



**NEAR EAST UNIVERSITY
INSTITUTE OF GRADUATE STUDIES
DEPARTMENT OF NURSING**

**THE KNOWLEDGE, ATTITUDE AND PRACTICE OF HEALTH
WORKERS REGARDING MEDICAL WASTE MANAGEMENT**

M.Sc. THESIS

Leyla AHMED HASSAN

**Nicosia
February, 2022**

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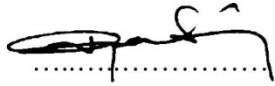
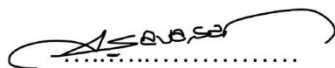
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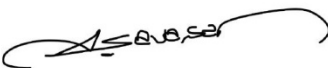
Approval

We certify that we have read the thesis submitted by Leyla AHMED HASSAN titled **“The Knowledge, Attitude and Practice of Health Workers regarding Medical Waste Management”** and that in our combined opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Educational Sciences.

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Declaration

I hereby declare that all information, documents, analysis and results in this thesis have been collected and presented according to the academic rules and ethical guidelines of Institute of Graduate Studies, Near East University. I also declare that as required by these rules and conduct, I have fully cited and referenced information and data that are not original to this study.

Leyla Ahmed Hassan

10/02/2022

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Firstly, I would like to thank Allah (SWT) who gave me the ability to perform and done this project thesis, Allah is the only one who eases and responsible the way to success.

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Leyla Ahmed Hassan

Abstract

The Knowledge, Attitude and Practice of Health Workers regarding Medical Waste Management

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The goal of this study was to evaluate the knowledge, attitude and practice of medical waste management among health workers. This cross-sectional and descriptive study was conducted at two referral hospitals in Mogadishu-Somalia between May 2021 and January 2022. The study included 150 health workers who had above 6 months of experience in hospital and who accepted to participate to the study. Data were collected using by the questionnaire consisted of questions on socio-demographic characteristics of participants and multiple-choice questions to assess knowledge, attitude and practices of health workers towards medical waste management. Chi-Square statistical test was used in data analysis. The results showed that the majority of respondents (55.3%) were female, 47.3% were nurses, 24.7% were 49 years old and over, 80.7% had 2 years and over work experience, and 57.3% had participated in 2 or 3 training regarding medical waste management. The rate of health workers who know the definition of medical waste was 94%. The majority of them (55.3%) stated that they 'sometimes' separated the biomedical wastes according to their types at the point of generation. The majority of those who stated that waste management was an important problem were in the age group 49 and over. The majority of those who felt responsible for medical waste management were nurses. Among those who felt responsible for medical waste management, those with 6-10 years of experience came to the fore. It is recommended that the hospitals managers to advance the supervision and control to the personnel for practicing the procedures on medical waste management.

Keywords: Medical waste, health workers, medical waste management

Özet

Sağlık Çalışanlarının Tıbbi Atık Yönetimine İlişkin Bilgi, Tutum ve Uygulamaları

Ahmed Hassan, Leyla

Yüksek Lisans, Hemşirelik

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Bu çalışmanın amacı, sağlık çalışanlarının tıbbi atık yönetimine ilişkin bilgi, tutum ve uygulamalarını değerlendirmektir. Bu kesitsel ve tanımlayıcı çalışma, Mogadişu-Somali'deki iki sevk hastanesinde Mayıs 2021 ile Ocak 2022 tarihleri arasında gerçekleştirilmiştir. Çalışmaya 6 aydan fazla hastanede deneyime sahip ve araştırmaya katılmayı kabul eden 150 sağlık çalışanı katılmıştır. Veriler, katılımcıların sosyo-demografik özelliklerine ilişkin sorular ve sağlık çalışanlarının tıbbi atık yönetimine yönelik bilgi, tutum ve uygulamalarını değerlendirmeye yönelik çoktan seçmeli sorulardan oluşan anket kullanılarak toplanmıştır. Verilerin analizinde Ki-Kare istatistiksel testi kullanıldı. Sonuçlar, ankete katılanların çoğunluğunun (%55.3) kadın, %47.3'ünün hemşire, %24.7'sinin 49 yaş ve üzeri, %80.7'sinin 2 yıl ve üzeri iş tecrübesine sahip olduğunu ve %57.3'ünün tıbbi atık yönetimi konusunda 2 veya 3 eğitime katıldığını göstermiştir. Tıbbi atık tanımını bilen sağlık çalışanlarının oranı %94'dür. Çoğunluğu (%55.3) biyomedikal atıkları üretim noktasında türlerine göre 'bazen' ayırdıklarını belirtmiştir. Atık yönetiminin önemli bir sorun olduğunu belirtenlerin çoğunluğu 49 yaş ve üzeridir. Tıbbi atık yönetiminden sorumlu hissedenlerin çoğunluğu hemşirelerdir. Tıbbi atık yönetiminden sorumlu hissedenler arasında 6-10 yıllık deneyime sahip olanlar öne çıktı. Hastane yöneticilerinin tıbbi atık yönetimine ilişkin prosedürlerin uygulanması için personele yönelik gözetim ve denetimi geliştirmeleri önerilir.

Anahtar kelimeler: Tıbbi atık, sağlık çalışanları, tıbbi atık yönetimi

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List of Abbreviations

WHO - World Health Organization

MWM - Medical Waste Management

PPE - Personal Protective Equipment

CHAPTER I

INTRODUCTION

Medical waste states to all waste products at health care facilities, including clinics, hospitals, dentistry practices, blood bank, doctor's offices and veterinary clinics as well as medical investigation centers and laboratories (Adogu et al., 2014). According to certain international sources, medical waste is identified as a by-product of healthcare such as blood, body parts, sharps, chemicals medicines, radioactive elements and medical devices (Deress et al., 2018; Kagoma et al., 2012; WHO, 2018). It is classified into four: generated, infectious, hazardous and radioactive (Kagoma et al., 2012; Malsparo, 2015).

The negative medical waste management provides a high threat to nurses, physicians, technicians, cleaning staff, patients and hospital visitors. (Adogu et al., 2014). In addition inappropriately segregated waste increases the quantity of waste that is in particular treated, and may additionally have substantial have an impact the fee of disposal. The rising quantities of scientific wastes additionally motive massive public health and environmental hassle worldwide. This state of affairs is worsened through unsuitable medical waste disposal procedures, inadequate of physical sources, and deficiency of lookup on clinical waste management (Salman, 2015).

75% to 90% of the complete waste generated in health care services, are common waste which are no longer want specific processing and disposal. The 10 to 25% of those are hazardous waste which could be constituted through sharps (needles, lancets etc.), blood or body fluid, syringes, contaminated surgical implements, transport cups, used gloves and gauzes, plasters. It might also include expired drugs, different chemical substances and laboratory reagents. These variety of waste want unique processing and disposal in order to avoid public health threat even although operating theatre occupy a small vicinity of the hospital (Adogu et al., 2014; Kagoma et al., 2012).

Segregation of waste at source and the use of color-coding baggage for segregation is one of the most significant components of healthcare waste administration rule (Adogu et al., 2014). It is stated that between 20% and 70% of medical waste originates from a hospital's working room and that up to 90% of this waste is

inappropriately sorted and dispatched for pricey and unnecessary hazardous waste processing (Manyele and Lyasenga, 2010).

There are inadequate coaching of personnel, insufficient non-public protecting equipment and deficiency of know-how regarding the appropriate use of such equipment in African countries such as Mozambique, South Africa, Kenya, Swaziland and Tanzania. The studies expose that desirable scientific waste administration in sanatorium requires a committed waste management team, top administration, careful planning, excellent organization, enough funding and full participation by a professional team of workers (Awodele et al., 2016).

Safe disposal and following destruction of clinical waste is an important step in reducing the risk of disease or damage from contiguity with this potentially dangerous fabric, as well as contributing to environmental contamination prevention (Adogu et al., 2014). As it is noted underneath the bio-medical waste management guidelines 1998 that every health care issuer should have enough knowledge related to medical waste management and need to recognize right exercise of dealing with and disposal clinical waste (Ranu et al., 2016).

According to a research conducted by Hassan (2018) in Somaliland on waste management knowledge amongst health workers, the majority of employees live and work among medical trash, however the majority of those who work with medical waste are uninformed of the dangers that come with it (51.4%). Only 48.6% of the workers were aware of the consequences of not properly disposing of medical waste. Lack of knowledge; poor attitude and inefficient exercise towards ideal waste administration and negative implementation of the insurance policies are some of the elements influencing poor medical management in the healthcare facilities (Adogu et al., 2014).

Statement of the Problem

Methods of poor medical waste management such as segregation failure and color coding mistakes, could result in dangerous trash not only being disposal of improperly, but also in members of the public obtaining accession to such material (Holmes, 2009). Some health professionals were reported to be giving out red bags to clients after they were discharged from the hospital to take away their personal things

and clothes due to a deficiency of knowledge of the necessity of color code and segregation in medical waste management (Mbongwe et al., 2008). Sharps containers are frequently stored in less secure locations, which can lead to containers containing tools being scavenged and reused (Mochungong, 2010). When handled improperly, clinical waste poses a threat to hospital employees, municipal workers, rag pickers, the general public, and the environment (GoB, 2007).

Purpose of the Study

The goal of the study was to evaluate the knowledge, attitude and practice of medical waste management among health workers in selected public hospitals in Mogadishu, Somalia.

Research Questions

- What are the knowledge, attitude and practice of health workers regarding medical waste management?
- Is there any association between socio-demographic characteristics and the knowledge, attitude, practice of health workers regarding medical waste management?

Significance of the Study

In the pursuit of the aim of reducing health problems and eliminating possible human health dangers, healthcare services unavoidably generate medical waste, which can be hazardous to one's health (Pruss et al., 1999).

Healthcare waste has increased dramatically in recent decades due to rising population, the quantity and size of health institutions, and usage of disposal medical equipment according to (Mohee, 2005). Improper healthcare waste management has direct consequences for persons working in health institutions, the society and the environment (Goddu et al., 2007).

Despite the size of the problem, medical waste management practice and policies in many countries, particularly in developing countries are insufficient and need to be improved (Jang, 2011).

This study gives an overview of current clinical waste management techniques at public hospitals in Mogadishu, Somalia. The findings and recommendation from the study might be utilized to help assure appropriate medical waste management in healthcare institutions, which would reduce danger to health personnel, the society and the environment.

The study can aid government agencies and local governments in enhancing existing regulations and planning strategies to decrease the risks of incorrect medical waste disposal. This study's findings may allow public hospitals to solve identified deficiencies and strengthen proper clinical waste management through the ministry of health.

Limitations

This study was confined to only two public hospitals to examine the knowledge, attitude and practice in respect of waste management. Another limitation was the use of self-report to examine knowledge, attitudes and practice regarding medical waste management amongst health workers.

CHAPTER II

Literature Review

In this section we are going to give a review of the literature that guides this research. We will focus on the details about knowledge, attitude and practice regarding medical waste management in context of healthcare facilities.

Overview of Medical Waste Management

Medical waste is defined as any solid waste produced in hospital and health related research facilities as result of diagnosis, treatment or immunization (Akum, 2014). Medical waste states to all waste produced in healthcare or in diagnostic activities and classify medical waste into two type of medical waste which include municipal or general waste which occupy 75 % to 90 % of total waste produced in healthcare facilities and special waste which occupy the rest of 10 to 20% of hospital wastes (Elisabeth, 2011).

In addition Lee and Mears (2012) stated that medical waste are divided into two main categories including general and regulated waste, he defined general waste as daily household waste which cannot be hazardous to human beings and which are not require special disposal and processing, those waste including bio-degradable waste (cotton, paper, packaging materials, and rest of food) and non-bio-degradable waste which are plastic, soil, caps and tops. The same author also described regulated waste as hazardous or contaminated waste which can cause a potential health hazard to human beings and require special processing and disposal, including infectious, pathological and chemical waste, sharps, pharmaceuticals, and radioactive materials.

However Ola-adisa et al. (2015) differentially classified medical waste into two main categories liquid waste and solid waste, and describe that liquid waste consist of biological wastes which consist of blood, excreta, and body liquid, chemical waste which include of solutions and inorganic salts, expired medicine and radioactive waste including wastes from radiology. Solid wastes are defined as waste which composed by perforating and cutting wastes, including needle, syringes, scalpels, broken glass phials

and nonperforating waste from treatment including dressings, plaster, faeces napkins, parts of the body, and organs like placentas, tissues and house type wastes.

In other hand, medical waste is classified into three categories: first category was general waste, which is same to domestic waste, including materials such as packing or waste paper. This kind of waste is generally innocuous and does not need special handling. The second category was hazardous healthcare wastes which include contagious waste (waste from patients with overly contagious diseases) and is characterized by a small volume of chemicals, pharmaceuticals, and unrecyclable pressurized containers. The third category which is sharps are extremely hazardous healthcare wastes, non-sharps waste that is very contagious, cholera patients 'stools, patients 'body secretions from severely infectious disorders, expired or undesired medications in huge quantities, substances that are harmful, wastes that is radioactive, wastes that are genotoxic, and wastes which are teratogenic (USAID, 2013).

To the Ministry of Health of Rwanda medical waste is classified into 7 categories including: Infectious waste, pathological waste, sharps waste, pharmaceutical waste, radioactive waste, chemical waste and nonhazardous general waste and these waste should be managed appropriately in order to prevent health risks associated (RWANDA MOH, 2016).

Medical waste management (MWM) is defining as all activities that taking part in the handling, storage, conditioning, treatment, transportation and dumping of medical waste in order to control infection spreading through medical waste in health facilities or in environment (OAG, 2014). Medical waste management has an important role in hospital cleanliness and infection control, therefore waste produced by health care institutions must be managed within the suitable and well recognized flow from their point of generation to their last disposal. This flow is composed of different stages that consist of waste generation, separation, collection, storage, transportation, and disposal (Ogbonna et al., 2012).

All types of medical waste must be managed through a series of procedures that include waste generation, segregation, transportation, storage, treatment and final disposal (Manyele & Lyasenga, 2010). Thareja et al. (2015) describe hierarchical way of MWM process which involves seven steps including minimization, source reduction,

reuse, recycling, energy recovery, treatment and disposal. Waste minimization is most favorable way used in medical waste management which may promote sustainable program; this step is composed by reduction at source, reuse, recycle, and compositing of medical waste.

Medical waste segregation steps at the point of generation is also very considerable in MWM process where medical waste should be separated according to their nature by using appropriate color coded plastic bag. In addition medical waste segregation aids waste minimization by lowering the quantity of biohazard waste created and increasing the amount of solid waste that can be managed cost effectively through recycling and composting (Amukugo et al., 2016).

According to Ministry of Health recommendation regarding medical waste management state that the colored bag should be inside in each medical waste collection bin and should be covered in order to prevent spillage of waste in the clinical area and during its transport, and MWM committee also should develop posters and put them on walls in wards, in hospital corridors and in any area where collection bin is located that can help in communication of the process of medical waste segregation and to orient health care providers, patient, cleaners and the visitors to put the waste in appropriate container (OAG, 2014).

According to WHO, color code plastic bag that recommended are yellow, red, brown, black and purple. WHO recommend that contagious waste should be in yellow bag ticked with international biohazard symbol, pathological or anatomical waste should be in red bag with international biohazard symbol, sharps waste should be in yellow container marked with “sharps”, pharmaceutical and chemical waste should be thrown in brown bag, and general waste should be in black bag, radio-active waste have to be in white bag marked with radioactive sign, and genotoxic waste in purple color bag (RWANDA MOH 2016).

Medical waste should not be permitted to build up at the generation area, they should be collected daily and taken to storage site, nursing or other members of the clinical team must ensure that the trash bag is properly packed and sealed at $\frac{3}{4}$ full, avoid staples when closing the waste bags, a sealed sharps container should be placed into yellow infectious labeled bag ,after removing the waste bag, is mandatory to replace

it immediately with the one of the same category, and the person in charge of waste bag supply should ensure that enough bags are supplied at least for 3 months and should avoid their stock out (Rwanda MOH, 2016).

Medical waste containers and sharps receptacles should be labeled by showing the source, generation date of rubbish, type and quantities of waste produced and international biohazard symbol where it's necessary (OAG, 2014). Medical waste should be stored after collection, in a cool environment for no more than 48 hours during the cold season and 24 hours during the hot season. Waste that is hazardous to the cell should be kept it apart from other medical trash away from other medical waste in secured area and containers should be used to store radioactive waste which prevent dispersion and labeled as required and infectious waste should be kept way from general waste (RWANDA MOH, 2016).

Before final disposal of infectious medical waste should be treated to minimize the risk of contamination. Therefore there are several ways of waste treatment including onsite medical waste treatment and offsite medical waste treatment. Onsite medical waste treatment is concerning the use of disinfection and autoclaving which are the preferred treatment method used now days. Autoclaving is mostly used on sharps and other infectious waste treatment; this is done in closed chambers where both heat and pressure are used over a determined period of time to destroy all the pathogenic agents that may be present in medical waste before final disposal. This method is cheap and it has a capacity to process up to 90% of waste. It is easily scaled to meet the needs of any medical institution (Salman, 2015).

The same as a microwave heat treatment system, is method used to decontaminate medical waste at the site of generation which consist of mixing of waste with a little water in order to make them slightly wet to facilitate best heat penetration and effective effect on pathogenic agent. Chemical Treatment is used decontaminate liquid medical waste at the point of generation before conducting them into sewer and the preferred product is breach. After onsite medical waste treatment, the waste can be disposed as noninfectious waste. However most of offsite medical waste disposal method is incineration and land disposal. Incineration is mostly used for pathological and pharmaceutical waste and can destroy about 99% of microorganism and it leave

minimal of them. Incineration of medical waste should be performed under control to make complete combustion in order to minimize any negative effects for the environment, and land disposal is used for disposal of decontaminated waste however a specialized landfill is used for disposal of infectious waste (Kim, 2016).

Knowledge toward Medical Waste Management

The knowledge of healthcare providers is very important to the best practice of waste management this help them, community, and environment to be safe from hazardous (Nagaraju et al., 2013). Furthermore Ola-adisa et al. (2015) discovered that stakeholder knowledge and practice play an essential role in MWM. In addition in the study done by Amukugo et al. (2016) found that waste segregation is a task of doctors, nurses, paramedical staffs that generate them even the cleaners who handle these waste are concerned and this task may be well accomplished when the concerned people have a positive knowledge and practice related to medical waste segregation. In the same study healthcare workers such as nurses, physicians, ward assistants and cleaners were examined on knowledge and practice regarding medical waste management and found that housekeeping staff including cleaners were less knowledgeable about waste segregation and disposal than nurses and doctors (Amukugo et al., 2016). Doctors, nurses and laboratory technicians were more educated about biomedical waste management than sanitary workers, according to a study on awareness, knowledge and practice of medical waste management. Laboratory personnel and nurses were found to have a superior understanding of color coding and waste separation than doctors (Pullishery et al., 2016).

However in the study done by Adogu et al. (2014) found that knowledge of participant was poor toward waste management and this lead to poor practice of waste management. According to study conducted in Indian North Bengal Medical College by Das (2016), found that only 6.6% of participant knew about five color coding of plastic bag used for medical waste segregation including red, black, yellow and blue color. Lack of knowledge toward MWM practices has negative impact on medical waste management's methods implementation in a study conducted in Magalore, it was discovered that 68 participants (43.31%) agreed that their healthcare setting provides

annual education on biomedical waste management, while 57 participants (36.3%) said their healthcare setting does not provide any education. The same study also revealed that the sanitary staffs who handle medical wastes are completely unannounced of the dangers (Pullishery et al., 2016).

Practice to Ward Medical Waste Management

Good practice of medical is very important in environmental cleaning and health hazard prevention. However study done on MWM practices among health workers in health facilities of Gondar, Northwest Ethiopia found that all surveyed health facilities did not have proper and sufficient color coded containers and plastic bags for medical wastes collection, waste bin was not labeled and all visited health facilities didn't have waste management guidelines in one of health center (Muluken et al., 2013). In the study by Akum (2014) found that 86.67% responded that waste is not separated before disposal in the larger storage containers while 13.33% indicated that the waste is separated before disposal. Majority of participants from the various department said that wastes from the several health care units are disposed into the large storage containers without segregated.

According to observation study done in Indian North Bengal Medical College revealed that in each and every ward visited there was posters and guidelines in working areas except in the radiotherapy ward and author highlighted that even though the posters was available there was some medical waste containers which was lacking the posters like on red color code and the others was not well printed which lead to poor medical waste segregation (Das, 2016).

In study done by Pullishery et al. (2016), related to awareness, knowledge and practice on MWM among nurses, doctors, laboratory technicians, and sanitary personnel in Mangalore city revealed that 70.6% of the participants agreed that contagious waste is not labeled with the biohazard sign. It was found that in medical waste treatment method sterilizing (67%) was the most extensively utilized medical waste treatment procedure in health facilities, followed by burning (51%), incineration (46%), segregation (37%), and deep burial (21%) (Pullishery et al., 2016).

Furthermore a study conducted in Indian North Bengal Medical College found that 50% of the observation during day duty staffs placed the infected medical wastes in the disinfectant solution hypochlorite (1%) as indicated by the BMW rules 1998 and their give priority to disposal of the sharps. However further study done in Indian found that human anatomical waste and animal waste are incinerated or disposed in deep burial, microbiology and biotechnology waste are treated by local autoclaving and incineration, sharps are treated by autoclaving and disinfection, discarded medicines and cytotoxic drugs treated by incineration and landfill disposal, solid waste contaminated with blood, and body fluids are treated by incineration and autoclaving, and wastes composed from disposable items other than the waste sharps such as catheters, tubing, IV set are treated by autoclaving and disinfection, liquid waste treated by disinfection and discharge in drains, incineration ash are disposed in landfill, and chemical waste are treated by chemical treatment and discharge into drains for liquids and secured landfills for solids (Thareja et al., 2015).

Factors influencing medical waste management

A variety of factors can influence waste management procedures in healthcare institutions, age, profession, experience year, overtime working hours in a day, no presence of color coding labeled containers are the key factors that affect medical waste management (Mesfin et al., 2014).

In addition in Indian lack of coordination, medical waste management committee, operation strategy, deficiency of awareness and training toward MWM, lack of pressure and lack of appropriate equipment was founded as major challenge against medical waste management (Muduli & Barve, 2012). WHO (2018) states that deficiency of awareness about the health hazards related to healthcare waste, insufficient training in proper MWM, lack of waste management and disposal systems, inadequate financial and human sources and the low priority given to the matter are the most common problems connected with medical waste and lack of proper regulations, or do not enforce them in many countries.

CHAPTER III

Methodology

Research Design

The study was a cross-sectional and descriptive study design.

Participants/Population and Sample

The study was carried out on two referral hospitals which are located in Mogadishu including Medina Police Constrain hospital (MPFH), and Demartino Public hospital (DPH), between May and August 2021. The population of the study was all health workers including nurses and surgeons, anesthesia technician, health care assistant, and cleaners who are operating at two public hospitals. In this study a formula established by Yamane was used to calculate a sample size, this formula is based on confidence level of 95% and P value of 0.05. Therefore, a total number of 150 respondents were calculated from the total population of 240 by using Yamane's formula (Israel, 1992; Polonia, 2013, p8). The detail of calculation is shown in table

$$n = \frac{N}{1 + N(e)^2}$$

N= Population size (240)

e =acceptable sampling error (0.05)

n = population sample (150)

The study included nurses, anesthesia providers, health care assistant, cleaners and medical doctors who worked in two referral hospitals in Mogadishu, who had above 6 months of experience in hospital and who accepted to participate to the study.

Data Collection Tools/Materials

The data was collected through the questionnaire which made up by the following sub-groups: A) Questions to deal with demographic information of the participants (age, gender, education, etc), B) knowledge and attitude regarding MWM

and C) practices regarding MWM. The questionnaire consisted of 48 questions prepared based on the literature (Hassan, 2018; Wafula et al., 2019; Behnam et al., 2020) (Appendix A).

The questionnaire was applied to 10% of the study population who were not included in the study. According to the pilot survey, the content of the questionnaire was modified.

Data Analysis Procedures

The Data was analyzed using in Statistical Package for Social Sciences (SPSS version 20). Descriptive statistics were performed to report on both demographics information, the levels of knowledge, attitude and practice of MWM. The analysis using Chi-Square statistical test was performed to report on possible relationships between knowledge, attitude, and practice and demographics information. p value was set at <0.05 with a confidence interval of 95%.

Study Plan

The participants met with the researcher morning before starting their work and during their break time. The researcher explained to them briefly about objective and significance of the study and gave them the consent form to sign and informed that they can withdraw at any time if their want. Then the questionnaires administered to every participant who are allowed to respond during the time he/she needs. The respondents were allowed to ask questions to researcher. Before completing questionnaires, the respondents were ensured about the privacy and confidentiality of their information, after completing the questionnaires researcher collected them and thank the respondents.

Ethical considerations

Permission and approval to conduct to the study was sought from Near East University Health Sciences Ethics Committee (Appendix B). Permissions were sought from administration of Medina Police Constrain hospital, and Demartino Public hospital (Appendix C, D).

The researcher gave the consent form to the participants to sign before data collection. They were informed that they can withdraw at any time if necessary and that their names were not being mentioned on the study, the participation was voluntary. Hard copies of data collected were kept in a locked cupboard and soft copies in password controlled computer without have access to anyone except the researcher and her supervisor.

Chapter IV

Findings

Table 1.

The study Participants' Socio-demographic Data

Variables	n	%
Age		
<30	35	23.3
31-36	32	21.3
37-42	29	19.3
43-48	17	11.3
>49 years	37	24.7
Gender		
Female	83	55.3
Male	67	44.7
Marital Status		
Divorce	7	4.7
Married	100	66.7
Separated	7	4.7
Single	36	24.0
Level Education		
University	59	39.3
Postgraduate	85	56.7
Others	6	4.0
Professional		
Nurse	71	47.3
Doctor	61	40.7
Laboratory technologist	8	5.3
Supportive staff	10	6.7
Work Station		
Obstetrics and Gynaecology unit	46	30.7
Medical/Pediatrics unit	29	19.3
Clinical laboratory	8	5.3
Surgical unit	51	34.0
Outpatient Clinic	10	6.7
Others	6	4.0

Years of Experience		
6 months-1 year	29	19.3
2-5 years	34	22.7
6-10 years	53	35.3
>10 years	34	22.7

As above table shown in the above, nearly 25% of the respondents were over 49 years old. More than 50% of the participants were female while the rest were male. According to the marital status, more than 60% of surveyors were married status. In educational level of the respondents, over 50% of them have postgraduate level that means that they have speciality. Almost 50% of the respondents were nurse professionals. More than 30% of the respondents had work experience for 6 to 10 years.

The Knowledge, Attitude and Practice of Health Workers Regarding MWM

Table 2.

The study Participants' Knowledge regarding Medical Waste Management

Variables	n	%
Knowing about medical waste		
Yes	148	98.7
No	2	1.3
Knowing the definition of medical waste		
Any waste that results from the treatment, diagnosis, immunization of humans at hospitals, and in health-related research facilities	141	94.0
Materials that may be poisonous, toxic, or flammable and do not pose disease-related risk	8	5.3
Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood	1	0.7
Knowing the type of waste that is segregated from general waste stream		
Chemical Waste	82	23.9
Pathological Waste	71	20.7
Infectious Waste	69	20.1
Sharps	65	19.0
Pharmaceutical Waste	56	16.3
Knowing type of labelling and color-coding is used for marking segregated waste		
Yellow	140	19.9

Black	138	19.6
White	138	19.6
Red	139	19.7
Blue	149	21.2
Knowing adequate disposal procedures of expired blood units and by-products waste		
Yes	124	82.7
No	26	17.3
Knowing adequate disposal procedures of human tissue remains		
Yes	122	81.3
No	28	18.7
Knowing adequate disposal procedures of expired medicines		
Yes	145	96.7
No	5	3.3

The above table 2 describes the question asked related to their knowledge about medical waste, almost 99% stated that they have known what the medical waste was. However, 94% of the respondents described the medical waste as any result from treatment, diagnosis, immunization of human at hospitals and in health related research facilities and 5.3% mentioned that the waste may be poisonous, toxic, or flammable and do not pose disease related risk while the rest pointed that waste is saturated to the point of dripping with blood or body fluids contaminated with blood. Approximately 95% percent of surveyors mentioned that exist defined procedure for the collection of waste for units in the hospital. According to type of waste, more than 23% of the respondents were told that chemical waste is a sort of waste that is separated from general waste stream followed 20.7% who mentioned pathological waste, 20.1% infectious waste, 19% sharps and the last 16.3% was pharmaceutical waste. 149 out of 150 of the respondents chose that Blue is type, labeling and color coding is used for marking segregated waste, next to Yellow color 140 out of 150 followed by red and the last are black and white colors. When questioned about proper disposal procedures for out of date blood units and by-products waste, 124 out of 150 participants said that yellow is the best option. 122 out of the 150 of the respondents were answered that yellow is a disposal of human tissue remains. 145 out of the 150 answered that they know adequate disposal procedures of expired medicines.

Table 3.

The study Participants' Awareness regarding MWM

Variables	n	%
Presence of procedures for the collection of waste for specified units in the hospital		
Yes	150	100.0
Presence of department responsible for waste available within hospital management		
Yes	150	100.0
Attending training on waste management		
Yes	147	98.0
No	3	2.0
Number of trainings attended on waste management		
2-3 trainings	86	57.3
>3 trainings	48	32.0
1 training	13	8.7
No	3	2.0

In the Table-3, all of the respondents emphasized that their hospitals have a department responsible for wastes. In training status of the staff of the hospital, most of them 147 out of 150 told that they attend training. When they were asked number of training they attended, 87 out of 150 respondents stated to attend average of 2 to 3 trainings.

Table 4.

The study Participants' Attitude regarding MWM

Variables	n	%
Reason for importance of medical waste management		
infection control only	107	34.7
hygiene purpose only	97	31.5
hazards and disease prevention only	104	33.8
Importance of medical waste management		
Yes	140	93.3
No	1	0.7
Not Sure	9	6.0
Seeing medical waste management as a serious problem		
Yes	135	90.0
Not Sure	15	10.0

Necessity of strict implementation for proper waste management		
Yes	139	92.7
Not Sure	10	6.7
No	1	0.7
Necessity of teamwork for waste management		
Agree	131	87.3
Disagree	6	4.0
Don't know	13	8.7
Knowing importance of availability of specialized waste-workers		
Yes	132	88.0
Not Sure	16	10.7
No	2	1.3
Rating the importance of hospital waste handling		
Very important	107	71.3
Not important	3	2.0
Important	40	26.7
Feeling responsible for waste management		
Very much	135	90.0
Very little	9	6.0
Not at all	6	4.0
Believing throwing blood waste in domestic waste is an adequate disposal procedure		
Yes	123	82.0
Not Sure	21	14.0
No	6	4.0
Believing throwing of human tissue remains in domestic waste is an adequate disposal procedure		
Yes	101	67.3
Not Sure	40	26.7
No	9	6.0
Believing throwing expired medicines		
Yes	126	84.0
Not Sure	18	12.0
No	6	4.0

The above table 4, according to importance of medical waste management, 107 out of the 150 responded that this aimed is infection control. 140 out of the 150 answered that the waste management is important. 90% of the respondents were

mentioned that waste management is a serious problem while the rest answered not sure if its problem or not. 139 out of 150 respondents answered that strict implementation is needed to get for proper waste management. More than 87% of the participants were agreed the requirement teamwork for waste management. 132 out 150 pointed the importance of availability of specialized waste-workers. 71.3% of the respondents rated very much to their importance of hospital waste handling. 90% of the respondents mentioned that they felt their responsibility very much for hospital waste management. %82 of those polled feel that dumping blood waste in household waste is an acceptable method of disposal. 67.3% of respondents agreed that disposing of human tissue remains to household waste is a suitable method of disposal. 84% of the participants said they follow the procedure of throwing expired medicines.

Table 5.

Participants' Experiences and Practices Regarding MWM

Variable name	n	%
Affected by poor waste management		
Yes	127	84.7
No	23	15.3
Encountering any sharp/needle stick injury in the last 12 months		
Yes	100	66.7
No	50	33.3
Having injury with a used syringe		
Yes	4	2.7
No	146	97.3
Reporting injury to the authorities		
Yes	4	2.7
No	146	97.3
Presence of reporting procedure in the hospital		
Yes	130	86.7
No	20	13.3
Presence of medical waste user manual available in the hospital		
Yes	125	83.3
No	25	16.7
Use of personal protective equipment		

Nose masks	55	36.7
Clinical coats	48	32.0
Gloves	34	22.7
Other	13	8.7
Identifying need to sort medical waste during collection		
No	11	7.3
Yes	139	92.7
Labelling biomedical waste containers		
Yes	136	90.7
No	14	9.3
Segregating biomedical wastes according to their type at the point of generation		
Sometimes	83	55.3
Yes	66	44.0
No	1	0.7

In the Table 5, 127 out of 150 mentioned that they affected due to poor waste management for their entire life. Two-third of the respondents was mentioned that encountered any sharp or needle stick injury the last 12 months. 4 out of 150 of the respondents told that they injured with a used syringe. All of the respondents injured with a used syringe reported to their authorities. 86.7% of the respondents said that their hospitals have reporting procedure. 125 out of the 150 of the participants stated that medical waste user manual is available in their work place. Most of the respondents (36.7%) stated that they used mask as personal protective equipment (PPE).

More than 90% of survey respondents said they can spot the need to separate medical waste during collection. Majority of respondents (90.7%) told that they label biomedical waste containers. Most of the respondents (55.3%) stated that they segregate biomedical waste according to their type at the point of generation "sometimes".

Table 6.
The study Participants' Practices Regarding MWM

Variable name	n	%
Providing personal protection tools for workers		
Sometimes	103	68.7
Yes	45	30.0
No	2	1.3
Monitoring usage of personal protection tools		
Sometimes	89	59.3
Yes	54	36.0
No	7	4.7
Training workers in dealing with medical waste		
Sometimes	94	62.7
Yes	50	33.3
No	6	4.0
Supervising workers during waste collection		
Sometimes	92	61.3
Yes	50	33.3
No	8	5.3
Presence of adequate number of workers collecting waste		
Yes	133	88.7
No	17	11.3
Number of waste collections per day		
1-2 times	34	22.7
2-4 times	89	59.3
> 5 times	27	18.0
Type of containers used for collection and internal transport of the waste		
Containers	121	80.7
Vehicles	29	19.3
Where the segregated waste stored while awaiting removal from the hospital or disposal		
Tank	130	86.7
Vehicles	14	9.3
Dug	6	4.0

59.3% of respondents mentioned that they "sometimes" monitor usage of personal protection tools. Most of the respondents (62.7%) said that they train workers

in dealing with medical waste "sometimes". 61.3% of the respondents responded that workers were supervised during waste collection "sometimes". 88.7% of the respondents told that their hospitals have adequate number of workers collection waste. According to waste collection in the hospital per day, majority of respondents (59.3%) responded that the waste is collected 2-4 times. 80.7% of respondents said "container" is the type of container used for waste collection and internal transportation. 86.7% of respondents answered that the segregated waste is stored in a tank until it is removal from the hospital or disposal.

Association between Socio-Demographic Characteristics and the Knowledge, Attitude, Practice of Health Workers Regarding MWM

Table 7.

Distribution and Comparison of the Knowledge, Attitude, Practice of Health Workers Regarding MWM According to Age Groups

Variables	Age groups									
	<30		31-36		37-42		43-48		>49	
	n	%	n	%	n	%	n	%	n	%
Number of trainings attended on waste management										
1 training	8	5.3	2	1.3	1	0.7	0	0.0	1	1.3
2-3 trainings	20	13.3	15	10.0	12	8.0	11	7.3	29	19.3
>3 trainings	5	3.3	15	10.0	16	10.7	6	4.0	6	4.0
No	2	1.3	0	0	0	0	0	0	0	0
X² /p	36.057 / 0.000									
Importance of medical waste management										
Yes	26	17.3	32	21.3	28	18.7	17	11.3	37	24.7
No	1	0.7	0	0	0	0	0	0	0	0
Not Sure	8	5.3	0	0	1	0.7	0	0	0	0
X² /p	27.139 / 0.001									
Seeing medical waste management as a serious problem										
Yes	24	16.0	30	20.0	29	19.3	15	10.0	37	24.7
Not Sure	11	7.3	2	1.3	0	0	2	1.3	0	0
X² /p	25.749 / 0.000									
Encountering any sharp/needle stick injury in the last 12 months										
Yes	20	13.3	20	13.3	16	10.7	12	8.0	32	21.3
No	15	10.0	12	8.0	13	8.7	5	3.3	5	3.3

X² /p	10.061 / 0.039									
Reporting injury to the authorities										
Yes	0	0	0	0	0	0	0	0	4	2.7
No	35	23.3	32	21.3	29	19.3	17	11.3	33	22.0
X² /p	12.551 / 0.014									
Presence of reporting procedure in the hospital										
Yes	26	17.3	31	20.7	25	16.7	17	11.3	31	20.7
No	9	6.0	1	0.7	4	2.7	0	0	6	4.0
X² /p	10.415 / 0.034									
Segregating biomedical wastes according to their type at the point of generation										
Sometimes	23	15.3	21	14	20	13.3	5	3.3	14	9.3
Yes	12	8	11	7.3	9	6	11	7.3	23	15.3
No	0	0	0	0	0	0	1	0.7	0	0
X² /p	21.165 / 0.007									
Providing personal protection tools for workers										
Sometimes	25	16.7	22	14.7	24	16	14	9.3	18	12
Yes	8	5.3	10	6.7	5	3.3	3	2	19	12.7
No	2	1.3		0	0	0		0	0	0
X² /p	18.745 / 0.016									
Presence of adequate number of workers collecting waste										
Yes	27	18.0	31	20.7	28	18.7	16	10.7	31	20.7
No	8	5.3	1	0.7	1	0.7	1	0.7	6	4.0
X² /p	9.946 / 0.041									

The above table (Table 7) shows the relationship between age groups and knowledge, attitude, practice of workers regarding MWM. There were significant relationships between the age groups and importance of waste management, seeing waste management as a serious problem, encountered any sharp or needle stick injury the last 12 months, reporting to the authorities, segregating of biomedical wastes, providing personal protection tools for workers and adequate number of workers collecting waste ($p < 0.05$).

Table 8.

Distribution and Comparison of the Knowledge, Attitude, Practice of Health Workers Regarding MWM According to Education Levels

Variables	Education					
	University		Postgraduate		Others	
	n	%	n	%	n	%
Encountering any sharp/needle stick injury in the last 12 months						
Yes	33	22	65	43.3	2	1.3
No	26	17.3	20	13.3	2	2.7
X ² /p	9.736 / 0.008					
Presence of reporting procedure in the hospital						
Yes	45	30	80	53.3	5	3.3
No	14	9.3	5	3.3	1	0.7
X ² /p	9.659 / 0.008					
Presence of medical waste user manual available in the hospital						
Yes	47	31.3	76	50.7	2	1.3
No	12	8	9	6	4	2.7
X ² /p	13.634 / 0.001					
Labelling biomedical waste containers						
Yes	52	34.7	81	54	3	2.0
No	7	4.7	4	2.7	3	2.0
X ² /p	14.323 / 0.001					
Presence of adequate number of workers collecting waste						
Yes	50	33	81	54	2	1.3
No	9	6	4	2.7	4	2.7
X ² /p	22.899 / 0.000					

The above table (Table 8) shows the relationship between education levels and attitude, knowledge, practice of health workers regarding MWM. There were significant relationships between education levels and encountered any sharp or needle stick injury the last 12 months, have reporting procedure in the hospital, availability of medical waste user manual in the hospital, label biomedical waste containers, adequate number of workers collecting waste ($p < 0.05$).

Table 9.

Distribution and Comparison of the Knowledge, Attitude, Practice of Health Workers Regarding MWM According to Profession

Variables	Profession							
	Nurse		Doctor		Laboratory technologist		Supportive staff	
	n	%	n	%	n	%	n	%
Number of trainings attended on waste management								
2-3 trainings	42	28.0	36	24.0	3	2.0	6	4.0
>3 trainings	18	12.0	25	16.7	4	2.7	1	0.7
1 training	10	6.7	0	0	1	0.7	2	1.3
No	1	0.7	0	0	0	0	1	0.7
X² /p	21.321 / 0.011							
Importance of medical waste management								
Yes	64	42.7	61	40.7	6	4.0	9	6.0
No	0	0	0	0	0	0	1	0.7
Not Sure	7	4.7	0	0	2	1.3	0	0
X² /p	25.504 / 0.000							
Seeing medical waste management as a serious problem								
Yes	60	40	60	40	7	4.7	8	5.3
Not Sure	11	7.3	1	0.7	1	0.7	2	1.3
X² /p	8.285 / 0.04							
Feeling responsible for waste management								
Very much	63	42.0	58	38.7	8	5.3	6	4.0
Very little	5	3.3	1	0.7	0	0	3	2.0
Not at all	3	2.0	2	1.3	0	0	1	0.7
X² /p	14.727 / 0.022							
Presence of adequate number of workers collecting waste								
Yes	64	42.7	56	37.3	7	4.7	7	4.0
No	7	4.7	5	3.3	1	0.7	4	2.7
X² /p	8.939 / 0.03							

The above table (Table 9) shows the relationship between professions and attitude, knowledge, practice of health workers regarding MWM. There were significant relationships between professions and number of training, importance of waste management, seeing waste management as a serious problem, feeling responsible for hospital waste management, adequate number of workers collecting waste ($p < 0.05$).

Table 10.

Distribution and Comparison of the Knowledge, Attitude, Practice of Health Workers Regarding MWM According to Work Stations

Variables	Work station											
	Clinical laboratory		Medical/ Pediatrics unit		Obstetrics Gynecology		Surgical		Outpatient Clinic		others	
	n	%	n	%	n	%	n	%	n	%	n	%
Knowing description of medical waste												
Yes	8	5.3	29	19.3	45	30.0	51	34	10	6.7	5	3.3
No	0	0	0	0	1	0.7	0	0	0	0	1	0.7
X² /p	12.294 / 0.031											
Importance of medical waste management												
Yes	6	4.0	28	18.7	43	28.7	50	33.3	7	4.7	6	4.0
No	0	0	0	0	1	.7	0	0	0	0	0	0
Not Sure	2	1.3	1	1.7	2	1.3	1	0.7	3	2	0	0
X² /p	19.998 / 0.029											
Providing personal protection tools for workers												
Sometimes	3	2.0	18	12.0	31	20.7	5	3.3	7	4.7	39	26.0
Yes	4	2.7	11	7.3	15	10.0	1	0.7	2	1.3	12	18.0
No	1	0.7	0	0	0	0	0	0	1	0.7	0	0
X² /p	20.024 / 0.029											
Presence of adequate number of workers collecting waste												
Yes	6	4.0	26	17.3	43	28.7	3	2	8	5.3	47	31.3
No	2	1.3	3	2.0	3	2.0	3	2	2	1.3	4	2.7
X² /p	12.868 / 0.025											

The above table (Table 10) shows the relationship between work stations and attitude, knowledge, practice of health workers regarding MWM. There were significant relationships between work stations and knowing description of medical waste, importance of waste management, providing personal protection tools for workers, adequate number of workers collecting waste ($p < 0.05$).

Table 11.

Distribution and Comparison of the Knowledge, Attitude, Practice of Health Workers Regarding MWM by Years of Experience

Variables	year of experience							
	6 moths-1 year		2-5 years		6-10 years		>10 years	
	n	%	n	%	n	%	n	%
Knowing description of medical waste								
Yes	27	18.0	34	22.7	53	35.3	34	22.7
No	2	1.3	0	0	0	0	0	0
X² /p	8.458 / 0.037							
Number of trainings attended on waste management								
2-3 trainings	15	10.0	25	16.7	32	21.3	15	10.0
>3 trainings	1	0.7	7	4.7	21	14	19	12.7
1 training	11	7.3	2	1.3	0	0	0	0
No	2	1.3	0	0	0	0	0	0
X² /p	63.431 / 0.000							
Seeing medical waste management as a serious problem								
Yes	22	14.7	29	19.3	51	34	33	22.0
Not Sure	7	4.7	5	3.3	2	1.3	1	.07
X² /p	11.443 / 0.01							
Feeling responsible for waste management								
Very much	19	12.7	31	20.7	52	34.7	33	22.0
Very little	8	5.3	0	0	1	0.7	0	0
Not at all	2	1.3	3	2.0	0	0	1	0.7
X² /p	35.410 / 0.000							
Presence of reporting procedure in the hospital								
Yes	21	14.0	27	18.0	51	34.0	31	20.0
No	8	5.3	7	4.7	2	1.3	3	2.0
X² /p	11.437 / 0.01							
Providing personal protection tools for workers								
Sometimes	22	14.7	27	18.0	36	24.0	18	12.0
Yes	5	3.3	7	4.7	17	11.3	16	10.7
No	2	1.3	0	0	0	0	0	0
X² /p	16.315 / 0.012							
Training workers in dealing with medical waste								

Sometimes	17	11.3	28	18.7	29	19.3	20	13.3
Yes	8	5.3	4	2.7	24	16.0	14	9.3
No	4	2.7	2	1.3	0	0	0	0
X² /p	21.458 / 0.002							

The above table (Table 11) shows the relationship between year of experience and dependent variables of knowing description of medical waste, number of training attended in waste management, seeing waste management as a serious problem, feeling responsible for hospital waste management, reporting procedure, providing PPE for workers, training workers in dealing with medical waste. There were significant relationships between year of experience and knowing description of medical waste, number of training attended in waste management, seeing waste management as a serious problem, feeling responsible for hospital waste management, reporting procedure, providing PPE for workers, training workers in dealing with medical waste ($p < 0.05$).

CHAPTER V

Discussion

Discussion of the Knowledge, Attitude and Practice of Health Workers Regarding MWM

Majority of health workers (98.7%) stated that they know medical waste. But the rate of those who know the definition of medical waste was 94% (Table 2). Letho et al. (2021) stated that 98.5% of respondents had heard of medical waste and 69.7% were aware with MWM legislation. 82.7% of respondents said that they knew acceptable disposal procedures for out of date blood units and by-products waste in the current study. The rate of those who stated that they know sufficient disposal ways of human tissue remains was 81.3% (Table 2). On the other hand, 82% of those polled believed that dumping blood waste in the household waste is an acceptable method of disposal. In addition, 67.3% of respondents agreed that disposing of human tissue remains to household waste was a suitable method of disposal (Table 4). The rate of those who stated that they know adequate disposal procedures for expired medicines was 96.7% (Table 2). But, 84% of the participants said they follow the procedure of throwing expired medicines (Table 4). This difference between the knowledge and practices of health workers could be because of low coercion and monitoring in hospitals. An observational study conducted by Pandey et al. (2016) showed that 30% to 35% of respondents did not practice MWM. Rutayisire et al. (2019) found that 49% of workers had good knowledge about MWM and that the majority of them (66.5%) had poor practices towards MWM.

The majority of health workers said that they were able to recognize the necessity for medical waste separation during collection (92.7%) and labeled the biomedical waste containers (90.7%) (Table 5). According to a research, 68% of healthcare professionals knew that medical waste segregation is the most important step in waste management (Ilyas et al., 2020). Other study discovered that 82 percent of participants were aware of the various color-coded segregation bins (Parida et al., 2019). But, in the current study, the majority of health workers (55.3%) stated that they 'sometimes' separated the biomedical wastes according to their types at the point of generation (Table 5). Medical

waste segregation at the point of generation is critical in MWM process where medical waste should be separated according to their nature. All medical wastes should be segregated at the point of generation (Amukugo et al., 2016; Manyele and Lyasenga, 2010). In a study, it was found that 88.2% of healthcare professionals segregated medical wastes at the source of generation (Deress et al., 2018). Jalal et al. (2021) found that during the disposal of biomedical waste, 69.1% of healthcare personnel followed the color coding of containers according to the type of waste and that 73.1% had a favorable attitude towards MWM. According to another study, 53% respondents used color coding to segregate infectious waste and 55.5% segregated general waste from biomedical waste (Rutayisire et al., 2019).

The majority of the health workers (98%) participating in the study stated that they attended training in MWM. The majority of health workers (57.3%) stated that they attended the training 2 or 3 times (Table 3). Providing training for health workers for sufficient MWM is a very important. In this study, nearly all of the study participants were trained on MWM. This result is higher than other studies conducted (36.8%, 61.6%, 46.9%, respectively) (Deress et al., 2018; Uddin et al., 2014; Azage et al., 2013). Letho et al. (2021) found that 43.2% of the respondent attended training on waste management. It was stated that half of the respondents felt that up-to-date knowledge on biomedical waste management was imperative (Jalal et al., 2021). On the other hand, most of the respondents (62.7%) in the current study stated that they trained workers in dealing with medical waste "sometimes" (Table 6). Most of the participants (93.3%) were nurses, doctors and laboratory technicians. A study conducted by Mathur et al (2011) found that nurses, laboratory technicians and doctors had better knowledge than sanitary personnel regarding medical waste management and that sanitary staff were uninformed regarding practices related to MWM. Low level of knowledge can be due to poor training facilities and to low educational level of the sanitary staff members. A study of adherence to waste management guidelines among nurses and waste handlers found that nurses (82.7%) were more aware of waste management guidelines and segregating waste to prevent diseases than waste handlers (68%) and that nurses were more trained on MWM than waste handlers. Nurses' greater adherence to medical waste guidelines was attributed to their being more educated in MWM. It was also stated that

this meant that the training focused only on those who generate waste, not those who handle waste (Njue et al., 2015). Therefore it is important in terms of medical waste management that health workers provide training to sanitary personnel who do not have sufficient knowledge.

The majority of healthcare workers believed that medical waste management was an important (93.3%) and serious problem (90%). Akkajit et al. (2020) found that the rate of those who stated that medical waste segregation was important as 86.6% in their study. Letho et al (2021) conducted an observational cross-sectional study and found that 74.4% of participants were aware of MWM.

The rate of those who believed that strict implementation is necessary for proper waste management was 92.7% (Table 4). By following the appropriate MWM, the public's health must be protected against harmful impacts. It must be properly managed to avoid the risk of contamination and disease transmission (OAG, 2014; Ogbonna et al., 2012; WHO, 2018). Jalal et al. (2021) found that the majority of health workers (55.1%) believed that proper MWM raised the quality assurance of the healthcare sectors. Health workers participating in this study were aware of the importance of MWM. At the same time, in the current study most of health workers (90%) felt responsible 'very much' for waste management (Table 4).

Furthermore, 87.3% of the participants were agreed the requirement teamwork for medical waste management. 4% of the participants were disagreed. 8.7% of the participants stated that they did not know if it was required teamwork medical waste management. Deress et al. (2018) found that 58.1% participants agreed that MWM is an issue involving teamwork. In other study, it was found that 52.3% healthcare workers agreed that biomedical waste management required teamwork (Jalal et al., 2021). Albalushi et al. (2018) found that the highest percentage of nurses (92.7%) among health personnel agreed that biomedical waste management requires teamwork.

Only 2.7% of the respondents told that they injured with a used syringe. All of the respondents injured with a used syringe stated that they reported to their authorities (Table 5). In other study it was stated that about 23.3% cases occurred in the last 12 months and this high ratio of needle stick or sharp injury incidence could be due to the

deficiency of the appropriate personal protective equipment or deficiency of attention to the safety of the MWM (Deress et al., 2018).

Discussion of Association between Socio-Demographic Characteristics and the Knowledge, Attitude, Practice of Health Workers Regarding MWM

The majority of the health workers participating in the research received 2 or 3 trainings on medical waste management. It has come to the fore that the majority of those who receive training 2 or 3 times were in the age group of 49 and above (Table 7). It was an expected result that those in the age group of 49 and above should receive more training on medical waste management. It can be said that those aged 49 and over emphasized the importance of waste management. Likewise, the majority of those who stated that waste management was an important problem were in the age group 49 and over. Among the healthcare workers who were injured as a result of needle stick; all those who reported this to the authorities were in the age group of 49 and over (Table 7). A study carried by Rutayisire et al. (2019) found that only age group was associated with good practice of MWM and that older age group had more probable to implement good practice.

The majority of those who stated that there was a reporting procedure and a medical waste manual in the hospital were those who had postgraduate education (Table 8). It can be said that those with postgraduate education were more aware of medical waste management and procedures. In other study, there was a significant association between the level of knowledge on medical waste management and some characteristics, such as educational level and work experience (Jalal et al., 2021).

The majority of those who received 2 or more training in MWM were nurses and doctors. The majority of those who felt responsible for medical waste management were nurses (Table 9). The training they received on medical waste management may have affected the health workers' feeling of responsibility. In the study of Deress et al. (2018), it was found that the highest practice point was saved amongst midwives (92.6%). Other study stated that the highest sufficient practice point was amongst nurses (97.3%) followed by doctors (77.8%) (Ray et al., 2014). According to a study evaluating the knowledge, attitudes, and practices of health workers on MWM in the Covid-19

pandemic, nurses, respiratory therapists and doctors had a more positive attitude (Jalal et al., 2021).

The majority of those who knew the definition of medical waste were those working in surgical clinics. Likewise, the majority of those who stated that medical waste management is important were working in surgical clinics (Table 10). It can be said that the awareness of health workers working in surgical clinics about MWM was high.

All health workers with 2 years or more of experience knew the definition of medical waste (Table 11). It was showed that working experience and its duration were significant factors influencing good MWM practice. In addition, it was stated that duration of working experience in health workers was considered to be one of the most significant factors in good practice in respect of MWM. Health workers with longer working experience incline to have better management skills in point of MWM than those with less working experience (Akkajit et al., 2020). Furthermore, among those who felt responsible for medical waste management, those with 6-10 years of experience came to the fore. Also, among those who stated that they trained workers on medical waste management, those with 6 years or more of experience came to the fore (Table 11).

It was found that healthcare workers with 6 or more years of experience received 2 or more trainings on medical waste management (Table 11). It was an expected result that those with more experience years should receive more education. It is seen that they had the opportunity to participate in more training over the years. Akkajit et al. (2020) found that high knowledge of health worker was associated with favorable attitude and good practice towards MWM in their study. Among those who stated that waste management was an important problem, those with 6 years or more of experience come to the fore. It can be said that healthcare workers who have 6 or more years of experience were more aware of medical waste management (Table 11). It was stated that the self-awareness of health workers in handling medical waste was one of the most important skills that influence the quality of MWM (Malini and Eshwar, 2015).

CHAPTER VI

Conclusion and Recommendations

Conclusion

- Majority of health workers (98.7%) stated that they know medical waste.
- The rate of those who know the definition of medical waste was 94%.
- The rate of those who stated that they know sufficient disposal ways of out date blood units and by-products waste was 82.7%.
- The rate of those who stated that they know sufficient disposal ways of human tissue remains was 81.3%.
- 82% of respondents stated that they believe throwing blood waste to household waste is a sufficient disposal way.
- 67.3% of respondents stated that they believe throwing of human tissue remains to household waste is a sufficient disposal ways.
- The rate of those who stated that they know sufficient disposal ways for out date medicines was 96.7%.
- 84% of the participants said they follow the procedure of throwing out date medicines.
- The majority of health workers stated that they were able to identify the need to separate medical waste during collection (92.7%) and labeled the biomedical waste containers (90.7%).
- The majority of health workers (55.3%) stated that they 'sometimes' separated the biomedical wastes according to their types at the point of generation.
- The majority of the health workers (98%) stated that they attended training in MWM.
- 62.7% of the respondents stated that they trained workers in dealing with medical waste "sometimes".
- The majority of healthcare workers believed that medical waste management was an important (93.3%) and serious problem (90%).
- The rate of those who believed that strict implementation is necessary for appropriate waste management was 92.7%

- 90% of health workers felt responsible 'very much' for waste management.
- 87.3% of the participants were agreed the requirement teamwork for medical waste management.
- 2.7% of the respondents told that they injured with a used syringe. All of the respondents injured with a used syringe stated that they reported to their authorities.
- The majority of the health workers participating in the research received 2 or 3 trainings on MWM.
- The majority of those who receive training 2 or 3 times were in the age group of 49 and above.
- The majority of those who stated that waste management was an important problem were in the age group 49 and over.
- The majority of those who received 2 or more training in MWM were nurses and doctors.
- The majority of those who felt responsible for MWM were nurses.
- The majority of those who knew the definition of medical waste were those working in surgical clinics.
- All health workers with 2 years or more of experience knew the definition of medical waste.
- Among those who felt responsible for medical waste management, those with 6-10 years of experience came to the fore.
- Among those who stated that waste management was an important problem, those with 6 years or more of experience come to the fore.

Recommendations

- Authorities should provide more sufficient training for health workers and support personnel who deal with medical waste management in healthcare settings.
- Timely and effective monitoring is recommended for health workers and support staff for enhancing sensitization to medical waste management.

- Organizing continuous training programs in the form of symposia, seminars and workshops on medical waste management to develop awareness among health workers are required.
- It is recommended that the hospitals managers to advance the supervision and control to the personnel for practicing the procedures on medical waste management.

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Appendices
Appendix A
The Questionnaire

TITLE: The Knowledge, Attitude and Practice of Health Workers regarding Medical
Waste Management

1. Do not write your name on the questionnaire.
2. All information contained in this questionnaire will be kept confidential.
3. The research is purely academic purpose and not for gaining money.
4. Please feel free and fill the spaces provided to the best of your knowledge.

Researchers

Leyla Ahmed Hassan
Assist.Prof. Ayşegül SAVAŞAN

Section A: Social demographic data

1. Age:

2. Gender

Male ()

Female ()

3. Marital status

Single ()

Married ()

Divorce ()

Separated ()

Widow/widower ()

4. Level of education

Primary ()

Secondary ()

University ()

Postgraduate ()

Informal ()

5. Professional

- Nurse ()
Doctor ()
Clinical Officer ()
Laboratory technologist ()
Physiotherapist ()
Support staff ()

6. Indicate your area of work/work station

- Medical/Pediatrics unit ()
Surgical unit ()
Obstetrics and Gynecology unit ()
Clinical laboratory ()
Rehabilitation unit ()
Outpatient Clinic ()

7. Years of Experience

- 6 moths-1 year ()
2-5 years ()
6-10 years ()
>10 years ()

Section B: KNOWLEDGE AND ATTITUDE REGARDING MEDICAL WASTE MANAGEMENT

8. Do you know medical waste?

- Yes () No ()

9. Which of the following statement describes medical waste?

- a.** Materials that may be poisonous, toxic, or flammable and do not pose disease-related risk ()
- b.** Waste that is saturated to the point of dripping with blood or body fluids contaminated with blood ()
- c.** Any waste that results from the treatment, diagnosis, immunization of humans at hospitals, and in health-related research facilities ()

10. Are there clearly defined procedures for the collection of waste for specified units in the hospital?

Yes () No ()

11. What is the type of waste that is segregated from general waste stream? (You can choose more than one)

Sharps () Pathological waste () Infectious waste ()
Chemical waste () Pharmaceutical waste ()

12. What type of labeling, color-coding is used for marking segregated waste? (You can choose more than one)

Yellow () Black () White () Red () Blue ()

13. What are the adequate disposal procedures of infectious solid and liquid waste?

Yellow () Black () White () Red () Blue ()

14. Do you know adequate disposal procedures of expired blood units and by-products waste?

Yellow () Black () White () Red () Blue ()

15. Do you know adequate disposal procedures of human tissue remains?

Yellow () Black () White () Red () Blue ()

16. Do you know adequate disposal procedures of expired medicines?

17. Is there department responsible for waste available within hospital management?

Yes () No ()

18. Have you ever attended training in waste management?

Yes () No ()

19. How many training did you attend in waste management?

1 training () 2-3 trainings () >3 trainings ()

20. What is the importance of medical waste management? (You can choose more than one)

infection control only ()

hygiene purpose only ()

hazards and disease prevention only ()

21. Is waste management is important?
Yes () No () Not Sure ()
22. Is waste management a serious problem?
Yes () No () Not Sure ()
23. Is strict implementation necessary for proper waste management?
Yes () No () Not Sure ()
24. Is waste management require teamwork?
Agree () Disagree () Don't know ()
25. Do you know importance of availability of specialized waste-workers?
Yes () No () Not Sure ()
26. How do you rate the importance of hospital waste handling?
Not important () Important () Very important ()
27. What extent do you feel you are responsible for hospital waste management?
Very little () Not at all () Very much ()
28. Do you believe throwing blood waste in domestic waste is an adequate disposal procedure?
Yes () No () Not Sure ()
29. Do you believe throwing of human tissue remains in domestic waste is an adequate disposal procedure?
Yes () No () Not Sure ()
30. Do you believe throwing expired medicines?
Yes () No () Not Sure ()

Section C: PRACTICES REGARDING MEDICAL WASTE MANAGEMENT

31. Have you ever been affected due to poor waste management?
Yes () No ()
32. Have you ever encountered any sharp /needle stick injury in the last 12 months?
Yes () No ()
33. Have you ever had injury with a used syringe?
Yes () No ()

34. If yes, what did you do? Did you report to the authorities?
Yes () No ()
35. Is there reporting procedure in your hospital?
Yes () No ()
36. Is medical waste user manual available in your hospital?
Yes () No ()
37. Do you use of personal protective equipment?
Gloves () Nose masks () Clinical coats () Other ()
38. Can you identify need to sort medical waste during collection?
Yes () No ()
39. Do you label biomedical waste containers?
Yes () No ()
40. Do you segregate biomedical wastes according to their type at the point of generation?
Yes () No () Sometimes ()
41. Are personal protection tools provided for workers?
Yes () No () Sometimes ()
42. Do you monitor usage of personal protection tools?
Yes () No () Sometimes ()
43. Do you train workers in dealing with medical waste?
Yes () No () Sometimes ()
44. Do workers supervised during waste collection?
Yes () No () Sometimes ()
45. Are there adequate number of workers collecting waste?
Yes () No ()
46. How many times a day is waste collected in your hospital?
47. What type of containers is used for collection and internal transport of the waste?.....
48. Where is the segregated waste stored while awaiting removal from the hospital or disposal?

Appendix B
Ethics Committee Approval

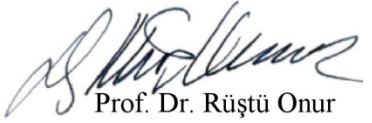


YAKIN DOĐU ÜNİVERSİTESİ
BİLİMSEL ARAŞTIRMALAR ETİK KURULU

ARAŞTIRMA PROJESİ DEĐERLENDİRME RAPORU

Toplantı Tarihi : 25.03.2021
Toplantı No : 2021/89
Proje No :1320

Yakin Dođu Üniversitesi Hemşirelik Fakültesi öğretim üyelerinden Yrd. Doç. Dr. Ayşegül Savaşan'ın sorumlu araştırmacısı olduđu, YDU/2021/89-1320 proje numaralı ve **“The Knowledge, Attitude and Practice of Health Workers regarding Medical Waste Management”** başlıklı proje önerisi kurulumuzca online toplantıda deđerlendirilmiş olup, etik olarak uygun bulunmuştur.



Prof. Dr. Rüştu Onur

Yakin Dođu Üniversitesi

Bilimsel Araştırmalar Etik Kurulu Başkanı

Appendix C

ISBITAAL MADIINA
Muqdisho, Soomaaliya



MADINA HOSPITAL
Mogadishu, Somalia

Tel: +252-615-585-121- / 252-611-111-977 / Email: madinahosp@hotmail.com, or @gmail.com

Date: -12/04/2021

TO: -Every department of Medina Hospital

Purpose: Research Permission.

Leyla Ahmed Hassan was allowed to do research at Medina Hospital.

Acting Director of Hospital and Head of Health
Dr. Mohamed Abdi Ahmed



Appendix D

YAKIN DOĞU ÜNİVERSİTESİ  NEAR EAST UNIVERSITY

Ref No: HIF-33/21

March 25, 2021

Dear Director;

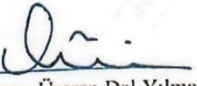
De Martino Public Hospital, Via Londra Rd, Hamar Jajab Mogadishu, Somalia.

Your citizen Leyla AHMED HASSAN, is master degree student in Near East University Faculty of Nursing. She wants to study about "The Knowledge, Attitude and Practice of Health Workers regarding Medical Waste Management" under Assist.Prof.Ayşegül Savaşan's supervision and we accepted her proposal.

She wants to study in De Martino Public Hospital. If you let her to study, she will make a study with health workers of De Martino Public Hospital in the health care units. Your cooperation will be highly appreciated.

I respectfully give the necessary permissions to Leyla AHMED HASSAN.

Yours Sincerely


 Professor. Ümran Dal Yılmaz
 Dean, Near East University Faculty of Nursing

- Dear Professor Umran
 We accept layla Ahmed to do
 that study in Demartino Hospital.
 Dr. Abdulaziz Yusuf Ahmed



YAKIN DOĞU BULVARI, LEFKOŞA - KKTC, MERSİN 10 TURKEY - TEL +90 (392) 680 20 00 - FAKS +90 (392) 223 64 61

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Appendix E

Turnitin Similarity Report

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