due to improper waste segregation and disposal.

Correct knowledge, positive attitude and safe practices of health care workers are very imperative while managing this infectious waste (Kumar, Somrongthong & Shaikh, 2013). Hence, proper waste segregation reduces the amount of waste that needs to be sent for incineration and to landfills. Therefore, it is very important for health care workers to master these domains on waste segregation so that they can be able to segregate infectious from non-infectious wastes. Furthermore, waste segregation is also important as land is beginning to

become less available while the amount of wastes continues to increase. The proper segregation of waste is not only a matter of hospitals and environmental concern, but also of economic importance (Herron, 2014).

Waste segregation requires that all type of Health Care Wastes (HCW) generated in the hospital be separated in different colour coded plastic bags. Health care waste can be defined as all the waste generated in a health care setting such as biological, cytotoxic, biohazard, radioactive, pharmaceutical wastes and sharps. On the other hand, general wastes like papers and paper plates, soiled linen and left over food are also generated in the hospital and can easily be mixed with biohazard wastes if health care workers lack knowledge on waste segregation.

Waste that is dangerous to a person's health or the environment is referred to as Health Care Risk Waste (HCRW). Improper management of HCRW can have direct and indirect negative impacts on patients, health care workers (HCWs), local communities and the environment (MOHSS, 2011). Ministry of Health and Social Services (MOHSS) Infection Prevention Control Guidelines state that colour coded plastic bags that are being used to segregate wastes are red, yellow, green, black and clear transparent (MOHSS, 2010). According to World Health Organization (WHO) guideline, it is expected that all health care workers possess knowledge, attitude and practice on waste segregation (WHO, 2014).

This research study took place at Intermediate Hospital Katutura (IHK) and Windhoek Central Hospital (WCH), Namibia, Khomas region. In order for segregation to take place, there are three categories of healthcare workers as stakeholders in this activity. These are; Firstly, clinical staff such as doctors, dentists and nurses, pharmacists and radiographers. Secondly, laboratory and mortuary staffs are. Thirdly, non-clinical ancillary staffs such as receptionists, ward clerks, gardeners and cleaners (ANHOPS, 2004).

There is no study conducted on waste segregation in Namibian health facilities, hence there is no statistic found. However, a joint of World Health Organization (WHO)/United Nation Children's Fund (UNICEF) assessment found that just over half (58%) of sampled facilities from 24 countries had adequate systems in place for the safe disposal of health care waste (WHO, 2015). According to WHO (2015), of the total amount of waste generated by health-care activities, about 85% is general or non-hazardous waste and the remaining 15% is considered hazardous material. They further reported that high-income countries generate on average up to 0.5 kg of hazardous waste per hospital bed per day. Although, the figure for low-income countries is only 0.2 kg per hospital bed per day, healthcare waste is often not separated into hazardous or non hazardous wastes, making the real quantity of hazardous waste potentially much higher (WHO, 2015). Meanwhile, an Infection Control Officer from one of the public training hospitals, (personal communication, March 18, 2014) confirmed that general and infectious wastes were found mixed and training and education of health care workers is not done regularly.

In order to make disposal successful, it is vital that the various health care workers working at these hospitals have correct knowledge, attitude and practices regarding waste segregation. In light of evidence from various parts of the world, gaps exist in these domains. Thus it is important to make an assessment of the same.

1.2 BACKGROUND

There are 14 Regional Health Directorates in Namibia and they are demarcated according to the political regions of the country. The Directorate Khomas Region hosts the capital city of Namibia; Windhoek, with a square kilometre area of 37590. The directorate is bordered by Otjozondjupa in the north, Omaheke in the east, Hardap in the south and Erongo in the west (MOHSS, 2016). According to Population and Housing Census Indicator of 2011, Khomas

region has 342 141 populations (Namibia, 2011). The two training hospitals, Intermediate Hospital Katutura and Windhoek Central Hospital where the study took place are in Khomas region. According to the staff establishment of the hospitals, the selected wards where the study took place (medical, surgery, gynaecology and postnatal) have 38 doctors including interns, 88 nurses, 14 ward assistants and 40 cleaners. This was confirmed by the doctors call list and duty rosters allocation for the nurses. These are filled posts, but not the number of posts in the establishment.

Waste segregation is one of the hospital strategies to prevent infections which are a core infection control intervention. In an effort to reduce infections among health care workers and the entire community, the Ministry of Health and Social Services clearly stipulated in the Infection Prevention Control Guidelines how segregation of wastes should be carried out. Biological wastes are pathological and thus it should be disposed of in red plastic bags and sent for incineration. Bio-Hazardous wastes are medical wastes that are contaminated with blood and other body fluids. It should be disposed of in red plastic bags and afterwards sent to municipality landfill waste sites. Kitchen wastes should be disposed of in yellow plastic bags and to be collected by private contractors, while household waste refers to items such as paper plates and waste papers and are disposed of in black plastic bags, afterward goes to the municipality landfills waste site (MOHSS, 2010). Furthermore, soiled linens are segregated in green plastic bags, sealed, and then sent to the hospital's laundry in white cloth bags, while sharps are put in a safety container designed for that purpose. Cleaners in all instances are responsible for collecting all plastic bags from the point of collection in the wards to the hospital cages outside the wards while awaiting final disposal. Removal from the hospital premises is done by the local authority and private contractors.

Studies done in South Africa and Egypt revealed a major policy implementation gap between the national government and the hospitals and some staff had no knowledge of bio-medical

waste legislation (Nemathaga, Maringa, Chimuka, 2008; Ajai & Nath, 2013). Furthermore, a similar study done in India concluded that there is a need of continuous training of health care workers regarding biomedical waste as they lack knowledge on waste segregation and disposal. They further stated that 10–25% of health care waste is hazardous, with potential for creating variety of health problems (Sanjeev, Kuruvilla, Subramaniam, Prashant, & Gopalakrishnan, 2014). A study done in Malaysia has shown the presence of specific pathogenic bacterial strains in clinical solid and general wastes including opportunistic bacterial agent (Hossain, Rahman, Balakrishnan, Puvanesuaran, Sarker & Kadir, 2013). If waste is improperly segregated it could become agents for spread of deadly diseases like human immunodeficiency virus /acquired immune deficiency syndrome (HIV-AIDS), ebola virus, hepatitis B and other communicable diseases that can affect health care workers, patients, visitors and the entire community (Enwere, & Diwe, 2014; Chaudhary, Mahato, & Bahatia, 2014; Kotwal & Taneja, 2010; Martins, Coelho, Vieira, Matos & Pinto, 2012).

1.3 PROBLEM STATEMENT

This study intended to examine, explore, describe and assess health care workers 'knowledge, attitude and practice on waste segregation. The researcher became interested in this topic due to the following reasons; being a Lecturer for the nursing students, she came across improper waste segregation practice when she was following up her students and visiting patients in public hospitals in Khomas region and noticed different colour coded plastic bags being used for unintended purposes. There was no study conducted on waste segregation in Namibian health facilities, hence there is no statistics found. However this was evidenced by nurse managers' supervisory visit to Windhoek Central Hospital (WCH) and Intermediate Hospital Katutura (IHK)'s wards whereby improper waste segregation was reported and reason remain unknown (*Supervisory Visit Report, 2014*).

Knowledge, attitude and practice of health care workers have a greater impact on proper waste segregation globally. A study conducted in Egypt and in South Africa indicated that attitude and knowledge among health care workers such as housekeepers, physicians and nurses could also play a vital role in management of wastes (Hakim, Mohsen & Bakr, 2014; Ramokate & Basu 2009). A similar case can happen in Namibia. Namibian guidelines on Infection Prevention Control and Integrated Health Care Waste Management Plan of 2010 and 2011 respectively made provision for proper waste segregation procedure to be done according to different colour coded plastic bags (MOHSS, 2010; MOHSS, 2011). Despite these guidelines that clearly stipulate waste segregation procedure at WCH and IHK, it has been noticed that waste segregation is not properly done. This prompted the researcher's interest to think that perhaps this can be a similar case in Namibia, since it is not known whether all HCWs possess sufficient knowledge on waste segregation as stipulated in the infection control guideline. Therefore, it was essential to explore the knowledge, attitude and practice of HCWs on waste segregation.

1.4 AIM OF THE STUDY

The aim of this study was to explore the knowledge, practice and attitude of health care workers on waste segregation in public training hospitals, Khomas region.

1.5 RESEARCH OBJECTIVES

The objectives of the study were to:

- Examine health care workers' knowledge on waste segregation in public training hospitals, Khomas region.
- Explore and describe health care workers' attitude towards correct waste segregation
- Assess health care workers' practice on compliance with the waste segregation.

1.6 SIGNIFICANCE OF THE STUDY

The results of this study will contribute both to an understanding of the challenges in respect of waste segregation and to an improvement of health care workers' knowledge, attitude and practice in this regard to waste segregation. Sharing this study's findings with health care workers might change their attitude and the way they practice. It will also improve implementation of efficient and effective waste segregation processes and make recommendations to the Ministry of Health and Social Services in terms of how waste segregation should be managed.

1.7 LIMITATIONS OF THE STUDY

The study focused on the Health Care Workers at the selected public training hospitals and it was context-specific to the departments of those selected hospitals. These might affect the generalization of the findings to other sites. There were also insufficient funds since the study was self-financed by the researcher and she had no control over undertaking some activities such as procurement of stationery for the study.

1.8 DELIMITATIONS OF THE STUDY

Unlike the limitations that were beyond the researcher's control, delimitations were within her control and these defined the boundaries of her study. Delimiting factors included the choice of objectives, the research questions, variables of interest, theoretical perspectives that the researcher adopted and the population she chose to investigate (Simon, 2011).

In this study, only two public hospitals in Khomas region and the researcher did a pilot study and conducted her research at these institutions. Apart from problems encountered with some doctors who did not want to make time for her, all nurses, ward assistant and cleaner participants gave their cooperation.

1.9 DEFINITION OF CONCEPTS

The following defined concepts are derived from the title “KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTH CARE WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS, IN KHOMAS REGION, NAMIBIA”.

1.9.1 Knowledge

Knowledge has been conventionally defined as beliefs that are true and are justified. It is reasonable to think of a true belief as one that is in accord with the way in which objects, people, processes and events exist and behave in the real world. Knowledge, itself, cannot be directly observed, it must be inferred from observing performance on a test, for example questions designed to determine the beliefs of a person about something (Hunt, 2003). In this study, health care workers were examined whether they possess knowledge on waste segregation.

1.9.2 Attitude

According to the Oxford Advanced Learners' Dictionary (Hornby, 2010), an attitude is the way that someone think and feel about something or the way that somebody behave towards something that shows how you think and feel. In this study, health care workers' attitude on waste segregation was explored so that they can express their feelings on waste segregation. The respondents were asked to rank themselves the way they segregate wastes by circling a number that best describe them.

1.9.3 Practice

According to the Oxford Advanced Learners' Dictionary (Hornby, 2010), practice is the actual application rather than just ideas. It is the way of doing something that is usual or expected way in a particular organization or situation. It further stated that it is a custom or

habit that is done regularly. Health care workers generate wastes on a daily basis when practicing. In this study, practices of health care workers were assessed using a checklist to analyze the existing situation of waste segregation. Availability and unavailability of colour coded plastic bags in the wards underpinned the way health care workers segregated the wastes.

1.9.4 Health care Workers

Health care workers are all the people that are engaged in the promotion, protection and enhancement of the health of the population. Health care workers are divided into three categories. Firstly, clinical staffs are those in primary care, who have regular, clinical contact with patients such as doctors, dentists and nurses, pharmacists/pharmacy assistants and radiographers/radiographer assistants. Secondly, laboratory and mortuary staffs are those who have direct contact with potentially infectious clinical specimens. Thirdly, non-clinical ancillary staffs are those who may have social contact with patients, but not usually of a prolonged or close nature. This group includes receptionists, ward clerks, gardeners and cleaners (ANHOPS, 2004). In this study the health care workers that were assessed are nurses, doctors, ward assistants and cleaners.

1.9.5 Waste segregation

Waste segregation is a proper manner of disposing of wastes according to its type; for example biological waste and is separated according to the colour coded plastic bags, to protect oneself and those who are around from infections, diseases and injuries (MOHSS, 2010).

1.9.6 Training hospital

Training hospital is a hospital that train nurses, doctors and other health professionals. In this study, training hospitals are Intermediate hospital Katutura and Windhoek Central Hospital.

Training hospital in Namibia is accredited by Namibia Qualification Authority (NQA). However, in Southern Africa, training hospitals must be accredited by Council for Health Services Accreditation in Southern Africa (COHSASA).

1.10 SUMMARY

The introduction and background of the study were described in this chapter. Statements of the problem, aim and objectives, the significance of the study along with the limitations and delimitations which are the backbone of the study were stated. This chapter also gave an overview of the different concepts definitions for the readers to gain a broader understanding of the research problem as this brings together a number of related concepts.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter gave a general overview and background of the study, including the problem statement, the research purpose, objectives, and significance of the study, limitations and delimitations of the study and defined the main concepts. In this chapter, the researcher presents a review of the literature. The researcher elaborates on general information regarding waste segregation and management and review the literatures done in Africa and other parts of the world. A review of relevant literature is an essential feature of any academic project. An effective review creates a firm foundation for advancing knowledge. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed (Webster & Watson, 2002).

2.2 GENERAL INFORMATION REGARDING WASTE SEGREGATION AND MANAGEMENT

2.2.1 Waste segregation

Waste segregation is one of the modes of infection control through which infection can be curbed. It is the component of waste management in addition to waste storage, transportation and disposal. Once waste is properly segregated, it will also keep waste apart during handling, storage and transportation. It is essential that all medical waste materials are segregated at the point of generation, appropriately treated and disposed of safely (WHO, 2015). By segregating properly, it makes the waste collection much more convenient for the local authority and contracted collecting companies.

Wessex Institute organizes International Conference on Waste Management and the Environment every two years. The eighth conference in 2016 follows the success of previous meetings held from 2002-2014. This conference will be on the 7 - 9 June 2016 València, Spain. It provides a forum for the exchange of scientific information and work on the current situation of waste management amongst professionals, researchers, government departments and local authorities. Some of the topics to be covered this year are; Hazardous waste, environmental impact, reduce, reuse, recycle and recovery (4Rs), waste incineration and gasification and disposal of high-level radioactive waste (Conference on waste management, 2016).

2.2.2 Waste segregation management

It is required that different wastes generated in the hospital are separated in different colour coded plastic bags. According to MOHSS Infection Prevention Control Guidelines colour coding plastic bags that are being used to segregate wastes are red, yellow, green, black and clear and wastes are segregated as biological, biohazardous, cytotoxic, radioactive pharmaceutical and sharps (MOHSS, 2010). Meanwhile, general wastes, soiled linen and left over food are also generated in the hospital and can easily be mixed with biohazard wastes if health care workers lack knowledge on waste segregation.

Biological wastes are pathological and biopsy specimens, tissues, organs that were removed during surgery, birth or autopsy and it should be disposed in red plastic bags and send for incineration. Bio-Hazardous wastes are medical wastes that are contaminated with blood and other body fluids or excrement and it should be disposed of in red plastic bags and afterwards send to municipality landfills waste site (MOHSS, 2010). Kitchen wastes are left over food that should be disposed of in yellow plastic bags and to be collected by private contractors, while household waste refers to items such as paper plates and waste papers and are disposed of in black plastic bags and after that goes to the municipality landfills waste

site. Furthermore, soiled linens are segregated in green plastic bags, and then send to the hospital's laundry, while sharps are put in a safety container designed for that purpose (MOHSS, 2010). Cleaners in all instances are responsible for collecting all plastic bags from the point of collection in the wards to the cages outside the wards while awaiting final disposal.

According to WHO Guideline (2014), the correct segregation of health-care waste is the responsibility of the person who produces each waste item. Meanwhile, the health-care facility management is responsible for making sure there is a suitable segregation, transport and storage system, and that all staff adheres to the correct procedures. However, it should be carried out by the producer of the waste as close as possible to its place of generation. The simplest waste-segregation system is to separate all hazardous waste from the larger quantity of non-hazardous general waste. Ideally, the same system of segregation should be in force throughout a country, and many countries have national legislation that prescribes the waste segregation categories to be used and a system of colour coding for waste containers. Where there is no national legislation, a World Health Organization (WHO) scheme is available. Labelling of waste containers, for example with biohazard symbol should be used to identify the source, record the type and quantities of waste produced in each area, and it allow problems with waste segregation to be traced back to a medical area. A simple approach is to attach a label to each filled container with the details of the medical area, date and time of closure of the container, and the name of the person filling out the label (WHO, 2014).

As it was stated in chapter 1 that waste segregation is a critical public health issue that needs proper assessment, it was expected that the various health care workers working at these hospitals possess correct knowledge, attitudes and practices regarding waste segregation for them to be able to manage wastes properly. Therefore, proper waste segregation is one of the most reliable practice in the health facilities that will ensure prevention of infection

transmission. Significant differences exist in the management of health-care waste management, globally. This is particularly so between low, middle and high-income countries (Caniato , Tudor, & Vaccari. 2015). Indiscriminate waste disposal by many healthcare facilities pose a serious health hazard to the inhabitants in general and people living around health care facilities in particular. Human scavengers collecting second hand objects for reselling could be a channel for spreading disease causing organisms (Alemayehu, Worku, & Assefa, 2015).

General information regarding waste segregation and management and international biohazard symbol that is recommended by World Health Organization to be on biohazard waste container is depicted in Table 2.1 and Figure 2.1 as follows:

Table 2.1: General information regarding waste segregation and management as recommended by World Health Organization

Type of waste	Colour of container and markings	Type of container
Highly infectious waste	Yellow, marked “HIGHLY INFECTIOUS”, with biohazard symbol	Strong, leak-proof plastic bag, or container capable of being autoclaved
Other infectious waste, pathological and anatomical waste	Yellow with biohazard symbol	Leak-proof plastic bag or container
Sharps	Yellow, marked “SHARPS”, with biohazard symbol	Puncture-proof container
Chemical and pharmaceutical waste	Brown, labelled with appropriate hazard symbol	Plastic bag or rigid container
Radioactive waste	Labelled with radiation symbol	Lead box
General health-care waste	Black	Plastic bag

(WHO Guideline, 2014)

Figure 2.1: WHO recommended international biohazard symbol on biohazard waste container



(WHO Guideline, 2014)

2.3 KNOWLEDGE, ATTITUDE AND PRACTICES OF HEALTH CARE WORKERS ON WASTE SEGREGATION.

2.3.1 Knowledge of health care workers on waste segregation

Knowledge of health care workers on waste segregation was required for them to be able to properly segregate all types of wastes and to reduce spread of infections. This prerequisite serves to benefit the health care workers, patients, visitors and the community. It also reduces costs and unnecessary spending. In absence of any knowledge, improper waste segregation may occur. According to Infection Prevention Control Guidelines, health care workers should

be trained so that they can acquire proper knowledge on waste segregation (MOHSS, 2010). Training is important as it imparts knowledge, gives information and instils insight into HCWs.

The literature sources advocate for importance of proper waste segregation. This can make a real difference in improving health hazard. The studies on segregation of medical waste into infectious waste and non-infectious waste in South Africa and Egypt revealed a major policy implementation gap between the national government and the hospitals and some staffs were not aware of bio-medical waste (BMW) legislation (Nemathaga, Maringa, Chimuka, 2008; Ajai & Nath, 2013). Similar studies conducted in Ethiopia and India indicated that attitude and knowledge among health workers such as doctors, nurses and housekeepers could also play a vital role in management of wastes and could vary between different professionals (Gulilat & Tiruneh, 2014; Sengodan & Amruth 2014; Singh, Gupta, Kumari & Verma, 2014; Mir, Ahamad, J., Ahamad, A. & Jan, 2013).

Kyle et al. (2013) found out that hospital staff was knowledgeable about waste segregation practices, but had poor compliance with national policies. However, after staff training in HCW management, the correct responses increased and bio hazardous waste disposal at the hospital reduced. Meanwhile, study results done in Sudan and Pakistan suggest that intensive healthcare waste management training could be an effective intervention for improving knowledge, attitudes and practices among health workers and it has recorded significant improvement immediately after the educational intervention program (Elnour, Moussa, El-Borgy, Fadelella, & Mahmoud, 2015; Mathur, Dwivedi, Hassan, & Misra, 2011; Kumar, Somrongthong & Shaikh, 2015).

Another study in Pakistan found out that serious gaps and deficiencies were observed related to segregation, collection, storage and disposal of the hospital wastes, hence proving to be

hazardous to the patients as well as the visitors (Kumar, Shaikh, Somrongthong & Chapman, 2015).

Adogu, Ubajaka & Nebuwa, (2014); P. Lakbala & M. Lakbala (2013); Jena & Nayak, (2014); Kumar, E.A. Khan, Ahmed, Z. Khan, Magan, & Mughal et al (2010) found out that lack of adequate training and awareness in the execution of rules and regulations for handling BMW can leads to a health and environment apprehension, since staff did not follow the best practices. This follows a study done in India that stated that to better manage HCW, a specific and comprehensive legislation and policy document on Health Care Waste Management (HCWM) with clear designation of responsibilities to various stakeholders should be issued immediately (Sharma, A., Sharma, S., Sharma, V. & Singh, 2013). Moreover, continuing education/training programme, and awareness raising activities about the proper management of HCW at all levels should be undertaken (Haylamicheal & Desalegne, 2012; Malini & Eshwar, 2015; Nema & Singh, 2015; Suchitra & Devi, 2007). Whereas, Kanwar, Sood, Gupta, & Salaria (2015) concurred with the above statements by saying that poor knowledge of nurses indicated a strong need of on the job training of healthcare providers in infection control practices.

In Kenya, it was found out that health and safety in health-care waste management was not included in most of the curricula for training the three health professionals (clinicians, nurses, laboratory technologists). However, most of them acquired this through on-job training from seminars and informally through organized talks at workplaces (Nkonge, Mayabi, Kithinji & Magambo, 2012). Furthermore, a study conducted in India revealed that greater experience or higher qualification does not appear to be a determinant of favourable knowledge, attitudes or practice (Kini et al, 2014).

2.3.2 Attitude of health care workers on waste segregation

Attitude of health care workers could influence the way they segregate wastes. Health care workers' negative attitude in hospitals might be triggered by poor working circumstances such as poor leadership and management, shortage of HCWs, overcrowded wards, poor communication and uncooperative behaviours among some HCWs.

The findings of the two studies in India suggest that the Bio-medical waste (BMW) management program cannot successfully be implemented without the willingness and cooperation of the health professionals (Sanjeev, Kuruvilla, Subramaniam, Prashant, & Gopalakrishnan, 2014; Sharma & Chauhan, 2008). It was concurred that for health care workers to have correct attitude and practice regarding hospital waste management, there should be a continuing training program along with the monitoring those practices, so that it leads to a safe protected biohazard free environment (Bathala, Sangur, Mahajan, Chawla, Mehrotra, & Singhal, 2015; Gupta, Singh, Parvinder, Gulpreet, Navneet, & Singh, 2015; Manchanda, Fotedar, Dahiya, Vats, De Sarkar, & Vats, 2015).

This followed by several studies (Al-Khatib, Al-Qaroot, Yousef, Ali-Shtayeh & Mohammad, 2009; Chaerul, Tanaka & Shekdar, 2008; Murthy, Leelaja & Hosmani, 2011; Zhang, Zhang, Wang et al, 2013) who have also proved that the incomplete segregation of domestic and medical waste has generated a higher quantity of medical waste due to insufficient training programmes and the NIMBY (not in my back yard) syndrome. A study done in Pakistan has revealed that poor safety, insufficient budget, lack of trainings, weak monitoring and supervision, and poor coordination has eventually resulted in improper waste management (Kumar, Shaikh, Somrongthong & Chapman, 2015).

2.3.3 Practices of health care workers on waste segregation

An Infection Prevention Control Guidelines for Namibia advocated that wastes should be segregated in colour coded plastic bags such as red, yellow, green, black and clear transparent (MOHSS, 2010). However, proper segregation might be jeopardized due to unavailability of some plastic bags, as some wastes ended up in wrong plastic bags.

There was no study done about Namibian hospitals 'waste segregation; however, there is a study which was conducted in Municipal Waste Management. In this study, the researcher mostly aimed at local authorities' waste management in different towns in Namibia (Hasheela, 2009). He did not necessarily address the gap in the Namibian health facilities.

The study done in Egypt, Iran and Turkey measured quantity of medical waste generated by different hospitals and they produced varying kg of waste per day (Abd El-Salam, 2010; Band-pay, Majlesi & Azad, 2015; Gaye, Semra, Ergun & Osman, 2015; Khazae, Hamidian, Taheri, Babakan, Mashoof, Rabizadeh, et al, 2015). This is a clear indication that these countries determine and quantify their wastes by weighing them as it was recommended by World Health Organization.

According to World Health Organization, high-income countries generate on average up to 0.5 kg of hazardous waste per hospital bed per day. Although, the figure for low-income countries is only 0.2 kg per hospital bed per day, healthcare waste is often not separated into hazardous or non hazardous wastes, making the real quantity of hazardous waste potentially much higher (WHO, 2015). A joint WHO/UNICEF assessment found that just over half (58%) of sampled facilities from 24 countries had adequate systems in place for the safe disposal of health care waste (WHO, 2015).

A study done in Botswana and Nepal concurred that as the demand for more healthcare facilities increases, there is also an increase on waste generation from these facilities. This

situation requires an organized system of healthcare waste management to curb public health risks as well as occupational hazards among healthcare workers as a result of poor waste management (Mbongwe, Mmereki & Magashula, 2008; Joshi, 2013).

According to Engelkirk & Dube- Engelkirk (2011, p.200) “the primary way to reduce the number of HAIs is strict compliance with infection control guidelines.” In the observation study that was done in the private nursing homes in India, it was found that nursing homes did not have black bags (Kishore, Agarwal, Kohli, Sharma, Kamat, & Tyagi, 2014). Furthermore, a study that was undertaken among health care workers in a tertiary care hospital in India found that awareness regarding disposal of items in red, yellow and puncture proof containers was low (Kumar, Singh, Kumesh, & Rawat, 2015).

2.4 SUMMARY

This chapter reviewed the general information regarding waste segregation and management and elaborated on different types of wastes generated in hospitals. It further reviewed the important findings from the literature that highlight the knowledge, attitude and practice of health care workers on waste segregation globally and how it is important to segregate the waste. The following chapter will cover the research methodology, the procedure and methods used for data collection and analysis in this study.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In the previous chapter the literature review was presented. In this chapter the researcher presents the research designs and all the components of the research design. This served to clarify the implementation of the quantitative methods in order to understand the knowledge, attitude and practice of health care workers with regard to waste segregation at two public training hospitals. The chapter concluded with a description of the research design, measures for ensuring trustworthiness and ethical standards that have been adhered to during the study to ensure the scientific value of the study.

3.2 RESEARCH DESIGNS

A research design is a set of logical steps taken by the researcher to answer a research question (Brink, Van der Walt & Van Rensburg, 2006). The researcher in this particular study wanted to assess the knowledge, attitudes and practices of health care workers on waste segregation. A quantitative, descriptive, cross-sectional study design was used. Firstly, it was quantitative in the sense that it measured all relevant variables objectively at a specific time and did not include an experimental or a control group. Secondly, it was cross-sectional, because the study was conducted in the present time to examine what currently existed and was characterized by the fact that all data were collected at one time (De Vos, Strydom, Fouche & Delport, 2011; Brink et al, 2006). Thirdly, a descriptive quantitative approach was used to assess the status of waste segregation in the two hospitals as well as to describe the knowledge, attitudes and practices (KAP) of health care workers in their settings on waste segregation practice.

3.2.1 Quantitative design

(Creswell as cited by De Vos, 2011), define quantitative study as an inquiry into a social or human problem, based on testing a theory composed of variables, measured with numbers and analysed with statistical procedures in order to determine whether the predictive generalisations of the theory hold true. A quantitative design was used to determine the existing knowledge of health care workers on waste segregation at the two training hospitals because it focused on moderately a small number of concepts and numeric information which were analyzed through statistical procedure. The checklists were used as planned practice and official instrument to assemble information through situation analysis (Brink, 2010).

3.2.2 Descriptive design

Descriptive research design can be cross-sectional or longitudinal. This research study is descriptive as it was directed toward describing and understanding the situation of waste segregation in the two public training hospitals and the experience of different health care workers on waste segregation to be able to prevent health hazards and risks that are facing them.

3.2.3 Cross-sectional design

Cross-sectional descriptive research designs are used to examine data at one point in time; that is data that are collected on one occasion rather than from the same subject at several points in time (Burn & Grove, 2011). A researcher records the information that emerges from a specific population at the same time without manipulating the variables. Large amount of data is collected at one point, making the results more readily available (Brink, 2010). This design is used to identify and justify problems with current practice, measures all relevant variables objectively at a specific time and makes judgment. It also represents the

simplest variety of descriptive epidemiology that may be conducted on representative samples of a population (Brink, 2010). Such a design describes the frequency of an attribute in a sample of a population at a given point in time.

3.3 RESEARCH SETTING

This study was conducted in Intermediate Hospital Katutura and Windhoek Central Hospital. These are public training hospitals and fully owned by the Namibian government. Intermediate Hospital Katutura is a regional hospital where district hospitals can refer their patients, while Windhoek Central Hospital is the country's main referral hospital, whereby the country's Intermediate and regional hospitals refer their patients. For objective one and two, the research took place in the 14 inpatient wards and the participants were selected randomly, while for objective three, the 7 wards (50%) were selected randomly from the 14 wards that met inclusion criteria, such as 4 medical wards, 1 surgery ward, 1 gynaecology wards and 1 postnatal ward from both Intermediate Hospital Katutura and Windhoek Central Hospital.

Figure.3.1: Intermediate Hospital Katutura



Figure 3.2: Windhoek Central Hospital



3.4 POPULATION

The population is the entire group of persons or objects that is of interest to the researcher and which met the criteria onto which the researcher wishes to investigate. The group should have a set of characteristics about which the researcher wishes to draw a conclusion (Brink, 2010).

In this study, the population of interest was doctors, nurses, ward assistants and cleaners working at two training hospitals. The target population was doctors, nurses, ward assistants and cleaners working at selected wards such as medical, gynaecology, and surgery and postnatal. The study population was selected from this target population. For objective one and two of this study, the study populations for 14 wards were: nurses (N=62), doctors (N=21), ward assistants (N=7) and cleaners (N=21) according to the change list allocations and doctors call list at the two facilities. The total study population estimate was (N=111), after random selection. The study population was HCWs in the inpatient wards and on day shift and night shift these being 6 medical wards, 4 surgery wards, 2 gynaecology wards and

2 postnatal wards. These wards were selected on the ground that they generated infectious and non-infectious wastes on a daily basis. In total, they were 14 wards.

For objective number three, target populations were 14 wards that met inclusion criteria and study population were 7 wards that were assessed by use of checklist to underpin and analyse the existing situation on how health care workers segregate wastes.

3.5 SAMPLE AND SAMPLING METHOD

Sampling is the process of selecting units from the population of interest so that by studying the sample it may fairly generate the results back to the population from which it was taken (Trochim, 2006). A sample therefore consists of a selected group of elements or units of analysis from a defined population. In sampling, the element is the most basic unit about which information is collected (Burns & Grove, 2011). In this study, a probability stratified random sampling method was used to ensure proportional representation of HCWs categories. Selection within each stratum occurred randomly (Struwig & Unrau as cited by De Vos, 2011).

Once a sample size for each profession was obtained, a sample size was calculated at 95% confidence interval to ensure the representation of all subgroups. It was obtained by calculating sample size using Statcalc in computer software, *Epi info* (De Vos et al, 2011; WHO, 2009). The sample populations for 14 wards were: nurses (n=53), doctors (n=20), ward assistants (n=7) and cleaners (n=20). The total sample size estimate were (n=100) as it is calculated in the Statcalc to ensure that each segment of population acquires sufficient representation. For objective three, same 14 wards were randomly selected to assess the practice of HCWs by means of checklist; consequently 7 wards out of 14 wards were selected randomly to conduct situation analysis (Brink, 2010; Van Dyk, 2008).

Inclusion criteria were applied during sampling. These criteria are referred to as eligibility criteria that the researcher wanted to include in the study. It is critical that the researcher carefully defines and describes the population and specifically stipulates the criteria for inclusion in it. In this study, the inclusion criteria are described as follow:

3.5.1 Inclusion Criteria

Inclusion criteria are evaluated for eligibility on the basis of relevance and acceptability (Timothy, 2006). Inclusion criteria give researchers a set of inclusive standards to screen potential participants. Inclusion criteria were crucial requirement for consideration which allowed the researcher to embrace the participants 'responses. The inclusion criteria in this study:

- 14 wards (6 medical wards, 4 surgery wards, 2 gaenacology wards and 2 postnatal wards) selected on the ground that they generate more infectious wastes.
- Health care workers that are included in this study were nurses, doctors, ward assistants and cleaners.
- All these health care workers should have worked in the hospital for more than 1 year because of their experience in the practice of waste segregation.
- Would agree to participate on a voluntary basis
- They were chosen through random sampling method

3.5.2 Exclusion Criteria

Exclusion criteria help researchers eliminate candidates based on a specific set of requirements and ability. Exclusion criteria are basic features for consideration which allow the researcher to exclude the participant who did not have the characteristics that the researcher was interested in, despite the fact that their inclusion would not have met the

purpose of the study (Welma, Kruger & Mitchell, 2008). On the first and second objectives of the study, health care workers that were excluded in the study were:

- Nurses, Doctors, cleaners and ward assistants who have worked less than 1 year in the hospital.
- Laboratory staff, Pharmacists and Pharmacist Assistants, Radiography staff, Dental staff, and Physiotherapists.
- Drivers, Institutional Workers, Clerical and Administrative Staff, because of their limited understanding of waste segregation procedure and they are not directly in contact with patients.
- Health care workers who have been on leave.

3.6 DATA COLLECTION

Data collection methods refer to the process of selecting subjects and gathering data from these subjects (Grove, Burns & Gray, 2013). The actual steps of collecting data are specific to each study and depend on the research design. In this study, self-administered questionnaire was completed by participants themselves in the presence of the researcher, but she limited herself from being involved. Direct observation by the researcher using a checklist was conducted with the wards supervisors to assess practices of HCWs. The data collection focused on the research instruments, data collection procedures, overview of the field work activities, validity and reliability of the data collection instrument and pilot study as discussed below:

3.6.1 Research instrument

Self-administered questionnaires and checklist were developed and used. The questionnaire contained four sections: *Section A* captured the demographic characteristics of the respondent such as sex, age, profession, department, ward and hospital; *Section B* captured knowledge of

health care workers on waste segregation; *Section C* captured attitudes of HCWs on waste segregation and *Section D* capture practices of HCWs on waste segregation. The questionnaire was piloted at Windhoek Central Hospital with a sample size of 9 HCWs. This pilot study was conducted using a random sampling method. All research ethics principles were followed during the entire pilot study. Since the sample size comprised a small size, the data was analysed manually.

3.6.2 Procedure for data collection

Data were collected by the researcher herself and an assistant researcher who were trained by the researcher on the technique to be used. The training was more on ethical consideration, interview skills, content of the questionnaire and proper filling and coding of answers of the questions. The questionnaire that was developed in English was tested in a pilot study with 9 HCWs of different job categories (doctors, nurses, ward assistant and cleaners) and any required changes were made. Meanwhile, emphasis was placed on using simple language for ward assistants and cleaners. The data was collected over a period of 7 weeks.

In this study data collection involved collection, analysis and interpretation of study result regarding the KAP of the health care workers on waste segregation at WCH and IHK to help the hospitals to develop the strategies to improve the efficiency of waste segregation. A pre-designed self-administered questionnaire items about the demographic characteristics, knowledge, attitude and practice of the participants was used. That means the questionnaire was completed in the presence of the researcher.

3.6.3 Overview of the field work activities

Data collection approach for objective one and two in this study used self-administered questionnaire using a pre-tested structured questionnaire. The reason for pretesting is simply to improve validity, reliability, objectivity and to ensure that errors of whatever nature are rectified immediately at a little cost. (Newman as cited by De Vos, 2011). Responses were recorded on every encounter with the respondent, one at a time, on the questionnaire. Meanwhile, for objective three, a checklist was used to observe if all the waste segregation materials were available at the facilities; cleanliness of the wards and to observe if wastes were put in the correct plastic bags.

3.6.4 Validity of the data collection instrument

According to De Vos et al (2011), validity is the degree to which an instrument measures what it intends to measure, given the context in which it is applied. It is the extent to which a measurement could be trusted and it is also referred to as the closeness of a measurement towards a true finding. Content validity refers to the degree to which an instrument covers the scope and range of information that is sought, while face-value validity is a subjective determination that an instrument is sufficiently adequate to obtain the desired information. In this study, both the content and the face-value validity were assessed. The researcher established face-value validity by submitting the questionnaire to her supervisors, who evaluated the questions in relation to the objectives of the study. Content-related validity was achieved through an extensive literature search on HCWs' KAP on waste segregation to ensure that the data collection instrument had all the necessary questions for addressing these issues.

3.6.5 Reliability of the data collection instrument

De Vos et al (2011) relate reliability to the accuracy and consistency of the information obtained in the study. In general, reliability refers to the extent to which the independent administration of the same instrument consistently yields the same results under comparable conditions. In order to ensure the reliability of the data collection instrument, the researcher pre-tested the questionnaire during a pilot study that yielded the same results as in the main study.

3.6.6 Pilot study

Polit & Beck (2012) explains pilot study as the system which is intended to study whereby the researcher uses resembling subject, the same location and same data collection and data analysis method by administer instrument of data collection to a small group of the participant from the intended test population and this selected participant should not participate in the main study. A pilot study was conducted in order to identify unforeseen problems and to assess the feasibility of the study (Brink, 2010). The other purposes of the pilot study were to determine the effectiveness of the intervention and identified the elements of prototype that may have needed to be revised (De Vos et al, 2006).

The pilot study was conducted at Windhoek Central Hospital among Health Care workers and was used to determine whether the recommended study was feasible, refined research instruments, and diagnose problems with the design of the study. A small group of 9 health care workers were selected to participate in the pilot study; however WCH health care workers who participated in the pilot study did not participate in the main study.

The selection was also applied during the pilot study. To address the first and the second objective, a self-administered questionnaire was used, for the third objective; the checklist was used to assess the existing situation of waste segregation practices.

3.7 DATA ANALYSIS

Data was analysed quantitatively. The researcher carefully checked the completed questionnaires on daily basis for consistency, accuracy and completeness of data collected. The questionnaires were coded before data entry. Quantitative data from questionnaires and a checklist were then prepared for data entry into the computer. After the data entry was completed, the researcher checked all the records with the original data. This process included checking and editing the collected data and eventually cleaning, coding (systematically reorganising raw data into a computer readable format) and analysing them using Epi-Info *version 3.5.1* (Kreuger & Neuman as cited by De Vos, 2011). Frequency distribution tables, descriptive statistics and measures of variability were used.

3.8 ETHICAL CONSIDERATION

Research ethics are principles, rules and regulations that all researchers should follow and abide by while conducting research. There are three fundamental ethical principles that guide researchers, namely, the principle of respect for persons, the principle of beneficence and the principle of justice. In this study the research ethics was applied in terms of the purpose, design, pilot study, the collection and analysis of data, the interpretation of results, and the presentation and publication of results were closely monitored by the University of Namibia (UNAM) Postgraduate Studies Committee as well as external examiners to guarantee that sound knowledge for practice is generated. Another human right that was respected during research is the right to privacy and confidentiality (Brink et al, 2006).

3.8.1 Permission to conduct the research

Firstly, permission to conduct the research was granted from School of Nursing and Public Health; secondly, the research proposal ethical clearance was granted from University of Namibia postgraduate study committee and lastly clearance, approval from the Ministry of

Health and Social Services Research Ethical Committee and lastly by the Medical Superintendents of the two public hospitals.

3.8.2 Work acknowledgement

To conduct research ethically, the researcher must carry out the research competently, manage resources honestly, and acknowledge fairly those who contribute guidance and assistance, communicate results accurately and consider the consequences of the research (Brink et al, 2006). Hence, use of other people's work was acknowledged.

3.8.3 Informed consent

The researcher obtained informed consent from individuals. Obtaining informed consent implies that all possible or adequate information on the goal of the investigation; the expected duration of the participant's involvement; the procedures which were followed during the investigation, the possible advantages and disadvantages to which respondents may be exposed; as well as the credibility of the researcher, be rendered to potential subjects (de Vos et al, 2011). The researcher ensured that respondents understood the information provided and voluntarily agreed to partake in the study.

3.8.4 Respect for persons

This principle is based on human rights that need to be protected in research, namely, the right to self-determination, to privacy, to anonymity and confidentiality, to fair treatment, to being protected from discomfort and harm and scientific integrity (Tulchinsky & Varavikova, 2009). Information given anonymously ensures the privacy of subjects. Researchers sometimes assure subjects of anonymity in their covering letters or by verbal communication, but secretly mark the questionnaire (de Vos et al, 2011). Invasion of subjects privacy occurs when the researcher shares private information without the subjects' knowledge, for example, if the researcher tries to inform the hospital management what the individual health care worker has

revealed about the hospital by mentioning subject' names. In this research, all the respondents were reassured that the information they gave would be regarded as confidential.

The researcher had protected the anonymity of the subject and to maintain the confidentiality of data collected during the study this was done as follows: Anonymity of the respondents was protected by making it impossible to link the specific data to a specific person. Writing of the research report made sure that individual or group cannot be identified through their response. The questionnaires were not labelled with the respondent's name, but instead given identification numbers. The completed questionnaires were kept at a secure place to ensure privacy and all the study subjects were reassured that the information they gave would be kept confidential. The researcher kept a master list of the subjects and their code number in a locked place (Matheson, 2007). Furthermore, participation was at all times voluntary and no one was forced to participate in this project. In this study the researcher confirmed respect for the participants by obtaining informed consent without forcing each participant. Procedures to be followed during completion of a questionnaire were made clear to the participant before commencement and duration of completion was estimated to last about 15-20 minutes. They were also informed of their right to withdraw from the study at any time, to refuse to give information or to ask for clarifications about the purpose of the study and the researcher respected individuals 'opinion.

3.8.8 Principle of fair treatment /justice

The fundamental ethical principle to fair treatment is based on the ethical principle of justice which implies being fair and impartial (Burns & Grove, 2011). This principle was ensured in the study because the study subjects were all selected for the reasons directly related to the research, and not because they were readily available or could be easily manipulated (Brink, 2010). In this study, all respondents were asked similar questions in order to ensure the

principle of justice. Any agreement that the researcher made with the participants was also respected.

3.8.6 Beneficence and non-maleficence

The principle of beneficence means people must take an active role in promoting good and preventing harm in the world around them, as well as in research studies (LoBiondo-Wood & Haber, 2010). The researcher has an ethical obligation to protect the respondents against any form of harm that could result from their participation in a study (De Vos et al, 2011). In this study, the researcher protected the participants from discomfort and harm by ensuring that she did not reveal their identity on who segregate wastes wrongly.

3.9 CONCLUSION

The topic under study determined the type or research design used. This chapter gave an overview of research design used in the research process, research population, sample and sampling method, data collection, research instrument, the procedures followed during the research process and an overview of the field work activities. Meanwhile, validity and reliability of the data, pilot study and data analysis was also discussed. Furthermore, it also discussed the way in which the researcher adhered to ethical practices in the entire data collection, analysis and report writing process. The following chapter will present and discuss the research findings.

CHAPTER 4

PRESENTATION AND DATA ANALYSIS OF THE RESULT

4.1 INTRODUCTION

The research designs of this study were described in chapter 3. The study population and the sampling methods that were used to obtain the sample were presented, as well as the research instruments (self-administered questionnaires and checklist) that were used for data collection were discussed. The data was analysed quantitatively and presented in numerical forms.

In this chapter, the researcher presents the findings obtained from the analysis conducted on the data that were collected using self-administered questionnaires and checklist tools, as well as in view of the objective questions that assessed the knowledge, attitudes and practices of health care workers on waste segregation.

The findings and the discussion were divided into four sections. The first section A presents the social demographic data. The second section B presents the findings on the knowledge of health care workers on waste segregation. The third section C presents the attitude of health care workers on waste segregation and the way in which these attitudes influence their daily practices. The fourth section D presents the findings on the practice of health care workers on waste segregation. The researcher was available when the respondents were completing the questionnaires, but she limited her own contribution to the completion of the questionnaire to the absolute minimum (De Vos et al, 2011).

4.2 DATA MANAGEMENT AND ANALYSIS

Apart from data analysis that was done through Epi info version 3.5.1 calculation, the critical data management and analysis procedures that the researcher followed are described below.

4.2.1 Data entry, editing and handling

It is a prerequisite for any researcher to make data entry and editing before data analysis. In this study, the researcher checked if every data file actually contained the necessary information before making them ready for coding and transfer to computer. The researcher edited the information by checking and adjusting the collected information for consistency, omissions and legibility. Whenever errors were detected on the information, the researcher diagnosed, but did not change them and edited to make the information more complete, consistent, and readable. For the missing data elements which were very small in number, values were assigned for that purpose.

Afterwards, the researcher made a coding procedure and recorded in the database all the respondents' responses for each question to facilitate computerised data analysis. The researcher then made data cleaning check to verify that all codes were accurate and legitimate. The researcher made sure that the Epi info version 3.5.1 that was used to clean the data was compatible with the reading languages from the data base. The data was then stored and shared with the statistician for assistance in the analysis.

4.2.2 Data storage and disposition

For safety and security reason, the study's data were stored in the researcher's computer and in a hard-drive. The researcher opted to have a separate memory stick from which she was working on to minimise the chances of losing her data. She kept on adjusting her information on the computer and the hard-drive. Password protected due to proprietary, ethical or privacy consideration. The researcher kept the data files in such a way they could be properly tracked the information whenever the researcher needed them. The paper-based filled questionnaires were safely stored in a lockable file cabinet in the researcher's office. The researcher will retain the data at least for five years before they may be deleted.

4.3 STUDY RESULTS

The results of the study discussed were demographic data of participants (Section A), knowledge of the HCWs on waste segregation (Section B- objective 1), attitude of the HCW on waste segregation (Section C- objective 2) and in both instances n=100. Practice of the HCW on waste segregation (section D – Objective 3) was also discussed and n=7. They are described as follows:

4.3.1 Demographic data of the study respondents (Section A)

Respondents were (n=100) that includes 53 nurses, 20 doctors, 20 cleaners, and 7 ward assistants that have participated in the study. The demographic data that were discussed were gender, age, profession, duration of current work experience, hospital and the ward where the health care workers were working.

4.3.1.1 Gender of respondents

Gender for all respondents were 25% for male and 75% for female. Among nurses who responded, 10 (18. 9%) were male, while 43 (81. 1%) were female; 11 (55. 0%) doctors were male, while 9 (45. 0%) were female. Meanwhile, 7 (100%) ward assistants were female and lastly, 4 (20. 0%) cleaners were male and 16 (80. 0%) were female. Genders for all respondents are indicated in table 4.1 as follows:

Table 4.1: Frequency table on gender of study respondents

Gender	Frequency	Percentage	Cumulative percentage	95% Confidence Limits
Male	25	25.0%	25.0%	16.9% -34.7%
Female	75	75.0%	100.0%	65.3% -83.1%
Total	100	100.0%	100.0%	

4.3.1.2 Age of respondents

The oldest respondent in the sample was 64 years old, while the youngest was 23 years old (Range=41 years). Meanwhile 4 (4.0%) respondents did not state their ages. A large proportion of (34.4%) of the respondents were aged between 20 and 30 years, followed by (26%) in the age categories of 41-50. Furthermore, (25%) respondents were in the age categories of 31 to 40 age groups and (14.6%) fell into the age categories of 50 and above. The reason for categorising the age was to find out which age categories are more prevalent in the hospitals and are involved in waste segregation. The mean ages of all respondents were 37.4 (SD 13.0) years, Median 36.5 and Mode 28. However, the mean ages per profession were as follows: Doctors 35.7 (SD 9.0), nurses were 38.3 (SD 13.2), ward assistants were 35.7 (SD 16.5) and cleaners were 37 (SD 15.3) years. Age categories of respondents are indicated in table 4.2 as follows:

Table 4.2: Frequency table on ages of study respondents

Age categories	Frequency	Percentage	Cumulative Percentage
20-30	33	34.4%	34.4%
31-40	24	25%	59.4%
41-50	25	26.0%	85.4%
51 and above	14	14.6%	100%

4.3.1.3 Occupational categories of respondents

Occupational categories who were selected for the study are doctors including the interns, nurses, ward assistants and cleaners. These professional categories were selected on the

ground that they are the most health care workers that handle wastes in the selected wards. Other demographic data questions were applicable to all selected professions. Professional categories frequencies are indicated in table 4.3 as follows:

Table 4.3: Frequency table of professional categories of study respondents

Profession	Frequency	Percentage	Cumulative percentage	95% Confidence Limits
Doctors	20	20.0%	20.0%	12.7% -29.2%
Nurses	53	53.0%	73.0%	42.8% -63.1%
Ward assistants	7	7.0%	80.0%	2.9% -13.9%
Cleaners	20	20.0%	100.0%	12.7% -29.2%
Total	100	100.0%	100.0%	

4.3.1.4 Duration of work experience

Duration of work experience of health care workers who took part in the study was assessed. 39% of respondents' duration of work experience was ≤ 1 year-5years, while 26% and 34% respondents' duration of work experience were ≤ 5 years-10 years and ≤ 10 years respectively. The reason for assessing duration of work experience was to find out the frequencies of work duration for HCWs who took part in the study. This is indicated in table 4.4 as follows:

Table 4.4: Frequency table on duration of work experience

Duration	Frequency	Percentage	Cumulative percentage	95% Confidence Limits
Missing	1	1.0%	1.0%	0.0% -5.4%
≤1yr-5yrs	39	39.0%	40.0%	29.4% -49.3%
≤5yr-10yrs	26	26.0%	66.0%	17.7% -35.7%
≤10yrs	34	34.0%	100.0%	24.8% -44.2%
Total	100	100.0%	100.0%	

4.3.1.5 Hospitals where the study took place

Two training hospitals that were assessed are Intermediate Hospital Katutura and Windhoek Central Hospital. These were the only public training hospitals in Khomas Region where the study took place. Table 4.5 indicates frequencies of HCWs per hospital.

Table 4.5: Frequency table of health care workers per hospital

Hospital	Frequency	Percentage	Cumulative percentage	95% Confidence Limits
IHK	40	40.0%	40.0%	29.4% -54.7%
WCH	60	60.0%	100.0%	49.7% -69.7%
Total	100	100.0%	100.0%	

4.3.1.6 Ward type

49% of respondents were from medical wards, 28% were from surgery wards and 11% of respondents were from gynaecology and postnatal wards each. The reason for selecting these

wards was that they generate all type of wastes on a daily basis. Frequencies are indicated in table 4.6 as follows:

Table 4.6: Frequency table of ward type and number of HCWs per ward type

Ward type	Frequency	Percentage	Cumulative percentage	95% Confidence Limits
Missing	1	1.0%	1.0%	0.0% -5.4%
Medical	49	49.0%	50.0%	38.9% -59.2%
Gynaecology	11	11.0%	61.0%	5.6% -18.8%
Surgery	28	28.0%	89.0%	19.5% -37.9%
Postnatal	11	11.0%	100.0%	5.6% -18.8%
Total	100	100.0%	100.0%	

4.3.2 Knowledge of the HCWs on waste segregation (Section B- objective 1)

Health care workers such as doctors including interns, nurses, ward assistants and cleaners were examined on the items below. The reason for assessment was simply to find out whether they possessed knowledge on waste segregation.

4.3.2.1 Healthcare waste hazardous

Respondents were given the opportunity to rate themselves with a **YES** or **NO** to state whether health care wastes were hazardous. 89 (89.9%) said **YES** and only 8(8%) health care workers who said **NO**, while 3(3%) of respondents' rating were **missing**. These ratings are indicated in table 4.7 as follows:

Table 4.7: Rating of health care workers on health care waste hazardous

PROFESSIONS	RATING	FREQUENCY (%)
Doctors	Yes	19(95%)
	No	1(5.0%)
Nurses	Yes	46(86.8%)
	No	5(9.4%)
	Missing	2(3.8%)
Wards assistants	Yes	6(85.7%)
	No	1(14.3%)
Cleaners	Yes	18(90.0%)
	No	1(5.0%)
	Missing	1(5.0%)

4.3.2.2 Usage of the plastic bags

The participants were assessed regarding usage of different colour coded plastic bags, whereby papers and paper plates are segregated in black plastic bags soiled linen are being put in green plastic bags, infectious or biohazardous are segregated in red plastic bags and left over food in yellow plastic bags. This was reported in table 4.8 as follows:

Table 4.8: Usage of the plastic bags

ITEMS	PROFESSIONS	USAGE AND FREQUENCY (%)					
		Black	Yellow	Green	Red	Don't know	Missing
Papers and papers plates	Doctors	17(85.0%)	1(5.0%)	1(5.0%)	1(5.0%)	-	-
	Nurses	39(73.6%)	4(7.5%)	-	6(11.3%)	2(3.8%)	2(3.8%)
	Wards assistants	7(100.0%)	-	-	-	-	-
	Cleaners	16 (80.0%)	2(10.0%)	-	-	2(10.0%)	-
Soiled linen	Doctors	-	-	11(55.0%)	6(30.0%)	3(15.0%)	-
	Nurses	1(1.9%)	1(1.9%)	47(88.7%)	4(7.5%)	-	-
	Wards assistants	-	-	6(85.7%)	1(14.3%)	-	-
	Cleaners	1(5.0%)	-	13(65.0%)	6(30.0%)	-	-
Infectious and Biohazardus wastes	Doctors	-	1(5.0%)	-	19(95.0%)	-	-
	Nurses	-	-	2(3.8%)	51(96.2%)	-	-
	Wards assistants	1(14.3%)	-	-	6(85.7%)	-	-
	Cleaners	-	-	-	20(100.0%)	-	-
Leftover food	Doctors	8(40.0%)	4(20.0%)	2(10.0%)	1(5.0%)	5(25.0%)	-
	Nurses	11(20.8%)	41(77.4%)	-	1(1.9%)	-	-
	Wards assistants	2(28.6%)	5(71.4%)	-	-	-	-
	Cleaners	5(25.0%)	15(75.0%)	-	-	-	-

4.3.2.3 Handling of used syringes and needles

Only doctors and nurses were assessed on this item and 100.0% of doctors and nurses had knowledge on handling of used syringes and needles.

4.3.2.4 Handling of safety box

Doctors and nurses were assessed on this item and 19(95.0%) of the doctors possessed knowledge on handling safety boxes and it was only 1(5.0%) who did not have knowledge on the same item. Meanwhile, nurses who were assessed, 45(84.9%) had knowledge on safety box handling, while 8(15.1%) did not have knowledge.

4.3.2.5 Training on waste segregation

Respondents were asked to rate themselves with a **YES** or **NO** whether they have received training on waste segregation. Only 43(43.0%) who were trained and 57(57.0) were never trained on waste segregation. The following table shows health care workers rating on training according to their professions.

Table 4.9: HCWs training frequency and percentage on waste segregation

PROFESSIONS	RATING	FREQUENCY (%)
Doctors	Yes	4(20.0%)
	No	16(80.0%)
Nurses	Yes	17(32.1%)
	No	36(67.9%)
Wards assistant	Yes	4(57.1%)
	No	3(42.9%)
Cleaners	Yes	18(90.0%)
	No	2(10.0%)

4.3.3 Attitude of the HCW on waste segregation (Section C- objective 2)

On a scale of 1-4 (1=Strongly disagree; 2=Disagree; 3=Agree and 4=Strongly agree), the respondents were asked to rank themselves the way they segregate wastes by circling a number to best indicate their rating of the following statements. For the doctors were n=20, nurses n=53, ward assistants n=7 and cleaners n=20. However, they were not rated individually. Frequencies on attitude are indicated in table 4.10 below as follows:

Table 4.10 Frequencies on attitude of study respondents n= 100

STATEMENT /ITEMS	STRONGLY DISAGREE	DISAGREE	AGREED	STRONGLY AGREED	MISSING
Item 1: I always put waste in the correct plastic bags	3(3%)	11(11%)	29(29%)	57(57%)	-
Item 2: Correct segregation of waste is of utmost importance for preventing infection transmission	2(2.0%)	1(1.0%)	14(14.0)	83(83.0%)	-
Item 3: Wearing personal protective equipment reduces the risk of contracting infection	2(2.0%)	3(3.0%)	15(15.0%)	80(80.0%)	-
Item 4: Waste disposal is a team work and not a hospital management responsibility	1(1.0%)	7(7.0%)	23(23.0%)	64(64.0%)	(1.0%)
Item 5: Efforts in safe waste disposal are a financial burden on the administrative department of the hospital	18(18.0%)	16(16.0%)	29(29.0%)	37(37.0%)	-
Item 6: I am not at all ignorant when disposing wastes in the hospital	5(5.0%)	5(5.0%)	24(24.0%)	66(66.0%)	-
Item 7: I am sometimes ignorant when disposing wastes in the hospital	60(60.0%)	14(14.0)	16 (16.0)	10(10.0%)	-
Item 8: I am always ignorant when disposing wastes in the hospital	73(73.0%)	10(10.0%)	5(5.0%)	12(12.0%)	-

4.3.4 Practice of the HCW on waste segregation (section D – Objective 3)

4.3.4.1 Hospital

Two training hospitals, Intermediate Hospital Katutura and Windhoek Central Hospital were assessed. These were the only training hospitals in Khomas Region.

4.3.4.2 Ward

The wards that were assessed are medical, gynaecology, surgery and postnatal wards. These wards were selected on the ground that they generate all categories of wastes. The discussion focused on the checklist of seven (7) wards that were selected randomly from 14 wards that meet inclusion criteria. The reason of assessment was to find out whether all relevant plastic bags were available in the wards and to analyse the existing situation of waste segregation practice of health care workers.

4.3.4.3 Availability of plastic bags in the wards

On observation of the wards; black, red, green and clear plastic bags were found in all seven wards 7(100%), while yellow plastic bags were not in 4 (57.1%) of the hospital wards assessed. This is depicted in table 4.11 as follows:

Table 4.11: Availability of plastic bags in the wards (n=7)

Plastic bags	RATING	FREQUENCY (%)
Black plastic bags	Yes	7(100.0%)
	No	-
Red plastic bags	Yes	7(100.0%)
	No	-
Green plastic bags	Yes	7(100.0%)
	No	-
Yellow plastic bags	Yes	3(42.9%)
	No	4 (57.1%)
Clear plastic bags	Yes	7(100.0%)
	No	-

4.3.4.4 Disposing of body fluid/blood-contaminated fomites

Seven (7) wards were assessed by use of checklist to find out on how health care workers dispose blood-contaminated fomites. Incorrect disposal was observed in 2 (28.6%) wards, while such observation was not seen in 5 (71.4%) of the wards.

4.3.4.5 Availability of posters in the wards

Seven (7) wards were again assessed to find out whether there were posters that indicate proper waste segregation practices. Posters were found in all seven (7) wards (100%).

4.3.4.6 Availability of the guidelines in the wards

A checklist was used to assess seven (7) wards to find out whether there were guidelines that showed proper waste segregation practices. In this case waste segregation is clearly stipulated in the Infection Prevention Control Guidelines of the Ministry of Health Social Services. Only 1(14.3%) of the wards were found to have these guidelines, while 6(85.7%) wards did not have. The reason given was that student nurses remove the guidelines from the wards especially when they compile their assignments.

4.3.4.7 Off-Loading area of the plastics bags of each ward

An immediate area for off-loading plastic bags from the wards was checked for the following:

1) Cleanliness, free from dirtiness and free from bad smell; 2) dirtiness, but free from bad smell; 3) extremely dirty, smelling bad, littering and require urgent attention. 4(57.1%) off-loading area were found to be clean, free from dirtiness and free from bad smell, while 3(42.9%) off-loading zone were found dirty, but free from bad smell.

4.3.4.8 Storage of used plastic bags in the cage

Plastic bags are collected from off-loading zone of each ward to the cages outside the wards waiting to be transported to their respective places such as municipality landfill sites,

incineration and to be collected by private contractors. These cages are expected to be clean and locked at all time. This assessment was carried out for each training hospital; IHK and WCH (n=2). The conditions of these cages were checked for cleanliness and whether they are lockable. The result of the study found that 1(50%) cage zone of one hospital was clean, but unlockable; while for another hospital 1(50%) was found not to be clean, smelly and littering all over the place.

4.4 SUMMARY

A descriptive, cross sectional study about knowledge, attitude and practice of health care workers on waste segregation was conducted among 100 respondents at Intermediate Hospital Katutura and Windhoek Central Hospital, Khomas Region, Namibia. The aim of this study was to explore the knowledge, practice and attitude of health care workers on waste segregation in public training hospitals, Khomas region.

The data was collected through self-administered questionnaire to the respondents and by using a checklist to assess the wards. The demographic data that was discussed were gender, age, profession, duration of current work experience, hospital and the ward where the health care workers were working. The findings showed that all the respondents were aged between 23 and 64 years. The mean ages of all participants were 37.4 (SD 13.0) years, Median 36.5 and Mode 28. The demographic data, knowledge and attitude of health care workers were examined and explored and practice of selected training hospitals 'wards were assessed. However, the results of the study have shown varying results for these domains.

CHAPTER 5

DISCUSSION, CONCLUSION, RECOMMENDATIONS AND LIMITATIONS

5.1 INTRODUCTION

This is the final chapter of this research study and focuses on discussing the research findings and the results presented in Chapter 4. It also contains an evaluation of the overall purpose of the study, together with its three objectives. Subsequently, conclusions are drawn and recommendations are made. The overall purpose of this study was to explore the knowledge, practice and attitude of health care workers on waste segregation in public training hospitals, Khomas region.

Accordingly, it is concluded that the research aim was achieved to a large extent by the findings of this study. To justify this conclusion, the findings were appraised against the research intention and the three research objectives for the study. These objectives were: 1) To examine health care workers' knowledge on waste segregation in public training hospitals, Khomas region; 2) To explore and describe health care workers' attitude towards correct waste segregation; and 3) To assess health care workers' practice on compliance with the waste segregation. The researcher administered questionnaire to 100 health care workers at Windhoek Central Hospital and Intermediate Hospital Katutura.

5.2 DISCUSSION

This chapter presents the discussion obtained from the analysis conducted on the data that were collected using self-administered questionnaire, checklist as well as in view of the objectives that assessed the knowledge, attitude and practice of health care workers on waste segregation. Since, we have not found any study in Namibia addressing the same objectives, key strength of this study was that this assessment of KAP related to waste segregation gave us a unique opportunity to provide information about a topic which is lacking in our country.

It also helps to identify the gaps between the current KAP among the health-care workers involved in waste segregation and the future desired state that should be reached.

5.2.1 Section A: Demographic data of health care workers on waste segregation

Respondents were (n=100) that includes 53 nurses, 20 doctors, 20 cleaners, and 7 ward assistants that have participated in the study. The demographic data that was discussed are gender, age, profession, duration of current work experience, hospital and the ward where the health care workers were working. Genders for all participants were 25% for male and 75% for female. Among nurses who respondents, 10 (18.9%) were male, while 43 (81.1%) were female; 11 (55.0%) doctors were male, while 9 (45.0%) were female. Meanwhile, both 7 (100%) ward assistants were female and lastly, cleaners 4 (20.0%) were male and 16 (80.0%) were female.

The oldest respondent in the sample was 64 years old, while the youngest was 23 years old. Meanwhile 4 (4.0%) respondents did not state their ages. A large proportion of (34.4%) of the respondents were aged between 20 and 30 years, followed by (26%) in the age categories of 41-50. Furthermore, (25%) respondents were in the age categories of 31 to 40 age groups and (14.6%) fell into the age categories of 50 and above. The mean ages of all participants were 37.4 (SD 13.0) years, Median 36.5 and Mode 28. However, the mean ages per profession were as follows: Doctors 35.7(SD 9.0), Nurses were 38.3 (SD 13.2), Ward assistants were 35.7 (SD 16.5) and Cleaners were 37 (SD 15.3) years.

Professional categories chosen were selected on the ground that they are the most health care workers that handle wastes in the selected wards. Other demographic data questions were applicable to all selected professions. 39% of respondents' duration of work experience was ≤ 1 year-5years, while 26% and 34% respondents' duration of work experience were ≤ 5 years-10 years and ≤ 10 years respectively. From the point of nurses respondents (53%) who are the largest proportion of respondents, 23 (43.4%) had work experience duration of ≤ 1 year-5years

and they were never trained on waste segregation. Then, 11 (20.8%) and 19 (35.8%) had work experience duration of ≤ 5 years-10years and ≤ 10 years respectively. From the results of this study, a large proportion of younger age (32%) who had duration of work experience of ≤ 1 year-5years which was at 39% (of which the majority of HCWs' duration of work experience were less than 2 years) can be attributed to poor knowledge on waste segregation among this age group as majority of them were not trained. The 49% of respondents were from medical wards, 28% were from surgery wards and 11% of respondents were from gynaecology and postnatal wards each.

5.2.2 Section B: (Objective 1) Knowledge of health care workers on waste segregation

Knowledge about waste segregation is important for all health care workers as lack of knowledge about waste segregation may jeopardise infection control in the health facilities. The study revealed that 95.0% of doctors, 86.8% of nurses, 85.7% ward assistants and 90.0% of cleaners who participated in the study knew that health care wastes are hazardous and could pose health risks if not properly segregated. That means doctors' score were higher than the other 3 occupational categories on this item. This might also be explained by the fact that they have more in-depth understanding due to their higher education and professional levels. Doctors scored higher on red plastic bags 95%, ward assistants 86%; while nurses and cleaners scored exceptionally well with 96% and 100% respectively. Meanwhile, nurses and ward assistants scored high on green plastic bags knowledge, 89% and 86% respectively, while doctors scored 55% and cleaners 65% and this can be attributed to the fact that the two formers are dealing with soiled linen on a daily basis.

A study done in Egypt found that housekeeping staff including cleaners were less knowledgeable about waste segregation and disposal. While in India, knowledge about color coding containers and waste segregation was found to be better among doctors and nurses as

compared to that of other staff (Madhukumar & Ramesh, 2012). On the other hand, doctors in our study were less knowledgeable about yellow plastic bags 20% and this could be attributed to the fact that they are not involved much with these plastic bags on a daily basis. Meanwhile, underscores of knowledge on yellow plastic bags were also noticed in other professionals, whereby nurses scored 77%, cleaners scored 75% and ward assistants scored 71%. This poor performance may be due to the fact that yellow plastic bags were not found in 4 out of 7 wards assessed with a checklist and food items were wrongly placed in black plastic bags. These study findings are in agreement with findings of other study conducted in government and private hospitals in Sana'a, Yemen that showed poor awareness among health care workers regarding medical waste handling, and a lack of differentiation between domestic and medical waste disposal (Al Emad, 2011).

Only doctors and nurses were assessed on handling used syringes and needles and both of them scored 100.0%. They were also assessed on safety box handling, whereby 19(95.0%) doctors possessed knowledge on handling of safety box and it was only 1(5.0%) who did not had knowledge on the same item. Meanwhile, nurses who were assessed, 45(84.9%) had knowledge on safety box handling, while 8(15.1%) did not have knowledge.

On the training item, doctors who were trained were only 4(20.0%), and the untrained were 16(80.0%). Nurses who were trained were 17(32.1%), while those who were not trained were 36(67.9%). On the other hand, ward assistants who were trained were 4(57.1%), while those who did not receive training were 3(42.9%). Lastly, cleaners who were trained were 18(90.0%), and those who were not trained were only 2(10.0%). The high overall knowledge score on waste segregation into plastic bags among cleaners which was (80%) than the doctors which was (63.8%) might be attributed to the fact that 90% of cleaners were trained on waste segregation, whereas doctors trained were only 20%.

Based on the study findings, the following conclusions may be drawn: This is a clear indication that training was only directed towards HCWs with low educational level such as cleaners and ward assistants, while high educational level professionals such as doctors and nurses were denied training. It might also suggest that an increase with cleaners' knowledge might be due to training they have acquired. In case of the doctors, this might also be attributed to the fact that doctors sometimes find it difficult to attend trainings given by nurses, since infection control officers in the hospitals that train HCWs on infection control including waste segregation are nurses. However, training of these health care workers was not done regularly. Almost all HCWs trained, had their training done more than a year of which the highest trained HCWs in waste segregation was cleaners with 90% and out of these percentages, 75.0% respondents were trained more than a year ago. This irregularity might be attributed to shortage of staff in the hospitals that may hinder staff to attend trainings.

5.2.3 Section C: (Objective 2) attitude of health care workers on waste segregation

Regarding the attitude of health care workers towards waste segregation and disposal at the two training hospitals, the respondents were asked to rank themselves the way they segregate wastes by circling a number to best indicate their rating. On average, HCWs that strongly agreed that they always put wastes in the correct plastic bags were 57(57%). The percentage of HCWs that strongly agreed that safe disposal is of utmost importance for preventing infection transmission 83(83.0%). For this study, the main outcome of interest was that higher percentage of HCWs (83.3%) strongly agreed on this statement and that was a good indication that they know how to prevent infections. This was followed by 80(80.0%) of HCWs who strongly agreed that wearing personal protective equipment reduces the risk of contracting infection. While those who strongly agreed that waste disposal is a team work and not a hospital management responsibility were 64(64.0%). Furthermore, HCWs that strongly agreed that efforts in safe waste disposal are a financial burden on the administrative department of

the hospital were only 37(37.0%). These study findings are in agreement with findings of another study conducted in Egypt that researched on some of the above statements such as; safe waste disposal should be a priority, waste disposal is teamwork not a hospital responsibility, and that disposal of waste is a financial burden on the hospital. In their study, the proportion of housekeeping staffs had showed a higher significant approval of these statements than other HCWs categories.

These statements were also assessed per professional category. It was found that the percentages of cleaners who strongly agreed that they always put wastes in the correct plastic bags were (80. 0%), ward assistants (71. 4%), nurses (52. 8%) and doctors (40.0%). Meanwhile, the percentage of HCWs that strongly agreed that safe disposal is of utmost importance for preventing infection transmission was as follows; ward assistants (85. 7%), doctors (85.0%), nurses (84.9%) and cleaners (75.0%). On the other hand, the percentages of nurses (84.9%), cleaners (85, 0%), ward assistants (71.4%) and doctors (65.0%) strongly agreed that using personal protective equipment decreases the risk of contracting infection. The proportion of cleaners strongly agreed that waste disposal is a team responsibility were 80.0%, nurses were 62.3%, doctors were 60.0% and ward assistants were 42.9%. Furthermore, HCWs that strongly agreed that safe waste disposal might be a financial burden on the administrative department were as follows; cleaners (50. 0%), doctors (45. 0%), ward assistants (42. 9%) and nurses (28.3%). It is interesting to note that cleaners are scoring higher than other categories and this could be attributed to the training they have received. Based on the study findings, the following conclusion may be drawn: Training on waste segregation was only directed to low level categories of health care workers such as cleaners. A study done in Pakistan suggest that training could be an effective intervention for improving knowledge, attitudes and practices regarding infectious waste management if it is directed to all categories of health care workers.

5.2.4 Section D: (Objective 3) practice of health care workers on waste segregation

On the practice of health care workers on waste segregation, wards were assessed using a checklist to analyze the existing situation of waste segregation practice of health care workers. Practices among HCWs were not found up to standard in some of these wards. On observation of the wards; black, red, green and clear plastic bags were found in all the wards (100%), while yellow plastic bags were not in 4 (57%) of the hospital wards assessed. According to the ward supervisors, this problem had been going on for months. This unavailability of yellow plastic bags had already underpinned the circumstances in which HCWs were working. That means, wastes that were supposed to be put in yellow plastic bags ended up in wrong plastic bags and eventually wrongly disposed of.

The World Health Organization suggested that a biohazardous symbol should be attached to the plastic bag used to indicate to others the types of wastes segregated in the specific plastic bag. Meanwhile, incorrect disposal of blood-contaminated fomites was observed in 2(28. 6%) wards, while such observation was not seen in 5 (71. 4%) of the wards. Practices could only be improved by regular and proper trainings and by allocating the proper budget for colour coded plastic bags. This was concurred by the study that was done in Pakistan which concluded that poor resources and lack of healthcare worker's training in infectious waste resulted in poor waste management at hospitals.

5.3 CONCLUSION

It was concluded that training of personnel was not adequate and did not cater for all different level of health care workers. Some of the waste handlers did not segregate wastes properly, but mixed them up and a large amount was incinerated including the wastes that would otherwise have been non-infectious. The study concluded that regular orientation and re-orientation training programs should be organized for all hospital staff and strict

implementation of guidelines of biomedical waste management that includes waste segregation, to protect themselves and hospital visitors (Othigo, 2014). Moreover, for effective implementation of waste segregation practices in the hospitals, it requires mandatory periodical sensitization to improve the biomedical waste knowledge and practices among health care workers.

5.4 RECOMMENDATIONS

The results of this study show that not all of these HCWs possessed good knowledge and attitude towards waste segregation. Doctors and nurses who were least trained are knowledgeable with colour coded plastic bags surrounding their area of work ,whereas cleaners and ward assistants who scored high on waste segregation training possessed good knowledge almost with all colour coded plastic bags. However, the unavailability of yellow plastic bags in one hospital wards jeopardise efforts in safe waste disposal and can lead to financial burden of the hospital and the Ministry at large. Meanwhile, lack of yellow plastic bags in the wards underpinned the poor practice of health care workers as it was observed in the wards kitchen, where black plastic bags were used instead.

At times, HCWs might also ended up putting wastes in wrong plastic bags such as red plastic bags making the quantity more and overloaded, but is not really infectious waste. Moreover, wastes that was put in wrong plastic bags and has to go for incineration would overload the incinerators unnecessarily. Wastes that were taken to Municipality landfills were weighted and they charged some amount of money from the MOHSS. Improper waste segregation might add up unnecessary kilograms on such plastic bags and the Ministry of Health and Social Services ended up paying a huge amount of money. Furthermore, in some wards areas where plastic bags were loaded from the wards, bags were accumulated there and it became smelly and unhygienic.

The following recommendations were made:

5.4.1 Management and Policy

Waste segregation is a problem to our health care workers, patients, visitors and the entire community. Waste segregation is part of waste management, therefore, policies and guidelines need to be re-looked, since their focus in addressing proper waste segregation is more on health care workers. Programme should be multi-sectoral and everyone should be involved, not only staff from the hospitals and clinics but also patients, visitors and the entire community as they also generate wastes when visiting the hospital and may throw those waste in the wrong plastic bags. Private agencies such as Municipalities and Non- Governmental Organizations (NGO) should be involved. The researcher therefore strongly recommends for active involvement of all stakeholders in policy development. The Ministry of Health and Social Services should come up with clear guidelines for each hospital to be able to measure and quantify the amount of medical waste generated in each unit of the hospital periodically. Orderings of colour coded plastic bags not to be left in the hands of chief cleaners. The administrative departments and management of the hospitals to have clear policies on who should be tasked to determine constant supply and quantity plastic bags stock to be ordered, to avoid under stock. Finally, hospitals to come up with a draft policy that will look at incentivizing and rewarding departments and wards that are doing well in waste segregation.

5.4.2 Training

Training on waste segregation must be included in all health training institutions curricula. Health facilities should train all categories of health care workers on waste segregation on a regular basis. In this regular training, trainers have to encourage health care workers to take ownership of their wards and follow proper ways of waste segregation and disposal. Furthermore, health care workers should be encouraged to emulate positive attitude that will lead to good practices.

5.4.3 Monitoring and Evaluation

Training hospitals and all other health facilities should ensure adequate monitoring and evaluation of waste segregation processes in their premises. Currently, there are no Environmental Health Practitioners employed in the two training hospitals to run the affairs of waste management. Therefore, the researcher recommend that the Ministry of Health and Social Services should employ Environmental Health Practitioners to be in charge of overall waste management in hospitals and spearhead all the activities of waste segregation and waste disposal, since they are well trained in all processes of waste management. Health care workers should be empowered and involved in active Monitoring and Evaluation of waste segregation. Meanwhile, a positive attitude and good practices by all health care workers will help them to acknowledge the benefits of proper waste segregation such as decreasing costs that the Ministry pay to the Municipality landfill.

5.4.4 Programme implementation and strategies

Wastes can be harmful to the community and their environment. Some members of the community fall victims of being scavengers of different wastes on the dump sites. Promotion messages focusing not only on the community's role in ensuring their safeties but also on ensuring that they understand and know about effects of these wastes on their health and the environments should be made available. Information packages should be developed in local languages for everybody to understand. Currently, the Ministry of Health and Social Services has their first training intake of Health Extension Workers in Windhoek who are being trained at National Health Training Centre and they are due to complete their training in three months period. One of the modules in their curriculum is waste management. The researcher recommend that, MOHSS to utilize some of these people in waste management activities especially at the Municipality landfills and dump sites to provide the communities who are scavenging at these sites with comprehensive information and communication. The primary

goal of these activities should be to help people understand the consequences of scavenging at dump sites. Strategies and education programmes aimed at breaking negative attitudes and poor practices of some HCWs should also be instituted as a possible way to address the underlying issues especially in public hospitals.

5.4.5. Research

Research on waste segregation and biomedical waste management was conducted regularly throughout the globe, but research within the Namibian context is scarce and therefore evidence-based statistics remain a challenge. The researcher has found that the gap is not only on waste segregation, but also on waste storage, collection, transportation and disposal. Therefore, the following are some recommendations for further research:

- Knowledge, Attitude and Practice of HCWs about the whole process of hospital waste management in both public and private hospitals.
- A review of legal framework applicable for the management of health care waste and management practices.
- Emphasis on the role of stakeholders in the safe disposal of biomedical wastes.
- Effectiveness of intensive health care waste management training model among health professionals at training hospitals.

5.5 LIMITATIONS

The researcher experienced some difficulties during data collection. For examples some of the HCWs who were initially selected randomly happened to fall sick on the assessment day; hence they could not meet the inclusion criteria. Unwillingness of some of the health care workers to participate in the study as some of the respondents opted not to answer some questions and some respondents were too busy to complete the questionnaires. Meanwhile, almost half of the HCWs in some wards were newly employed, more specially nurses and they

could not meet the inclusion criteria of more than one year of working experience, so they were excluded from the sample. The researcher experienced difficulties with the majority of the doctors, as they had to postpone the assessment dates due to their busy schedules.

Consequently, this could have led to the biased responses and distortion of the study, but the researcher stacked on self-administered questionnaires and was available when the respondents were completing the questionnaires. She limited her own contribution to the completion of the questionnaire to the absolute minimum. Meanwhile, the study cannot be generalized to district level hospital, health care centre, clinics and private health facilities. The study would have been more representative if the researcher included more health facilities. Nevertheless, the current study successfully highlighted how in a developing country such as Namibia, despite the presence of legislation for hospital waste management, implementation of proper waste segregation and disposal of waste is not yet accurately implemented by health-care workers.

5.6 SUMMARY

In this chapter, discussion based on demographic, knowledge, attitude and practice of health care workers, limitations, recommendations and conclusions were presented. The conclusions are the researcher's evaluation of the status of the outcomes or the results achieved from the study. Ultimately, the researcher states the way forward for the study in terms of the recommendations, which were based on the implications of the study findings.

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**ANNEXURE A: RESEARCH PERMISSION LETTER FROM THE POST GRADUATE
STUDY.**

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19 February 2015

TO WHOM IT MAY CONCERN

RE: RESEARCH PERMISSION LETTER

1. This letter serves to inform that student: **Anna N Haifete** (Student number: **9205446**) is a registered student in the School of Nursing and Public Health at the University of Namibia. Her research proposal was reviewed and successfully met the University of Namibia requirements.
2. The purpose of this letter is to kindly notify you that the student has been granted permission to carry out postgraduate studies research. The School of Postgraduate Studies has approved the research to be carried out by the student for purposes of fulfilling the requirements of the degree being pursued.
3. The proposal adheres to ethical principles.

Thank you so much in advance and many regards.

Yours truly,

Name of Main Supervisor: **DR HJ Amukugo**

Signed: _____

Dr. C. N.S. Shaimemanya

Signed: _____

Director: School of Postgraduate Studies

Tel: 2063523

E-mail: cshaimemanya@unam.na

**ANNEXURE B: ETHICAL CLEARANCE CERTIFICATE FROM THE UNIVERSITY OF
NAMIBIA RESEARCH ETHICS COMMITTEE**



ETHICAL CLEARANCE CERTIFICATE

Ethical Clearance Reference Number: SONPH/11/2015

Date: 10 February, 2015

This Ethical Clearance Certificate is issued by the University of Namibia Research Ethics Committee (UREC) in accordance with the University of Namibia's Research Ethics Policy and Guidelines. Ethical approval is given in respect of undertakings contained in the Research Project outlined below. This Certificate is issued on the recommendations of the ethical evaluation done by the Faculty/Centre/Campus Research & Publications Committee sitting with the Postgraduate Studies Committee.

Title of Project: Knowledge, attitude and practice of health care workers on waste segregation at two public training hospitals in Khomas Region, Namibia

Nature/Level of Project: Masters

Researcher: ANNA N. HAIFETE

Student Number : 9205446

Host Department & Faculty: School of Nursing and Public Health

Supervisor : Dr. H. Amukugo ; (Main) (Co) Dr. H. Iita

Take note of the following:

- (a) Any significant changes in the conditions or undertakings outlined in the approved Proposal must be communicated to the UREC. An application to make amendments may be necessary.
- (b) Any breaches of ethical undertakings or practices that have an impact on ethical conduct of the research must be reported to the UREC.
- (c) The Principal Researcher must report issues of ethical compliance to the UREC (through the Chairperson of the Faculty/Centre/Campus Research & Publications Committee) at the end of the Project or as may be requested by UREC.
- (d) The UREC retains the right to:
 - (i). withdraw or amend this Ethical Clearance if any unethical practices (as outlined in the Research Ethics Policy) have been detected or suspected,
 - (ii). request for an ethical compliance report at any point during the course of the research.

UREC wishes you the best in your research.

Prof. I. Mapaure
UNAM Research Coordinator
ON BEHALF OF UREC

**ANNEXURE C: LETTER TO REQUEST PERMISSION TO COLLECT DATA AT
WINDHOEK CENTRAL HOSPITAL AND INTERMEDIATE HOSPITAL KATUTURA**

ANNA NDAPANDULA HAIFETE

P.O.BOX 20355

WINDHOEK

CELL: 0812201845

23 MARCH 2015

MR ANDREW NDISHISHI

PERMANENT SECRETARY

MINISTRY OF HEALTH AND SOCIAL SERVICES

PRIVATE BAG 13198

WINDHOEK

Dear sir

**Re: Permission to conduct a study at Windhoek Central Hospital and Intermediate
Hospital Katutura**

I Anna Ndapandula Haifete, student number **9205446**, a UNAM student in the school of nursing and public health. Would like to request a permission to carry out a study at Windhoek Central Hospital and Intermediate Central Hospital. Pilot study would like to do it at Katutura Health Centre. The title of the research topic is **“Knowledge, Attitude and Practice (KAP) of health care workers on waste segregation at two public training hospitals, in Khomas region, Namibia”**.

The purpose of the study is to explore the knowledge, practice and attitude of health care workers on waste segregation in public training hospitals, Khomas region.

The objectives of the study is to examine health care workers' knowledge on waste segregation in public training hospitals, Khomas region. To explore and describe health care workers' attitude towards correct waste segregation. To assess health care workers' practice on compliance with the waste segregation.

The researcher will ensure voluntarily participation in the study. Wards will also be assessed by the researcher together with the unit supervisor after in depth interview. Participants will remain anonymous as their names or any information that identifies them will not appear on the recordings or on transcript to ensure confidentiality. Furthermore the identity of the participants will not be revealed when the study is reported or published. Participants have right to autonomy and can withdraw from the research process at any stage.

Findings of this study will benefit the two institutions and results will be made available on request.

The proposal was approved by post graduate studies committee and UNAM Senate.

I trust that my application will receive your favorable consideration.

Yours sincerely

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Anna Ndapandula Haifete

ANNEXURE D: LETTER OF PERMISSION FROM THE MINISTRY OF HEALTH AND SOCIAL SERVICES



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 203 2125
Fax: 061 – 222558
E-mail: msimasiku@mhss.gov.na

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3

Enquiries: Mr. M. Simasiku

Date: 31st July 2015

Ms Anna Ndapandula Haifete
P.O. Box 20355
Windhoek
Namibia


Dear Ms. Haifete

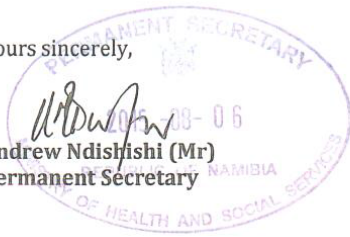
Re: Knowledge Attitude and Practice of Health care worker on waste segregation at two public training hospitals, in Khomas region, Namibia.

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
 - 3.1 The data to be collected must only be used for academic purpose;
 - 3.2 No other data should be collected other than the data stated in the proposal;
 - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;

- 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
- 3.5 Preliminary findings to be submitted upon completion of the study;
- 3.6 Final report to be submitted upon completion of the study;
- 3.7 Separate permission should be sought from the Ministry for the publication of the findings.

Yours sincerely,


Andrew Ndisihishi (Mr)
Permanent Secretary



**ANNEXURE E: LETTER OF PERMISSION FROM INTERMEDIATE HOSPITAL
KATUTURA MEDICAL SUPERINTENDENT**



Republic of Namibia

Ministry of Health and Social Services

Private Bag 13215
WINDHOEK
Namibia

Intermediate Hospital Katutura
Independence Avenue
WINDHOEK

Telephone (061) 203 4004/5
Telefax (061) 222706

Enquiries: Ms. P. Swartbooi

Date: 28 August 2015

OFFICE OF THE MEDICAL SUPERINTENDENT

**MS. ANNA NDAPANDULA HAIFETE
P. O. BOX 20355
WINDHOEK
NAMIBIA**

**RE: KNOWLEDGE ATTITUDE AND PRACTICE OF HEALTH CARE
WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING
HOSPITALS, IN KHOMAS REGION, NAMIBIA**

This office hereby grants you permission to do the research knowledge attitude and practice of Health care worker on waste segregation at two public training in Katutura Intermediate Hospital.

Thank you

Yours in health

.....
**DR. N. T. AMAGULU
MEDICAL SUPERINTENDENT**



**ANNEXURE F: PERMISSION LETTER FROM WINDHOEK CENTRAL HOSPITAL
MEDICAL SUPERINTENDENT**

9-0/00



REPUBLIC OF NAMIBIA
Ministry of Health and Social Services

Private Bag 13215 Windhoek Namibia Enquiries: Mrs. A. Mootu	Harvey Street Windhoek Central Hospital Ref.	Tel. No: (061) 203 3024 Fax No: (061) 222886 Date : 25 August 2015
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**OFFICE OF THE MEDICAL SUPERINTENDENT
WINDHOEK CENTRAL HOSPITAL**

ANNA NDAPANDULA HAIFETE
P.O.BOX 20355
WINDHOEK
CELL: 0812201845

Dear Ms Haifete

**RE: PERMISSION TO CONDUCT A STUDY AT WINDHOEK CENTRAL HOSPITAL
FROM 31/08/15-11/09/15**

Kindly be informed that permission has been granted to Anna Ndapandula Haifete under the following conditions.

Patients / clients information should be kept confidential at all times.

Thank you for your kind gesture.

Yours sincerely

Dr. S. Shalongo
P.P. Dr. S. Shalongo
P.P. Dr. S. Shalongo

DR. S. SHALONGO
MEDICAL SUPERINTENDENT

ANNEXURE G: CONSENT FORM

TITLE: KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTH CARE WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS, IN KHOMAS REGION, NAMIBIA

Researcher: Anna Ndapandula Haifete

Dear participant

I am Anna Ndapandula Haifete registered with University of Namibia, doing a Master degree in Public Health. I wish to conduct a research project entitled: “knowledge, attitude and practice of health care workers on waste segregation at two public training hospitals, in Khomas region, Namibia. The study will be conducted under the supervision and guidance of Dr. H. Amukugo and Dr. H. Iita, School of Nursing and Public Health, University of Namibia.

One of the objectives of this study is to describe the knowledge, attitudes and practice (KAP) of, health care workers on waste segregation at two public training hospitals with the aim to explore their knowledge, practice and attitude of health care workers on waste segregation at Windhoek Central Hospital (WCH) and Intermediate Hospital Katutura (IHK), Khomas region and to propose interventions for improving waste segregation. Your participation will provide information that might enable decision makers to assist in this regard. Participation in this study will take approximately 15-20 minutes. The procedure includes responding to questions on demographic, knowledge and practices. Meanwhile a check list will be used by the researcher and this will assist her to gain more insight and understanding by exploring and describing the attitude of health care workers on waste segregation.

Your participation in this study is voluntary and you have the right to withdraw at any time should you feel so. You should feel free to ask the researcher to clarify the question where you don't understand and you will be expected to answer all questions. You will receive the

questionnaire and fill it on your own at the time of study and hand it to the researcher. The study data will be coded so they will not be linked to your name. Your identity will not be revealed during the study or when the study is being reported or published with the permission granted by the Ministry of Health and Social Services for the benefit of improving waste segregation in the two hospitals. The researcher and the supervisors are the only people that will have access to the data collected.

You are among the study population of the health care workers in the inpatient wards such as medical wards, surgery wards, gynaecology wards and postnatal wards. These wards are selected on the ground that they generate more infectious wastes. Should you agree to participate, please sign your consent with full knowledge of the nature and purpose of the study.

If you have any questions or concerns about the research, please feel free to contact Mrs Anna Ndapandula Haifete at(061-2032579), cell 0812201845 or E-mail annahaifete@gmail.com. The main supervisor Dr.H.Amukugo at 061-2064617: E-mail: hamukugo@unam.na and Co-Supervisor:Dr. H.lita at: E-mail:hiita@unam.na. Faculty of Health Science, School of Nursing and Public Health, at the University of Namibia.

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims or rights because of your participation in this research study.

Should you agree to participate, please sign the consent provided. If you have any question that need clarification you are welcome to contact me.

I.....

Agree to participate in this research project on my own will.

Signed at

.....

Participant signature

.....

Date

ANNEXURE H: QUESTIONNAIRE

QUESTIONNAIRE FOR ASSESSING THE KNOWLEDGE, ATTITUDES AND PRACTICES (KAP) OF HEALTH CARE WORKERS (HCWs) ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS, KHOMAS REGION

Researcher: Anna Ndapandula Haifete

Institution: University of Namibia

The following questionnaire is part of a study to be conducted to explore knowledge, attitude and practice of health care workers on waste segregation at two public hospitals, in Khomas region, Namibia. To ensure confidentiality, please do not write your name on the questionnaire as this study is anonymous. Thank you very much for taking the time to complete our questionnaire, your effort is greatly appreciated.

GUIDES FOR COMPLETING THE QUESTIONNAIRE

This is a questionnaire, aimed at exploring knowledge, attitude and practice of health care workers on waste segregation in the hospital. Please read through the entire questionnaire before starting to respond to the questions. All responses will be treated confidentially and you are required to complete ALL applicable questions. If a certain statement is not applicable to you, please tick in the not applicable block.

1. SECTION A: QUESTIONNAIRE ON DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS (please tick in the box of your choice).

Identification code:

1.1 Gender of respondent

Male

- Female
- 1.2 What is your current age?
- 1.3 What is your profession? Doctor
- Category: Intern Medical officer
- Specialist
- Nurse
- Category: R/N E/NM
- Ward assistant
- Cleaner
- 1.4 Duration of current work experience More than 1 year-5 years
- More than 5 years-10 years
- More than 10 years
- 1.5 Which hospital are you working? Windhoek Central Hospital
- Intermediate Hospital Katutura
- 1.6 Which ward type are you working? Medical
- Gynecology
- Surgery
- Postnatal

2. SECTION B: KNOWLEDGE OF HEALTH CARE WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS (please tick in the box of your choice).

2.1 Healthcare waste hazardous Yes No

2.3 Plastic bags

2.3.1 In which plastic bag do you put waste papers and paper plates? Black

Yellow

Green

Red

Do not know

2.3.2 In which plastic bag do you put soiled linen? Black Yellow

Green

Red

Do not know

2.3.3 In which plastic bag do you put infectious or bio-hazardous wastes, e.g. body parts,

bandages, gauze, catheters and urine drainage bags? Black Yellow

Green

Red

Do not know

2.3.4 In which plastic bag do you put leftover food? Black Yellow

Green

Red

Do not know

2.4 Immediately after using syringes and needles, where do you put them?

(Doctors and Nurses only)

In a puncture-proof safety box

In an open container for the blood to get dry from needle

In a dustbin in patients rooms

Do not know

2.5 In order to prevent needle-sticks, the safety boxes should be closed, how full should it be?
(Doctors and Nurses only)

$\frac{1}{2}$ full $\frac{3}{4}$ full

Do not know

2.6 Have you ever attended training on waste segregation? Yes No

2.7 If yes, how often do you attend this training?

Every month

Every six months

Every year

More than a year

Not applicable

2.10 How would you rate the overall level of training? Strongly satisfied

Satisfied

Dissatisfied

Strongly dissatisfied

Not applicable

3. SECTION C: ATTITUDE OF HEALTH CARE WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS. On a scale of 1-4 (1=Strongly disagree; 2=Disagree; 3=Agree and 4=Strongly agree), rank yourself the way you segregate wastes. (Please circle a number to best indicate your rating of the following statements).

3.1 I always put wastes in the correct plastic bags

Strongly disagree **1 2 3 4** Strongly agree

3.2 Correct segregation of waste is of utmost importance for preventing infection transmission Strongly disagree **1 2 3 4** Strongly agree

3.3 Wearing personal protective equipment reduces the risk of contracting infection
 Strongly disagree **1 2 3 4** Strongly agree

3.4 Waste disposal is a team work and not a hospital management responsibility
 Strongly disagree **1 2 3 4** Strongly agree

3.5 Efforts in safe waste disposal are a financial burden on the administrative department of the hospital Strongly disagree **1 2 3 4** Strongly agree

3.6 I am not at all ignorant when disposing wastes in the hospital
 Strongly disagree **1 2 3 4** Strongly agree

3.7 I am sometimes ignorant when disposing wastes in the hospital
 Strongly disagree **1 2 3 4** Strongly agree

3.8 I am always ignorant when disposing wastes in the hospital
 Strongly disagree **1 2 3 4** Strongly agree

ANNEXURE I: CHECKLIST

4. SECTION D: PRACTICES OF HEALTH CARE WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS (Researcher to tick the applicable box in the CHECKLIST).

QUESTION NUMBER	QUESTION	CODING	OPTIONAL (Not applicable block)
4.1	Name of hospital	IHK <input type="checkbox"/> WCH <input type="checkbox"/>	
4.2	Ward	Medical <input type="checkbox"/> Gynecology <input type="checkbox"/> Surgery <input type="checkbox"/> Postnatal <input type="checkbox"/>	
4.3	Usage of plastic bags		
4.3.1	Are black plastic bags available in the ward?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.3.2	Are red plastic bags available in the ward?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.3.3	Are green plastic bags available in the ward?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.3.4	Are yellow plastic bags available in the ward?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.3.5	Are clear plastic bags (patient's bedside dustbin) available in the ward?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.4	Any observation regarding incorrect disposing of body fluids/blood-contaminated fomites?	Yes <input type="checkbox"/> No <input type="checkbox"/>	

4.5	Are there posters or other signs in the ward that encourage proper waste segregation practices?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.6	Is there Infection control guideline in the ward?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
4.7	How is the condition of the immediate area of each ward where different plastic bags are off-loaded from the wards?	Cleared, free from dirtiness, free from bad smell <input type="checkbox"/> Dirty, but free from bad smell <input type="checkbox"/> Extremely dirty, smelling bad, littering and require urgent attention <input type="checkbox"/>	
4.8	How is the condition of the cage area where plastic bags are being locked up waiting for incineration? (per hospital)	Locked and clean <input type="checkbox"/> Not locked, but clean <input type="checkbox"/> Not clean, smelly and littering <input type="checkbox"/>	