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KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTHCARE WORKERS ON WASTE SEGREGATION AT TWO PUBLIC TRAINING HOSPITALS

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ABSTRACT

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 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. 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. For the knowledge the study revealed that doctors' score were higher than the other 3 occupational and they have more in-depth understanding due to their higher education and professional levels. While for the attitude the percentage of HCWs are strongly agreed that safe disposal is of utmost importance for preventing infection transmission and prevent infections. On the practice of health care workers on waste segregation found to be universal practices in the entire ward. 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.

INTRODUCTION AND BACKGROUND

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.

The two training hospitals, 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).

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.

MATERIALS AND METHODS

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 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.

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.

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.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.

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 Statically 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:

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 gynaecology 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

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 date was analysed manually.

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. 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.

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.

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

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).

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.

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.

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.

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.

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.

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.

RESULTS

The results of the study discussed were demographic data of participants knowledge of the HCWs on waste segregation attitude of the HCW on waste segregation and in both instances n=100. Practice of the HCW on waste segregation was also discussed and n=7. They are described as follows:

DEMOGRAPHIC DATA OF THE STUDY RESPONDENTS

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.

Gender of respondents

Genders 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 1 as follows:

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.

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 1 as follows:

Table 1: Frequency table of professional categories of study respondents

			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%	

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.

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 2: 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%	

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 table3 as follows:

Table 3: 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%	

KNOWLEDGE OF THE HCWS ON WASTE SEGREGATION

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.

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**.

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 as follows:

Table 4: 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%)	-	-	-	-

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.

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.

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 5: 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%)

ATTITUDE OF THE HCW ON WASTE SEGREGATION

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 6 below as follows:

Table 6 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%)	-

PRACTICE OF THE HCW ON WASTE SEGREGATION

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.

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 7: 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	-

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.

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%).

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.

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.

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.

DISCUSSION

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.

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.

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 impart 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 all. (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 all (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 all, 2014).

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.

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).

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.

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.

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.

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 materials.

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; Khazaee, Hamidian, Taheri, Babakan, Mashoof, Rabizadeh, et all, 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).

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.

CONCLUSION

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. 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).

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REFERENCES

1. Abd El-Salam, M., M. Hospital waste management in El-Beheira Governorate, Egypt.J Environmental Management, 2010; 91(3): 618-29. doi: 10.1016/j.jenvman.2009.08.012.
2. Adogu, P., Ubajaka, C., F. & Nebuwa, J.E. Knowledge and Practice of Medical Waste Management among Health Workers in a Nigerian General Hospital. Asian Journal of Science and Technology, 2014; 5(12); 833.
3. Ajai, S., & Nath, S. R. Knowledge, Attitude and Practices of Bio-medical Waste Management amongst Staff of Institutional Trauma Center Level II. International Journal of Research in Health Sciences, 2013; 1 (2): 62-68.
4. Al Emad, A.A. Assessment of Medical Waste Management in the main Hospitals in Yemen. Eastern Mediterranean Health Journal, 2011; 17(10): 730-737.
5. Al-Khatib, I. A., Al-Qaroot, Y. S & Ali-Shtayeh, M. Management of Healthcare Waste in Circumstances of Limited Resources: A Case Study in the Hospitals of Nablus city, Palestine. Waste Management & Research, 2009; 27(4): 305-12.doi: 10.1177/0734242X08094124
6. Association of National Health Occupational Physicians, Immunization of Healthcare Workers Guidelines, 2004. Available at: www.anhops.org.uk/guidelines.asp
7. Bathala, L. R., Sangur, R., Mahajan, T., Chawla, P. S., Mehrotra, A., & Singhal, P. (2015). Bio-medical Waste Disposal"- A Survey to assess the Knowledge, Attitude and Behaviour among Dental Personnel in Kanpur City, (U.P.), India. © 2015 IJSRST, 2015; 1(2). Print ISSN: 2395-6011.
8. Brink, H. Fundamental of Research Methodology for Health Care Professionals (2nd ed). Cape Town: Juta, 2010.
9. Brink, H., Van Der Walt, D., & Van Rensburg G. Fundamentals of ResearchMethodology for Health Care Professionals. Cape Town: Juta and company LTD, 2006.
10. Burns, N, & Grove, S. K., Understanding Nursing Research 3rd ed. Philadelphia: Saunders, 2011.
11. Chaudhary, N., Mahato, S., K. & Bahatia, B., D. (2014). Biomedical Waste Management in Nepal: A

review. Journal of Universal College of Medical Sciences, 2014; (2)4,8: 46.
12. De Vos, A.S., Strydom, H, Fouche, C.B., & Delport, C.S.L. Research at Grass Roots: For the Social Sciences and Human Services Professional. Pretoria: Van Schaik, 2006.
13. De Vos, A. S., Strydom, H., Fouche, C.B., & Delport, C.S.L. Research at Grass Rootsfor Professions. 4rth ed. Pretoria: Van Schaik Publishers, 2011.
14. Elnour, A., M, Moussa, M. M. R., El-Borgy, M. D., Fadelella, N. E. E. & Mahmoud, A. H. (2015). Impacts of health education on knowledge and practice of hospital staff with regard to Healthcare waste management at White Nile State main hospitals, Sudan. International Journal of Health Science, 2015; 9(3): 315–331. PMCID: PMC4633195.
15. Engelkirk, G.P., & Dube- Engelkirk, J. Burton's Microbiology for the Health Siences. (9thed.) Philadelphia: Lippincott Williams & Wilkins, 2011.
16. Enwere, O., O. & Diwe, K., C. Knowledge, Perception and Practice of Injection Safety `and Healthcare Waste Management among Teaching Hospital Staff in South East Nigeria: An Intervention Study. Pan African Med Journal, 2014; 17: 218. doi: 10.11604/pamj.2014.17.218.3084.
17. Gaye, S., Semra, C., Ergun, N. & Osman, Survey of Hospital Waste Management of Selected Hospitals in Samsun, Turkey. Environmental Engineering & Management Journal, 2015; 14(10): 2427-2433.
18. Grove, S.K., Burns, N., & Gray, J.R. The practice of nursing research: Appraisal, synthesis, and generation of evidence (7th Ed.). China: Saunders Elsevier, 2013.
19. Gulilat,K. & Tiruneh,G. Assessment of Knowledge, Attitude and Practice of Health Care Workers on Infection Prevention in Health Institution. Ethiopia: Bahir Dar city, 2014; 2(5): 384-393. doi: 10.11648/j.sjph.20140205.13.
20. Gupta, S. S., Singh, K. S., Parvinder, S. Gulpreet, Navneet, & Singh, A. G. Tostudy Biomedical Waste Awareness among Private Practitioners in Amritsar Region. Indian Journal of Comprehensive Dental Care, 2015; 5(1): 542-545.
21. Hakim, S.A., Mohsen, A &Bakr, I. Knowledge, Attitudes and Practices of Health-CarePersonnel towards Waste Disposal Management at Ain Shams University Hospitals, Cairo, 2014; 20(5): 347-354.
22. Hasheela, R. Municipal Waste Management in Namibia: The Windhoek Case Study.Universidad Azteca: Mexico, 2009.
23. Haylamicheal, I. D., & Desalegne, S .A. A review of legal framework applicable for the management of healthcare waste and current management practices in Ethiopia. Epub, 2012; 30(6): 607-18. doi: 10.1177/0734242X11419891.
24. Herron,W.(2014).The Importance of Waste Segregation. Available at: http://www.rapidwasteanddisposal.ca/importance-waste-segregation/.
25. Intrnational Student's Edition.
26. Hossain, M.S., Rahman, N.N., Balakrishnan, V., Puvanesuaran, V.R., Sarker, M. Z., & Kadir, M.O. Infectious risk assessment of unsafe handling practices and management of clinical solid waste. Int J Environ Res Public Health, 2013; 10(2): 556-67. Doi: 10.3390/ijerph10020556.
27. Jena, B., & Nayak, P., L. Awareness about Bio-Medical Waste Management among Health Care Personnel. Middle-East Journal of Scientific Research, 2014; 21(9): 1590-1594. doi: 10.5829/idosi.mejsr.2014.21.09.21732.
28. Joshi, H., D. Health Care Waste Management Practice in Nepal. J Nepal Health Res Counc, 2013; 11(23): 102-8.
29. Kanwar, V., Sood, A., Gupta, P., K. & Salaria N. Knowledge Regarding Infection Control Practices among Nurses in Rural Public Health Settings: An Emerging Public Health Concern in India. IJHSR, 2015; 5(2): 282-287.
30. Kishore, J., Agarwal, R., Kohli, C., Sharma, P. K., Kamat, N. V. & Tyagi, S.C. Status of Biomedical Waste Management in Nursing Homes of India, Delhi, 2014; 8(3): 56–58. doi: 10.7860/JCDR/2014/7630.4106. PMCID: PMC4003686.
31. Kotwal, A., & Taneja, D.K. Health Care Workers and Universal Precautions: Perceptions and Determinants of Non-compliance. Indian J Community Med., 2010; 35(4): 526–528. PMC3026136.
32. Kumar, M., Singh, R., K, Kumesh, R & Rawat, V. Awareness and Practices about Bio-medical Waste among Health Care Workers in Tertiary Care Hospital of Haldwani, Nainital. National Journal of Medical Research, 2015; 5(1): 47.
33. Kumar, R., Khan, E.A., Ahmed, J., Khan, Z., Magan, M., & Mughal M.,I.et all Healthcare Waste Management in Pakistan: Current Situation and Training Options. J Ayub Med Coll Abbottabad, 2010; 22(4): 101-5.
34. Kumar, R., Shaikh, B.T., Somrongthong, R & Chapman, R.S Practices and Challenges of Infectious Waste Management: A Qualitative Descriptive study from Tertiary care Hospitals in Pakistan. Pakistan Journal Medical Science, 2015; 31(4): 795-798. doi: 10.12669/pjms.314.7988.
35. Kumar, R., Somrongthong, R. & Shaikh, B.T. Knowledge, Attitude and Practices of Health Staff regarding Infectious Waste handling of Tertiary Care Health Facilities at Metropolitan City of Pakistan, 2013; 25(1-2): 109-12.
36. Kumar, R., Somrongthong, R. & Shaikh, B.T. Effectiveness of Intensive Healthcare Waste Management Training Model among Health Professionals at Teaching Hospitals of Pakistan: a Quasi-Experimental Study. BioMed

Central Health Services Research, 2015; 15(81). doi: 10.1186/s12913-015-0758-7.
37. Kyle, M. J., González, M.L., Lourdes, D.,Gamero, M.,Relyea, G., & Luque, L.E. et all. Improving Waste Segregation while reducing costs in a Tertiary-Care Hospital in a Lower Middle-Income Country in Central America. Waste Management & Research, 2013; 31(7): 733-738.doi: 10.1177/0734242X13484192
38. Lakbala, P. & Lakbala, M. (2013). Knowledge, Attitude and Practice of Hospital Staff Management. 31 (7),729-732.doi:10. 1177/0734242x13484190.
39. LoBiondo-Wood, G., & Haber, J. Nursing research: Methods and critical appraisal for evidence-based practice (7th ed.). China: Elsevier, 2010.
40. Madhukumar, S., & Ramesh, G. Study about Awareness and Practices about Health Care Wastes Management among Hospital Staff in a Medical College Hospital, Bangalore. Iranian Journal of Basic Medical Sciences, 2012.
41. Malini, A., & Eshwar, B. Knowledge, Attitude and Practice of Biomedical waste management among health care personnel in a tertiary care hospital in Puducherry. International Journal of Biomedical Research, 2015; 6(3): 172-176.
42. Manchanda, K., Fotedar, S., Dahiya, P., Vats, A., De Sarkar, A. & Vats, A., K. Knowledge, Attitude, and Practices about Biomedical Waste Management among Dental Healthcare Personnel in Dental Colleges in Himachal Pradesh: A Cross Sectional Study, 2015; (6)3: 166-169. doi: 10.4103/0976-433X.156215.
43. Martins, A., Coelho, A.C., Vieira, M., Matos, M., & Pinto, M.L. Age and Years in Practice as Factors Associated with Needlestick and Sharps Injuries among Health Care Workers in a Portuguese Hospital, 2012; 47(11). doi:10.1016/j.aap.2012.01.011.
44. Matheson, J., L. The Voice Transcription Technique: Use of voice recognition software to transcribe digital interview data in a qualitative research. The Qualitative Report, 2007; 12(4): 547-560.
45. Mbongwe, B., Mmereki, B.T., & Magashula, A. Healthcare Waste Management: Current Practices in Selected Healthcare Facilities, Botswana. Epub, 2008; 28(1): 226-33.
46. Ministry of Health and Social Services. Annual Calendar, 2016. Available at: http://www.mhss.gov.na/#.
47. Ministry of Health and Social Services. (2011). Integrated Health Care Waste Management Plan. Windhoek, Government Printers.
48. Ministry of Health and Social Services. (2010). Infection Prevention Control Guidelines. Windhoek, Government Printers.
49. Mir, M. R., Ahamad, J., Ahamad, A. & Jan, R. Knowledge, Attitude and Practices about Biomedical Waste Management among Nursing Professionals of SKIMS Medical College Hospital Bemina-A Cross Sectional Study. IOSR Journal of Nursing and Health Science, 2013; 1(5): 47-48.
50. Nema, S. & Singh, A. Awareness and Practices about Health Care Waste Management among Hospital Staff of a Medical College Hospital in Bhopal, Central India. International Journal of Recent Advances in Multidisciplinary Research, 2015; 2(7): 0518-0521.
51. Nemathaga, F., Maringa, S. & Chimuka, L. Hospital Solid Waste Management Practices inLimpopo Province, South Africa: A case study of two hospitals. Waste Management, 2008; 28(7): 1236-45.
52. Nkonge, N. A., Mayabi. O. A, Kithinji, J. & Magambo, K.J.(2012). Knowledge, Attitude and Practice of Health-care Waste Management and Associated Health Risks in the two Teaching and Referral Hospitals in Kenya, 2012; 37(6): 1172-7. doi: 10.1007/s10900-012- 9580-x.
53. Sanjeev, R., Kuruvilla, S., Subramaniam, R., Prashant, P.S, Gopalakrishnan, M. Knowledge, Attitude, and Practices about Biomedical Waste Management among Dental Healthcare Personnel in Dental Colleges in Kothamangalam: A Cross-Sectional `Study. An Open Access Peer Reviewed E-Journal, 2014; 2(1): 128-132.
54. Sengodan, V.C., & Amruth, K. H. Knowledge, Attitude and Practices Study on Biomedical Waste Management among Health Care Professionals and Paramedical Students in a Tertiary Care Government Hospital in South India, 2014; 3(11).
55. Sharma, A., Sharma,S., Sharma, V., & Singh, P. Awareness of Biomedical Waste Management among Health Care Personnel in Jaipur, India. Oral Health and Dental Management, 2013; 12(1): 32.
56. Sharma, S., & Chauhan, S.V.S. Assessment of Bio-Medical Waste Management in Three Apex Government Hospitals of Agra. Journal of Environmental Biology, 2008; 29(2): 159-162.
57. Singh, G.P, Gupta, P., Kumari, R., & Verma, S.L. Knowledge, Attitude and Practices Regarding Biomedical Waste Management among Healthcare Personnel in Lucknow, India . Indian Journal of Clinical Practice, 2014; 24(9).
58. Suchitra, J.B., & Devi, N.L. Impact of Education on Knowledge, Attitudes and Practices among various Categories of Health Care Workers on Nosocomial Infections. Indian Journal of Medical Microbiology, 2007; 25(3): 181-187. Doi: 10.4103/0255-0857.34757.
59. Supervisory Visit Report (unpublished report), (2014). Intermediate Hospital Katutura and Windhoek Central Hospital, 2014.
60. Timothy,M. Selecting Studies for Systematic Review: Inclusion and Exclusion Criteria. The University of Texas-Pan American, Edinburg, 2006; 33: 21–27.

61. Tulchinsky, H.T & Varavikova, A.E. The New Public Health. (2nd ed.) London: Elsevier Academic Press, 2009.
62. Van Dyk, A. (2008). Research Methodology in Health Sciences, University of Namibia Centre for External Studies, Windhoek.
63. Welman,C., Kruger, F., & Mitchel, B. (2005). Research Methodology, Inc ISBN-1932159509, Cape Town, South Africa: J. Ross.
64. WHO, (2015). Health care waste. Available from: http://www.who.int/topics/medical_waste/en/.
65. WHO, (2009). Instructions for Data-entry and Data-analysis using Epi Info.
66. WHO, (2014). Safe Management of Wastes from Health- Care Activities. (2nd.ed). Available at: http://www.searo.who.int/srilanka/documents/safe_management_of_wastes_from_healthcare_activities.pdf.
67. WHO, (2015). Water, sanitation and hygiene in health care facilities. Status in low- and middle-income countries and way forward. Available at: http://apps.who.int/iris/bitstream/10665/154588/1/9789241508476_eng.pdf.
68. Zhang, H.J., Zhang, Y.H., Wang, Y.,Yang, Y. H., Zhang, J., Wang, Y.L. et.al. Investigationof Medical Waste Management in Gansu, Province, China. Waste Management & Research:The Journal of the International Solid Wastes and Public Cleansing Association, 2013; 31(6): 6559.doi: 10.1177/0734242X13482161.
69. Khazaee, Manoochehr, Amir Hossein Hamidian, Mohmmad Taheri, Touran Babakan, Ali Mashoof, and A. Khazaee. "Assessment of medical waste management in Karaj hospitals, Iran." Inter Res J App Basic Sci 9, no. 10 (2015): 1750-57.