PROCESS EVALUATION IN COMPLIANCE WITH THE NATIONAL MEDICAL WASTE CONTROL GUIDELINES AMONG HEALTHCARE STAFF AT MWANANYAMALA REGION REFERRAL HOSPITAL, KINONDONI, DAR ES SALAAM

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Department of Development Studies

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By

Babere Benjamin

A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master Science (Project Management, Monitoring and Evaluation in Health) of

Muhimbili University of Health and Allied Science
October, 2024

CERTIFICATION

The undersigned certify that they have read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled: **"Process Evaluation in Compliance with the National Medical Waste Control Guidelines among Healthcare Staff at Mwananyamala Region Referral Hospital, Kinondoni, Dar es Salaam"** in (partial) fulfillment of the requirements for the degree of Master Master Science (Project Management, Monitoring and Evaluation in Health) of Muhimbili University of Health and Allied Sciences.

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Date

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Mr. Godwin Pancras

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_____

Date

DECLARATION AND COPYRIGHT

I, **Babere Benjamin** declare that this **dissertation** is my own original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

Signature……. **Date**……

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DEDICATION

This work is dedicated to my parents Mr. and Mrs. Benjamin Babere, my wife Sylvia Msangi and son, Jeremiah Babere for their love and inspiration in my academic life.

ABSTRACT

Background: Healthcare services are among the largest sources of waste globally and produce the second most harmful waste after radiation waste. Hospitals are major primary sources of healthcare waste. Nearly 15-25% of healthcare waste generated in hospitals is hazardous and a potential source of infectious diseases (1). Healthcare waste is a major potential risk factor for fatal infectious diseases worldwide, such as hepatitis C virus (HCV), human immunodeficiency virus (HIV), and hepatitis B virus (HBV) (2). Healthcare workers play a crucial role in effective healthcare waste management if they comply with healthcare waste management standards. However, in Tanzania, healthcare waste management indicators show unsatisfactory waste management practices in hospitals.

Objective: To appraise the level of compliance with the National Medical Waste Control Guidelines among healthcare staff at the Mwananyamala Regional Referral Hospital in Kinondoni Dare-es-Salaam.

Methodology: Analytical cross-sectional study design was employed. The sample size of the respondents in a study were 171 healthcare workers from Mwananyamala Regional Referral Hospital. Structured questions and observations used as the major data collection methods. descriptive analysis was employed using Stata version 18.

Results: The study revealed that used gloves were mostly (19.33%) generated daily compared to other types of healthcare waste. Also, there was no compliance (62%) with medical waste management practices from collection to final disposal. Majority reported that there was no compliance of healthcare waste generation at Mwananyamala Hospital (61.4%). Also, the study participant reported, there was no compliance on waste segregation (76%). Additionally, the study revealed that there was compliance with the practices on HCW storage (62.6%), while 63.2% noted that there was no compliance with on onsite transport of HCW. Moreover, the majority reported that there was no compliance with practices of HCW treatment (71.9%). It was revealed that compliance level is associated with training whereby majority of participants

with no training showed non-compliance (71.2%) and also motivation to staff in issues related to HCWM, those with no motivation (75%) showed non-compliance.

Conclusion: Following the implementation of National Medical Waste Control Guidelines among healthcare workers at Mwananyamala regional referral hospital, the study found non-compliance with medical waste management practices. This was associated with age, lack of training, and motivation among healthcare staff.

Recommendation: The government through the office of the region medical officer should improve supervision to the regional referral hospitals regarding healthcare waste management through Region health management team (RHMT).

There should be an Infection and prevention focal person who has training in waste management. Also, there should be motivation as part of recognition by introducing competition among departments for 5S kaizen for infection, prevention and control within the hospital. Moreover, regular training on healthcare waste management should be put in place.

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ABBREVIATIONS AND ACRONYMS

HAIs	: Health Acquired Infections
HBV	: Hepatitis B Virus
HCW	: Health care waste
HCWM	:Health care waste management
HCV	: Hepatitis C Virus
HIV	: Human immunodeficiency virus
HRHIS	: Human resource for health information system
IPC	: Infection prevention control
PHCF	: Primary health care facilities
SDGs	: Sustainable Development Goals
SOPs	: Standards Operating Procedures
UNDP	: United National Development Program
WHO	: World Health Organization

OPERATIONAL DEFINITION OF TERMS

Health care waste: All waste products resulting from health care services at Mwananyamala Hospital (3)**.**

Hazardous health care waste: All hospital healthcare waste that carries potentially harmful infectious agents. These will include needles, human body parts, and blood (4)**.**

Non-hazardous healthcare waste: All hospital healthcare waste does not contain harmful infectious agents. It may include cotton wool, gloves, and masks (5)**.**

Healthcare waste management: All activities and standard practices are intended to make healthcare waste safe and protect healthcare workers, patients, and communities from health-acquired infections (6)**.**

Healthcare management plan: A detailed documentation of activities and how the Mwananyamala Regional Referral Hospital addresses and manages waste (6)**.**

Healthcare waste generation: A protocol for minimizing waste production showing how much waste is generated per patient per day by type and across hospital units (2)**.**

Healthcare waste segregation: A protocol showing how healthcare waste is sorted and categorized by type or nature (7)**.**

Healthcare waste storage: Temporary arrangements for keeping waste at waste sources and final disposal sites **.**(3)

Healthcare waste handling: A protocol and all activities that link waste segregation, collection, storage, treatment and disposal of wastes (7)

Healthcare waste transport: A protocol for moving healthcare waste from one point to point up to where waste is discarded (7)**.**

Healthcare waste disposal: A protocol for discarding healthcare wastes in the hospital (7)**.**

Healthcare workers deliver care and services to the sick and ailing either directly as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even medical waste handlers (7).

CHAPTER ONE

INTRODUCTION

1.1 Background information

Healthcare services are among the largest sources of waste globally and produce the second most harmful waste after radiation waste.(1) In developed countries, patient care produces up to 0.5 kg per bed per day in a hospital. Similarly, the value of waste generated in the course of providing health care routinely to a patient per bed in developing countries is 0.2 kg(1). Waste products used for health care service delivery include sharp materials such as needles, human body parts, highly infectious fluids and blood, and hazardous chemical substances (6). Hospitals are major primary sources of healthcare waste. Other potential sources of healthcare waste include health centres, dispensaries, laboratories, autopsy centres, pharmacies, radiology centres, mortuaries, and maternity home care(3,4).

Nearly 15-25% of wastes generated in routine hospitals are hazardous and are potential sources of these infectious diseases (3,8,9). Healthcare waste is a major potential risk factor for fatal infectious diseases worldwide, such as hepatitis C virus (HCV), human immunodeficiency virus (HIV), and hepatitis B virus (HBV)(10). Available evidence from epidemiological reports shows that the risks of personal HIV, HBC, and HCV infections are significantly high(11).

According to the World Health Organization, the risk of acquiring HIV, HBC, and HCV infections after being pricked with a needle used by infected source patients is 0.3%, 30%, and 1.8%, respectively ((6). Healthcare waste is also acknowledged to be a potential source of hospital-acquired infections and food contamination and is strongly associated with a number of hazardous occupational diseases. The prevalence of such infections has been shown to be high in scenarios where health care waste is mismanaged. These wastes are also important risk factors for viral infections. If not properly incinerated, healthcare waste is a potential cause of dioxin emissions, and particulate matter, including furans.

The responses of the World Health Organization to the combat effects of health care waste on human beings and the environment are highly appreciated. The responses are communicated through the dissemination of comprehensive guidelines for the management of healthcare waste (HCWM) and the development of a series of training guidelines for healthcare personnel. Every WHO member state is required to adopt or develop healthcare waste management guidelines, develop regulatory frameworks for managing medical waste, and design medical waste management systems.(3,6,8,12)

Nevertheless, in most developing countries, little attention is still given to healthcare waste management(13). Healthcare systems and healthcare facilities across developing countries struggle with medical waste management issues. The risk and exposure to medical waste become more serious if the wastes are not well managed. The domestication of medical waste management emphasizes that medical waste is both a technical and a management concern that deserves special attention and advocacy as a central component of health care services. Healthcare workers play a crucial role in effective medical waste management if they comply with medical waste management standards.

In a study by Samwel Manyele in Northern part of Tanzania discovered that most of the hospitals (48%) preferred open pit burning for medical waste which is not advisable. Very few hospitals had autoclave(4%) this is because they sought it was an expensive technology(14).

Responses and initiatives to prevent potential risk associated with medical waste place health care staff at its epicentre in the driver's seats. A number of HCWM guidelines have been successfully disseminated with useful standard operating procedures (SOPs) for health care facilities and health care workers(8).

Like other developing countries, Tanzania still faces the problem of healthcare waste management (HCWM) in all facilities providing healthcare services. The proliferation and expansion of healthcare facilities in Tanzania, particularly in urban areas, as a result of dramatic population growth has resulted in an exponential increase in healthcare waste generation. With on-going immunization campaigns, the use of disposable syringes and needles has increased,

and the number of home-based care services has increased as a result of the magnitude of the problem/healthcare waste.

Healthcare waste management has remained a serious concern due to failure to practice segregation at sources, collection, improper storage and transportation, treatment and final disposal. This implies that a significant proportion of the waste generated ends up in the environment in an unacceptable way, which accentuates environmental and public health risks.

Recognizing the urgency of this problem, the Ministry responsible for Health, Community Development, Gender, Elderly, and Children has taken initial steps to respond to this need, which includes the establishment of national standards and procedures, regulatory frameworks, the development of national plans, and the development of innovative technologies and approaches.

1.1.1 Description of the Intervention

In 2017, Tanzania under the Ministry of Health, Community Development, Gender, Elderly, and Children developed *"National Policy Guidelines for Health Care Waste Management in Tanzania"*. The purpose of these guidelines was to provide technical guidance on safe healthcare waste management and to ensure compliance with HCWM regulations, standards, procedures, and specifications to protect public health and safeguard the environment.

The guidelines specifically aim to guide technical personnel, decision-makers, and communities on safe healthcare waste management procedures; promote the recycling of medical waste as an alternative to avoid and prevent the release of UPOPs in the environment; promote nonburn technologies as alternative HCWM best practices; prevent and phase down the use of mercury-containing medical devices; promote appropriate, safe and sustainable technologies to treat and dispose of health care waste; guide coordination and intersectoral collaboration in HCWM; promote offsite treatment facilities in urban areas to control and maintain safe HCWM practices; provide guidance on capacity building for healthcare waste management to key implementers for a better understanding of HCWM; promote WASH and gardening in healthcare facilities; and provide advice on monitoring and evaluating HCWM practices (United Republic of Tanzania,(3).

Moreover, the policy guidelines apply to all healthcare facilities and other health institutions, including research institutions, laboratories, radiology facilities, home-based care situations, and alternative healthcare providers (traditional healers and traditional birth attendants). Others include mortuaries, cosmetic facilities, pharmacies, and chemists, which are public, private, nongovernmental or faith-based, medical training institutions, saloon and beauty centres, funeral homes, and waste management service providers that operate in the country at all levels (United Republic of Tanzania, (3).

The policy classifies waste into hazardous and non-hazardous categories; provides steps for healthcare waste management from the perspectives of generation, segregation, storage, transportation, treatment, and final disposal; and requires the provision of essential equipment for HCWM. Furthermore, it assigns roles and responsibilities to various stakeholders on best practices of HCWM, including measures for the protection of handlers and resource mobilization processes, and further prescribes mechanisms for monitoring and evaluation (United Republic of Tanzania,(3) . However, from the time it was established, less is conversant in its implementation, particularly regarding its level of compliance with medical waste management among healthcare staff. Therefore, this study attempts to bridge that gap.

1.2 Statement of problem

Inadequate healthcare waste management remains a rampant persistent concern in most developing countries, including Tanzania. The World Health Organization declared that the volume of hazardous medical waste production in developing countries is lower than that in developed countries. However, the risk of exposure to infections continues to be greater in developing countries than in developed countries due to inadequate waste management(8).

The majority of healthcare facilities in developing countries, including Tanzania, are still struggling with medical waste management, mainly the handling and disposal of medical waste. Medical waste management is characterized by elevated incidences of unfenced disposal locations near human settlements and inadequate waste storage areas(15)In Tanzania, healthcare waste management indicators show unsatisfactory waste management practices in hospitals. According to key indicators of waste management in hospitals, only 69% of staff in hospitals have been trained in medical waste management, 87.8% of staff in hospitals use safe injection boxes, 74.4% and 72.7% of staff in hospitals use waste segregation equipment, and medical waste disposal facilities, respectively, and 92.4% of staff in hospitals use personal protective equipment. (DHIS2-2023). Types of waste includes pathological waste example includes: Human tissue, fluids mostly produced in theatre. Sharps waste, chemical waste, pharmacological waste radioactive waste. The population at risk includes the public and the healthcare workers as well as patients in respective hospital.

The consequences of inadequate medical waste management include increased health safety problems (increased infectious disease) economic burdens associated with compromised safety, and the increased prevalence of medical care-associated infections (4). The long-term implications of inadequate healthcare waste management include less effectiveness and efficiency of care.

Low compliance with standard operating procedures (SOPs) and poor healthcare waste management practices are major causes of inadequate healthcare waste management among health facilities and healthcare workers in Tanzania and other developing countries (16). Recent studies in Uganda and Kenya have shown that compliance at regional referral hospitals is very

low, at 27.5% and 16.3%, respectively(17,18). However, in Tanzania, compliance with healthcare waste management at regional referral hospitals has not been accurately quantified over the last five years at region referral hospitals.

Therefore, we aimed to appraise the level of compliance with National Medical Waste Control Guidelines among healthcare staff at the Mwananyamala Regional Referral Hospital at Kinondoni in Dar es Salaam.

1.3 Conceptual framework

The study appraises the level of compliance with National Medical Waste Control guidelines among healthcare staff at Mwananyamala Regional Referral Hospital in Kinondoni Dare es Salaam. This study will define the medical waste management process as an independent variable, and compliance with medical waste management will be treated as a dependent variable. Following the health medical management process under the National Guidelines (2017) and the World Health Organization(2,8,9), waste generation, waste collection, waste segregation, waste transport, waste processing (treatment), and disposal constitute basic elements of the medical waste management process.

Additionally, compliance with National Medical Waste Control guidelines will be operationalized through the level of compliance with healthcare waste practices, which in this study will be consistently defined as high compliance, low compliance, or no compliance. According to national and international healthcare waste management guidelines, waste collection and segregation are two important aspects that occurs within a specific medical unit where waste is generated(1,3). Waste collection and segregation at medical units are intended to reduce the risk and volume of hazardous healthcare waste.

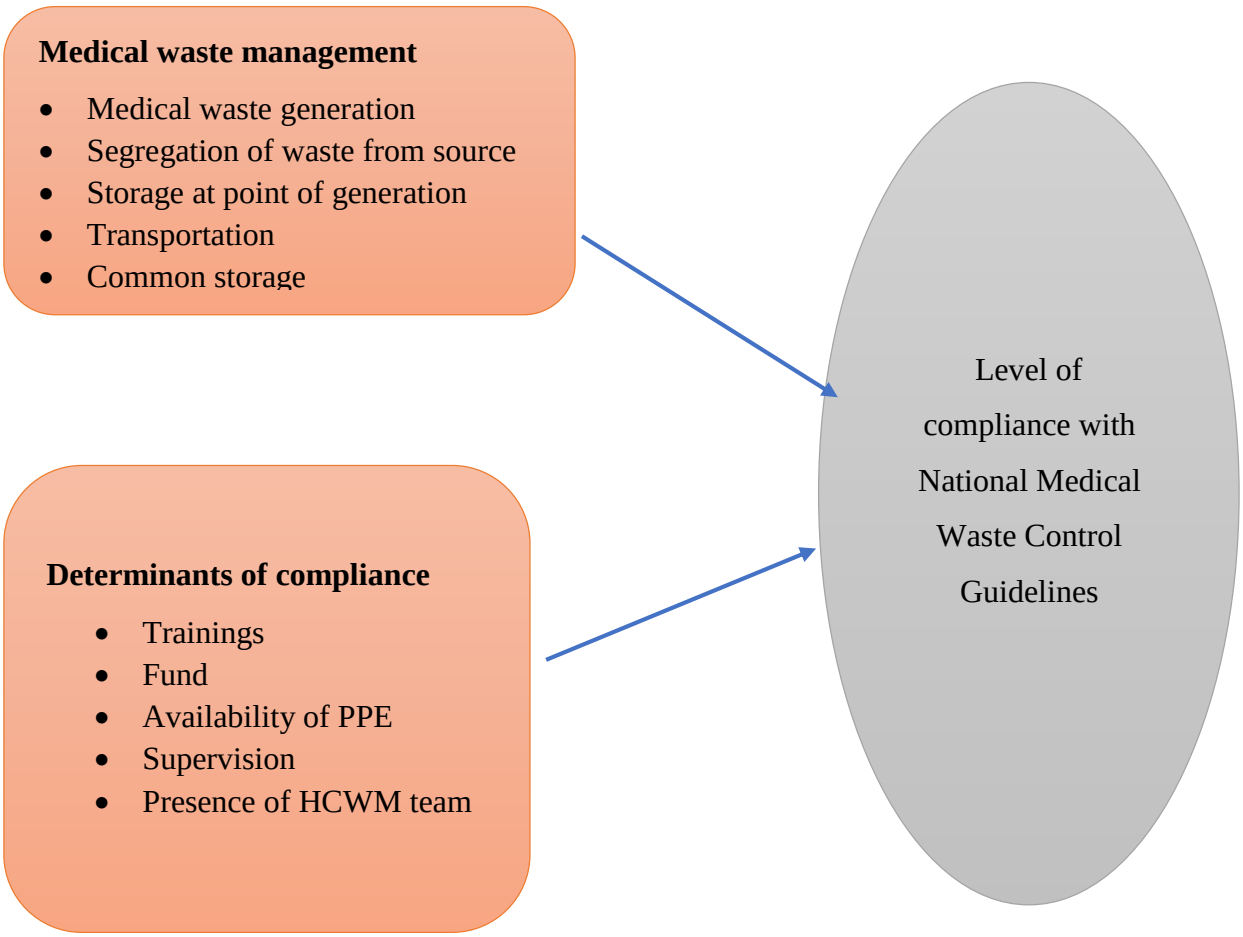


Figure 1: Conceptual framework

Source: Researcher own design (2024)

Consistently, all guidelines acknowledge that on-site transport and on-site storage of healthcare waste and on-site treatment and disposal occur at the health facility level (Padmanabhan & Barik, 2019). The final stage of medical waste management occurs outside the facility. This stage includes off-site waste transport and off-site disposal. Based on the existing guidelines, researchers suggest that compliance with healthcare waste management can be established across these three levels of medical units, health facilities, and off facilities.

1.4 Research questions

1.4.1 General research question

What is the level of compliance with National Medical Waste Control Guidelines among healthcare staff at Mwananyamala Regional Referral Hospital in Kinondoni Dare-es-Salaam?

1.4.2 Specific research questions

i. What are various types of waste generation at Mwananyamala Regional Referral Hospital in Kinondoni municipal in Dar-es-salaam?
ii. To what extent does waste collection to final disposal processes comply with National Medical Waste Control guidelines at Mwananyamala Regional Referral Hospital?
iii. What are the factors associated with determinants of compliance with the National Medical Waste Control Guideline?

1.5 Research objectives

1.5.1 General objective

To appraise the level of compliance with National Medical Waste Control guidelines among healthcare staff at Mwananyamala Regional Referral Hospital in Kinondoni Dare es Salaam.

1.5.2 Specific objectives

i. To assess the various types of waste generation at Mwananyamala Regional Referral Hospital.
ii. To determine the level of compliance with medical waste management practices from collection to final disposal at Mwananyamala Regional Referral Hospital.
iii. To identify factors associated with determinants of compliance with National Medical Waste Control guidelines at Mwananyamala Regional Referral Hospital.

1.6 Rationale of the study

Medical waste management is a global public health concern that compels every country's health system to express continued interest and commitment at all levels of medical care. Appropriate medical waste management is directly linked to the attainment of sustainable development goals, specifically goal three (SDG 3), as stipulated under targets 3.3 and 3.9. Inter alia to other things, these two daughter targets emphasize reducing mortalities due to illness from hazardous wastes. In this context, appraising compliance with medical waste management in medical health facilities, including the Mwananyamala Regional Referral Hospital, as in the case of this study, will be important in the following sense. Health system management. The study will help health system managers revise and strengthen health waste management plans and quality improvement initiatives at large. This research will enhance the quality in health care by providing evidence-based practices. The study will provide insights into how to reduce the amount of waste produced by routine healthcare services. Additionally, this study highlights areas that need more attention to minimize the level of waste generation in line with best practices suggested under national and international molecular waste management guidelines. The findings of the study will promote healthcare provision and community protection from infectious diseases such as hepatitis C and HIV/AIDS. Moreover, the study will provide vital insights into contextual factors to consider to foster high compliance and best practices in healthcare waste management practices. The study will strengthen health system advocacy to make healthcare waste management a priority among health service providers at the facility level.

CHAPTER TWO

LITERATURE REVIEW

The following section discusses the implementation of National Medical Waste Control Guidelines by specific objectives of the study.

2.1 Waste generation complies with National Medical Waste Control guidelines

Healthcare waste is among the common dominant concepts in infection prevention control (IPC). These are wastes resulting from activities and the process of providing health care(1). They can be broadly classified into medical care waste and nonmedical care waste or as harmful and nonharmful health care waste. The Tanzania National Policy Guidelines on Health Care Waste Management follow a similar classification by considering medical waste as hazardous health care waste and non-hazardous health care waste (3).

Non-hazardous medical waste refers to all medical waste that is free from infectious agents, does not contain any radioactive materials, or contains harmful chemical substances such as sharps, which are hazardous. If healthcare waste contains any of the listed components, then it is classified herein as hazardous waste(11,13). Hazardous wastes are further classified as chemical waste, genotoxic waste, pharmaceutical waste, radioactive waste, pathological waste, sharp waste, infectious waste, and highly infectious waste(19).

The World Health Organization highlights that medical waste management is a compulsory process for managing and limiting waste resulting from routine medical care activities to reduce the risk of nosocomial diseases (5,20). "*The European Council Directive on Waste defines waste management as collection, transport, recovery, and disposal of waste, including the supervision of such operations and after-care of disposal sites''*(8,13,21). It is a diligent process of handling and treating waste generated from healthcare activities. According to the Tanzania quality improvement framework for health care, HCWM is administrative, and all operational activities and procedures for the proper handling of waste conceivably make it harmless (22).The management of HCW includes technical aspects, such as collecting, segregating, transporting,

processing, and discarding waste from healthcare activities across all clinical and non-clinical practices. Its scope also includes planning, training health care and waste handlers, procurement of protective equipment, and proper use of tools and machines/equipment (13). In this sense, HCWM is a technical protocol for handling waste generated from healthcare activities to make healthcare safe and protect the environment. (5,23,24)

Every healthcare facility must observe the core principles of safe and suitable HCWM. Compliance in the context of HCWM is the degree to which the management of waste at health facilities meets the minimum or follows standard practices for HCWM (15). Compliance in this theoretical line of thinking is a basic measure of the level of effectiveness of best standard acceptable practices. Compliance is acknowledged as a primary principle for achieving safe and sustainable management of medical waste (25).

In addition, to achieve sustainable waste management from medical facilities, the World Health Organization acknowledges that proper healthcare waste generation is a core principle (7,8). This principle compels all healthcare facilities and all other institutions that are sources of medical waste to minimize the quantity of waste generated as much as possible(16,26). Assessment of medical waste generation is a key component of compliance with medical waste management practices. Across international and local waste management guidelines, the assessment of medical waste generation entails measuring the amount and volume of waste generated and classifying HCW as a part of the effective handling of waste (compliance with accepted standards). Recycling of some materials and institutionalized precautions for handling HCWs are also considered important standard practices. The presence of a sustainable stock purchasing policy and stock management policy are all basic metrics of HCW generation (27)

A study by Mwanike used a descriptive case study to assess compliance with medical waste management practices among nurses and waste handlers in the Thika sub-county in Kenya. The study revealed that waste generation in a hospital case study was high (560 kg/day), but compliance with HCWM guidelines was low (16.3%) and was comparable among nurses and waste handlers. The limitation of this study is that it did not include an important analysis of potential drivers of compliance with HCWM.(28)

2.2 Levels of compliance with National Medical Waste Control guidelines from collection to final disposal

There are standard operating procedures or methods and safety criteria for handling medical waste. Standard practices are a set of acceptable procedures for managing and controlling waste in a manner that provides high protection to patients, medical staff, and communities at large. These standard practices are proposed to reduce or increase the chance of avoiding exposure to health risks caused by microorganisms, chemicals, or waste substances. It constitutes step-by-step instructions and actions on how to carry out the process and activities for the collection of waste through the final disposal of healthcare waste (9).

Standard practices serve as a reference for good and best techniques to minimize the risk of acquiring infections from medical waste. In all cases, the proposed step-by-step procedures can foster and enable all healthcare medical practitioners to execute their tasks or procedures consistently and correctly, as expected (29). Thermal processes, including incineration, autoclaving, gasification, and pyrolysis, as well as plasma, recycling, and sanitary landfilling, present common practices in hospitals following the guidelines in effect.

As a critical part of compliance with HCWM, waste should be segregated by the individual who generates it. In addition to minimizing waste, waste segregation involves costs. Regular monitoring of HCW segregation, the use of standard color-coded bins and liners, appropriate storage of color-coded bins in health facilities, the use of safety boxes for the storage of sharp waste, and ensuring that a safety box is not used beyond 75% of its capacity are also key issues to observe by health care workers during HCW segregation.

Pepin et al reported that waste sorting is the basic starting activity for the segregation of waste. After the sorting process, several waste segregation criteria are observed. Some of these criteria include the use of double waste bags, the sealing of wastes, and the use of labelled and sprayed disinfectants. More importantly, a daily collection plan with records maintained under the supervision of a management team is recommended. In principle, each type of waste is collected and stored separately (29)(13).

The appropriate handling of medical waste in health facilities is another key aspect of medical waste management. This is a stage that describes the link between segregation to collection treatment and to disposal. Suggested handling practices include closing bags with a single overhand knot (3).

After proper handling of HCWs, the next recommended procedure is the transportation of segregated medical waste to disposal sites. Key issues in the transportation of HCWs include wearing and appropriately using personal protective equipment and the availability and consistent use of waste transport facilities such as trolleys, wheelbarrows, or special HCW dustbins.

The final but most sensitive activity in HCWM is the proper disposal of waste. Proper disposal criteria include the choice of appropriate disposal method according to the type of healthcare waste (6).

Compliance with and sound management of healthcare waste from collection and segregation to final disposal are crucial elements of HCWM standard practices (2,6). Segregating HCW at a specific medical unit where waste is generated (HCW source) is an important indicator of compliance. In principle, the suggested protocol for medical waste segregation in hospitals and other medical facilities should be developed.

An additional cross-sectional study on healthcare waste management among primary healthcare facilities in Kampala City, Uganda, reported unsatisfactory HCWM practices among medical staff. The study also revealed various contextual, institutional, and personal factors influencing staff practices related to HCWM(30).

In addition, the study done by Manyele and Mujuni evaluated the management of sharps waste in lower-level healthcare facilities in Tanzania. The study revealed that manipulation of needles and syringes was common in 37% of the facilities in which sharps were separated from other infectious waste and that only 33% of the facilities collected the entire syringe and needle in a puncture-- and leak-proof container. On-site incinerators were accessible in 39.3% of healthcare facilities, but they were of poor design, had short, rusty chimneys, and lacked automatic flame

burners. Additionally, approximately three-fifths (59%) of primary health care facilities (PHCFs) had makeshift sharps waste containers. (31).

2.3 Determinants of compliance with National Medical Waste Control guidelines

The literature on medical waste management is blended with a wide scope of factors that predict compliance with standard accepted best practices. According to, these factors can be considered individual personal or behavioural factors, organizational or institutional factors, and contextual factors. The level of knowledge and awareness of HCWM practices are often cited as personal factors influencing practices and compliance with HCWM practices. The level of healthcare facility management and top leaders' commitment to and support of HCWM, the availability of budgets for HCWM, planning, and the level of monitoring and evaluation of HCWM are commonly listed organizational or institutional factors that dictate practices and compliance with HCWM (8,9,32).

It is revealed that the level of continuous improvement within health facilities is another important factor determining compliance and practices related to the management of healthcare waste. Other potential factors include implementation clement, the availability of resources, organizational readiness, implementation policies and practices, innovation effectiveness and championship, and incentives for HCWM Different factors and practices related to healthcare waste management include awareness, knowledge among medical staff about waste management, exposure to waste management training, and availability of resources were key factors defining practices related to HCWM in the hospital (31,33).

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter describes the methodology used to conduct this evaluation study. The study area, study design and study population, sample size, sampling procedures, data collection methods, data management, analysis plan, and ethical considerations related to the study were outlined.

3.2 Study design

Analytical cross-sectional study design was used in this study to evaluate compliance with the National Medical Waste Control Guidelines among healthcare staff. The study design was used because the study wanted to describe the prevalence of healthcare waste management issues, and it was cross-sectional because data about the study was obtained at one moment in a time.

3.3 Area of the study

The study was conducted at Mwananyamala Regional Referral Hospital in Kinondoni Municipal, Dar es Salaam. This study setting was selected because Dar Es Salaam is a leading region with the highest number of population growth rate in Tanzania with higher number of hospitals located in a region hence lead as a producer of medical waste in a country. The reason for selecting the Kinondoni municipality is that it is one of the municipalities with the highest volume of outpatient flow. The reason for selecting the Mwananyamala Regional Referral Hospital is that it has the highest outpatient visits and a high bed occupancy rate. Currently, the hospital bed capacity is 254, thus lead as a producer of medical waste since it receives patients from peripheral hospital located along Kinondoni Municipality both private and public hospitals. The hospital treats 1,500 to 1,800 patients per day. Moreover, it is a referral hospital for other Kinondoni and Ubungo Public and Private Health Facilities. Hence, medical waste such as needles, syringes, bandages, and gloves are generated daily through various activities such as laboratory testing, surgeries, and diagnostic procedures.

3.4 Study population

The study population comprised of healthcare workers from Mwananyamala Regional Referral Hospital. The study participants included doctors, clinical officers, nurses, pharmacists, laboratory technicians, and radiographers and waste handlers and cleaners working at Mwananyamala Regional Referral Hospital.

3.5 Inclusion and exclusion criteria

3.5.1 Inclusion criteria

Health workers who are employees of Mwananyamala region referral hospital are eligible to participate in the study.

3.5.2 Exclusion criteria

Health workers who are not employees of Mwananyamala region referral hospital.

3.6 Study variables

3.6.1 Dependent variable

The dependent variable of the study is the level of compliance (those who says “Yes” shows compliance and who says “No” shows no compliance. Where by those with agree and strongly agree have YES and those with disagree, strongly disagree and neutral has NO

3.6.2 Independent variables

The independent variable of the study was the health care waste management process (medical waste generation, segregation of waste from the source, storage at point of generation, transportation and common storage) where by the minimum cut-off point was 60% as the good indicator of compliance and below 60% is a bad indicator of compliance

Also, determinants of compliance (training, fund, availability of PPE, supervision, and presence of HCWM team) also should exceed 60% of the score to be known as the good indicator.

3.7 Sampling procedure

3.7.1 Sample size

According to the hospital human resource for health information system (HRHIS), the hospital had a total of 251 health care workers as of January 2023. All 251 health care workers at Mwananyamala Regional Referral Hospital constituted the target population of this study. The sample size computation was based on a finite population formula, particularly the Yamane formula.

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

In this study, the total population (N) of the study was of all (251) health care staff of Mwananyamala Hospital. The sampling precision error (e) was 0.05

Sample size (n) = $251/1+251(0.05)^2$ = 154 health care workers

Then, to contain issues of nonresponse, a non-response rate of 10% was assumed.

The final sample size of the study was computed as

(n_{final}) = 154/RR = 154/0.9 = 171 healthcare workers.

Thus, the overall sample size of the study amount to 171 healthcare workers from Mwananyamala Regional Referral Hospital

3.7.2 Sampling method

The sampling strategy involved sampling the study area and study sites, followed by sampling the respondents.

3.7.2.1 Sampling of the study area and sites

The sampling of the Dares Salaam region, among other regions of the Tanzania mainland, was achieved through a convenience sampling procedure. In addition to being the region with the highest population growth rate, the allocated time for research and a limited budget for this study was a convenient sampling criterion for preferring the study to be conducted in the Dar es Salaam region.

Mwananyamala Hospital, which is the only regional referral hospital in Kinondoni that has the highest outpatient attendance and bed occupancy rate in the Kinondoni municipality which lead to the producer of large volume of medical waste, was conveniently sampled. At the hospital level, sampling data collection sites was achieved through stratified sampling where by the laboratory, patient wards, outpatient departments, including reproductive and child health clinics (RCHs), inpatient departments, operating theatre and pharmacy department and radiology department was the key sites.

3.7.2.2 Stratified sampling procedure for respondents

In this study, since a sampling frame for key respondents (i.e., medical staff and non-medical staff) can be established, a probability sampling approach was considered. Because the level of compliance with healthcare waste management varied greatly by department, a stratified sampling procedure was paramount. Stratification was performed to follow the standards of the HCWM.

All health care cadres, that was, doctors, nurses, pharmacists, laboratory technicians and radiographers, as well as non-medical staff from all departments, was defined as strata and a proportionate formula was considered to ensure that every carder is proportionately included in the sample. Moreover, since all healthcare workers in the study population have equal chances of participating, a simple random sampling procedure was used to select 171 healthcare workers. The simple random sampling process was performed as follows: first, all health care workers were given a specific number, and then all the numbers were rolled out in the box. Finally, the researcher blindly selected 171 respondents. The selection of every respondent followed the inclusion principle.

3.8 Data collection methods

This study used only primary data generated from healthcare workers at Mwananyamala to appraise the level of compliance with medical waste management guideline among medical and non-medical staff at Mwananyamala region referral hospital.

3.9 Data collection tools

The major data collection methods included questionnaires and observations.

3.9.1 Questionnaire

A structured question was used to collect data from 171 healthcare workers from Mwananyamala Regional Referral Hospital. This data collection tool comprised of four sections. The first section of the tool consisted of questions on the demographic characteristics of the respondents. Only key explanatory demographic variables which predicted the level of compliance with healthcare waste management were diligently considered.

The second section of the tool comprised of questions that assessed the extent to which various types of waste generated complies with health care waste management guideline at Mwananyamala region referral Hospital. For this section, a separate sheet for waste generation assessment was adopted from the United National Development Program (UNDP) to capture the levels of different types of healthcare waste generated by different medical units within the hospital over a week. The tool comprised of weight (kg) and volume (litre) by type of waste. The third section of the tool comprised of questions targeting the level of healthcare waste management compliance from collection to final disposal at Mwananyamala Hospital. Ideally, questions in sections II and III were comprised of standard practices on healthcare waste management provided under current national guidelines. The last section comprised a set of questions structured to identify factors associated with the level of compliance with healthcare waste management practices at Mwananyamala Hospital. A sample of HCW generation assessments and structured questions were provided in the appendix.

3.9.2 Observation checklist

Along with the use of structured questions, there are important aspects to observe across the medical waste management process flow. Therefore, researchers integrated silent observation from the generation of healthcare waste to the final disposal of waste. The observation included, observation of waste handlers and hospital facilities to assess how safety measures were followed and looked for evidence of practices.

Most observations took place in a wide range of clinical areas where needles, other sharps, and available waste disposal areas were frequently used. Administering injection and waste handlers' activities were observed on the spot based on their availability during the period of observation. During each visit, the disposal of syringes/medical waste was performed to provide a clear understanding of whether the health providers followed standard guidelines. A checklist for observation is provided in the appendix. Both questionnaires and the observation checklist were used to ensure responses in a questionnaire actually reflects the reality.

3.10 Data management

In this study, data management was considered during and after the data collection process. The following basic activities were performed as a part of the data management process. All data collection tools were checked to ensure that only complete data tools were used to collect the data. During the data collection, after every respondent, his or her structural questions were cross-checked to assess any incomplete, inconsistent, or wrong answers and, where possible, to collect the tool. Moreover, all tools found to be incomplete or with missing data above 10% were excluded from the analysis. Researchers developed a protected Microsoft spreadsheet where information from all filled data collection tools were entered. Additionally, the researcher used Stata version 18.0 as a data management tool. After data collection, the researcher entered all the data from the dually filled and complete tools into Stata. Missing values were assessed through the use of the Stata data validation menu.

3.11 Data processing and analysis

Microsoft Excel 2013 was used to clean and code the data. Stata version 18 was used for data administration and analysis. Descriptive statistics was used to present the data in frequency tables and percentages. Descriptive statistics involving the standard error mean score (SEM) test was useful for synthesizing information on the extent to which waste generation complied with healthcare waste management standards at Mwananyamala region referral Hospital. Moreover, descriptive statistics involving the standard error of the mean (SEM) test was useful for determining the level of compliance with healthcare waste management practices from

collection to final disposal at Mwananyamala Hospital. In addition, for the third objective of the study, standard error of the mean (SEM) test was used to determine factors associated with compliance.

3.12 Validity and Reliability

A pilot study of ten respondents was done in Temeke region referral hospital to test tool before used in this study

3.13 Ethical consideration

The research and publications committee of Muhimbili University of Health and Allied Sciences (MUHAS) received the proposal and granted an ethical approval to conduct the study. Any ethical issue was handled appropriately. The Medical Officer in charge (MOI), and other relevant authorities provided permission to conduct the study within the hospital. Furthermore, informed consent was obtained from the participants to participate in the study.

CHAPTER FOUR

STUDY FINDINGS

4.1 Socio- demographic characteristics of the study participants

The analysis for this study included a total sample of 171 healthcare workers from Mwananyamala Regional Referral Hospital. The majority of the study participants were male (52.1%). The majority of the study participants were aged 26-40 years (62.6%). Most of the participants were trained nurses (40.4%), and more than half 100 (58.5%) were having 1-5 years working experience. The majority were working at OPD (35.7%) and nearly half of the study participants were having diploma education (48.5%). Other characteristics of the study participants are presented in Table 1

Table 1: Socio-demographic characteristics of healthcare workers (n=171)

Variable		Frequency	Percentage
Sex	Male	89	52.1
	Female	82	47.9
Age	19-25	21	12.3
	26-40	107	62.6
	41-59	40	23.4
	60+	3	1.7
Professional	Medical attendant	28	16.4
	Trained nurse	35	40.4
	Clinician	20	11.7
	Trained laboratory technician	30	17.5
	Trained pharmacy personnel	16	9.4
	Environmental health officer	1	0.6
	Cleaner	25	14.6
	Radiographer	15	8.8
	Physiotherapy	1	0.6
Department	OPD	61	35.7
	IPD	16	9.4
	Laboratory	31	18.1
	Radiology	19	11.1
	Pharmacy	16	9.4
	Real estate	28	16.4
Working experience	Less than 1 year	21	12.3
	1-5 years	100	58.5
	6-8 years	26	15.2
	9-20 years	19	11.1
	20+ years	5	2.9
Education level	Certificate	33	19.3
	Diploma	83	48.5
	Bachelor degree/equivalent to degree	50	29.2
	Master's degree/PhD	5	2.9
Category of employment	Casual labour	42	24.6
	Temporary/volunteer	50	29.2
	Permanent/government employee	79	46.2

4.2 Generation complies with National Medical Waste Control guidelines

4.2.1 Types of health care wastes are generated daily

Majority of the study participants mentioned that used gloves (19.29%) was mostly generated daily, followed by non-infections/general wastes (16.33), while minority mentioned sanitary pads (2.52%) at Mwananyamala Regional Referral Hospital.

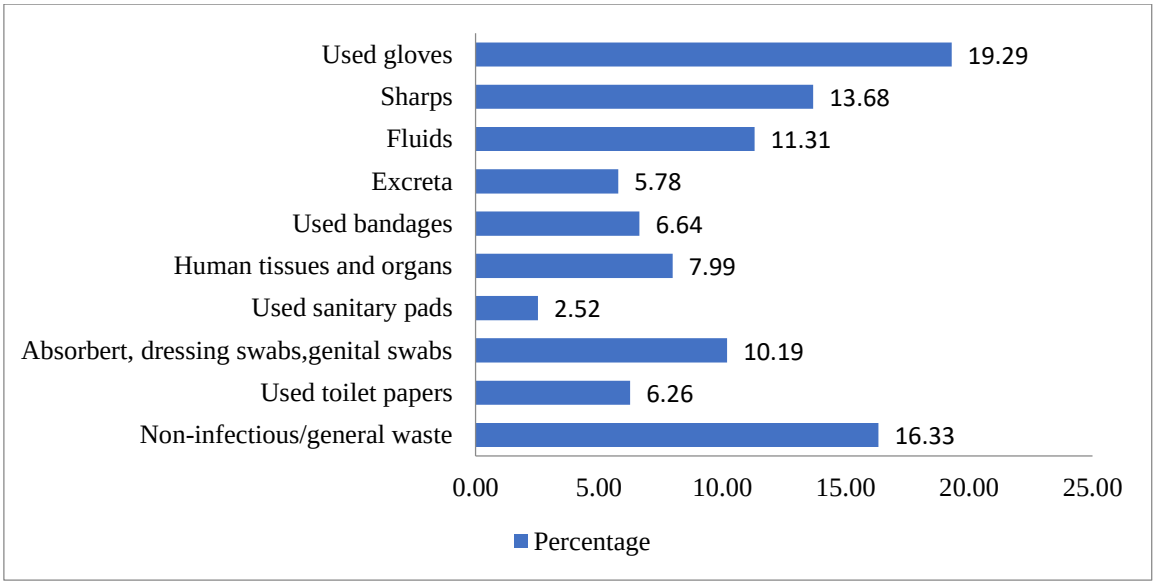


Figure 2: Health care wastes generated daily in percentage

4.3 The compliance with medical waste management practices from collection to final disposal

The study results have shown that there was no compliance (62%) with medical waste management practices from collection to final disposal. Majority of the study participants reported that there was no compliance of healthcare waste generation at Mwananyamala Hospital (61.4%). Additionally, most of the study participant reported there was no compliance with the practices on waste segregation (76%). In addition, most of the participants revealed that there was compliance with the practices on HCW storage (62.6%), while 63.2% noted that there was no compliance with the practices on onsite transport of HCW. Moreover, the majority reported that there was no compliance with practices of HCW treatment (71.9%) as shown in table 2.

Table 2: The compliance with medical waste management practices from collection to final disposal

Variable	No (%)	Yes (%)
Compliance to HCW generation	105(61.4)	66(38.6)
Compliance with the practices on waste segregation	130(76)	41(24)
Compliance with the practices on HCW storage	64(37.4)	107(62.6)
Compliance with the practices on onsite transport of HCW	108(63.2)	63(36.8)
Compliance with practices of HCW treatment	123(71.9)	48(28.1)
Total	106(62)	65(38)

4.4 The factors associated with the level of compliance on HCWM (n=171)

Table 3 results indicate that age (p=0.012), training(p=0.02), hospital HCWM team(p=0.002), supervision on HCWM (p=0.035) commitment and support(p<0.001), Motivation on HCWM (p<0.001) and fund (p=0.039), was statistically significant on the compliance of HCWM at Mwananyamala Regional Referral Hospital

Table 3: The factors associated with the level of compliance on HCWM (n=171)

COMPLIANCE WITH HCWM

Variable		Yes (%)	No (%)	p-value
Sex	Male	34(38.2)	55(61.8)	0.957
	Female	13(37.8)	51(62.2)	
Age group	19-25	10(47.6)	11(52.4)	0.012
	26-40	31(28.9)	76(71.1)	
	41-59	23(57.5)	17(42.5)	
	60+	1(33.3)	2(66.7)	
Professional	Medical attendant	10(35.7)	18(64.3)	0.879
	Trained nurse	13(37.1)	22(62.9)	
	Clinician	6(3)	14(7)	
	Trained laboratory technician	13(43.3)	17(56.7)	
	Trained pharmacy personnel	6(37.5)	10(62.5)	
	Environmental health officer	1(100)	0(0)	
	cleaner	9(36)	16(64)	
	Radiographer	7(46.7)	8(53.3)	
	Physiotherapy	1(100)	(0)	
Department	OPD	23(37.7)	38(62.3)	0.993
	IPD	5(31.3)	11(68.7)	
	Laboratory	12(38.71)	19(61.3)	
	Radiology	8(42.1)	11(57.9)	
	Pharmacy	6(37.5)	10(62.5)	
	Real estate	65(39.3)	17(60.7)	
Working experience	Less than 1 year	8(38.1)	13(61.9)	0.930
	1-5 years	39(39)	61(61)	
	6-8 years	10(35.7)	18(64.3)	
	9-20 years	7(41.2)	10(58.8)	
	20+ years	1(20)	4(80)	
Education level	Certificate	13(39.4)	20(60.6)	0.997
	Diploma	31(37.4)	52(62.6)	

	Bachelor degree/equivalent to degree	19(38)	31(62)	
	Master's degree/PhD	2(40)	3(60)	
Category of employment	Casual labour	16(38.1)	26(61.9)	0.759
	Temporary/volunteer	17(34)	33(66)	
	Permanent/government employee	32(40.5)	47(59.5)	
Training	Yes	20(50)	20(50)	**0.002**
	No	32(28.8)	79(71.2)	
	Neutral	13(65)	7(35)	
Hospital HCWM team	Yes	22(47.8)	24(52.2)	**0.002**
	No	29(28.2)	74(71.8)	
	Neutral	14(63.6)	8(36.4)	
Supervision on HCWM	Yes	22(47.8)	24(52.2)	**0.035**
	No	30(30)	70(70)	
	Neutral	13(52)	12(48)	
Commitment and support	Yes	28(56)	22(44)	**<0.001**
	No	25(25)	75(75)	
	Neutral	65(57.1)	9(42.6)	
HCWM plans and guideline	Yes	53 (42.7)	71(57.3)	0.113
	No	8(24.2)	25(75.8)	
	Neutral	4(28.6)	10(71.4)	
Motivation on HCWM	Yes	23(52.3)	21(47.7)	**<0.001**
	No	24(25)	72(75)	
	Neutral	18(58)	13(42)	
PPE	Yes	54(36.7)	93(63.3)	
	No	8(44.4)	10(55.6)	
	Neutral	3(50)	3(50)	
Fund	Yes	22(44.9)	27(55.1)	**0.039**
	No	26(29.2)	63(70.8)	
	Neutral	17(51.5)	16(48.5)	

4.4.1 Determinants of the level of compliance with HCWM

As shown in regression results in Table 4, healthcare workers aged 26-40 had higher odds (AOR=1.95, 95% CI=1.57, 10.74) of non-compliance compared to other age groups.

Additionally, healthcare workers with no training had higher odds (AOR=1.40, 95% CI=1.05, 1.88), of non-compliance compared to those with HCWM trainings. Moreover, healthcare workers with low motivation had higher odds (AOR=1.62, 95% CI=1.08, 2.43) of non-compliance with HCWM compared to those with motivation on HCWM.

Table 4: Logistic regression on determinants of the level of compliance with HCWM

Variable		**OR**	**95% CI**	***P- value***	**AOR**	**95% CI**	***P- value***
Age	19-25	Ref			Ref		
	26-40	2.23	1.86-5.77	**0.009**	1.95	1.57-10.74	**0.028**
	41-59	0.67	0.23-1.94	0.463	0.54	0.09-3.00	0.479
	60+	1.82	0.14-8.22	0.646	0.23	0.05-1.04	0.056
Training	Yes	Ref			Ref		
	No	2.27	1.17-5-19	**0.017**	1.40	1.05-1.88	**0.022**
	Neutral	0.54	0.18-1.63	0.274	0.26	0.15-6.11	0.601
Hospital	Yes	Ref			Ref		
HCWM team	No	2.34	1.14-4.81	**0.021**	2.20	0.87-5.54	0.094
	Neutral	0.52	0.18-1.49	0.225	1.36	0.70-2.64	0.369
Supervision on	Yes	Ref			Ref		
HCWM	No	2.13	1.04-4.39	**0.038**	2.37	0.20-27-04	0.486
	Neutral	0.85	0.32-2.24	0.737	0.64	0.91-4-68	0.235
Commitment	Yes	Ref			Ref		
and support	No	3.82	1.86-7.83	**<0.001**	1.11	0.92-1.34	0.274
	Neutral	0.95	0.34-2.67	0.929	0.82	0.53-1.26	0.356
Motivation on	Yes	Ref			Ref		
HCWM	No	3.29	1.55-6.96	**0.002**	1.62	1.08-2.43	**0.021**
	Neutral	0.79	0.31-1.99	0.620	0.85	0.68-1.06	0.140
Fund	Yes	**Ref**			**Ref**		
	No	1.97	0.96-4.07	0.066	1.08	0.58-1.88	0.650
	Neutral	0.77	0.32-1.86	0.557	0.60	0.27-1.32	0.21

CHAPTER FIVE

DISCUSSION

5.1 Introduction

In this section the study findings are interpreted and discussed with a comparison of what was reported by other studies. Under this study, level of compliance with the National Medical Waste Control Guidelines among healthcare workers was assessed based on types of healthcare wastes are generated daily, the compliance with medical waste management practices from collection to final disposal and determinants of the level of compliance with HCWM.

5.2 Types of healthcare wastes are generated daily

The findings from this study found that used gloves were mostly (91.8%) generated daily compared to other types of healthcare waste. The study conducted in Tanzania reported that medical facilities generate various types of waste on a daily basis through routine activities such as laboratory testing, surgical procedures, and diagnostic examinations. This waste includes items like used gloves(30,33). Moreover, the possible reasons for high generation of gloves might be due to healthcare workers are using a large number of gloves on a daily basis to protect themselves from potential exposure to infectious agents during patient care and other medical procedures. Moreover, gloves are used in all departments at Mwananyamala regional referral hospital. The study findings are consistently with the previous study conducted in Tanzania and Ethiopia (35,36).

5.3 The compliance with medical waste management practices from collection to final disposal

The study found that non- compliance with medical waste management practices from collection to final disposal was 62%. According to the World Health Organization (WHO), an assessment conducted across 22 developing countries found that the proportion of healthcare facilities that do not use appropriate waste disposal methods ranged from 18% to 64% (37).These might be due to various reasons including lack of supervision and dedicated focal

person, lack of essential equipment, such as appropriate waste bins, negligence and lack of accountability, ow level of awareness among healthcare workers regarding proper HCWM practices is a significant barrier to compliance. The study findings suggest to establish a dedicated HCWM committee or task force at the hospital level, comprising representatives from different departments, to oversee the development, implementation, and continuous evaluation of the hospital's waste management system. Moreover, to appoint a HCWM focal person responsible for monitoring the hospital's waste management policies and practices. The study findings has lower non-compliance compared to the study conducted in South West Ethiopia (71%) (38) and higher compared to the study conducted in India (41%) (39). The study findings are in line with study conducted in Bangladesh (40).

The study also found a lack of compliance with the established practices for segregating healthcare waste. Previous studies have found that poor segregation of healthcare waste can result in additional costs related to its disposal. It can also pose various environmental and public health threats (41,42). Lack of compliance with healthcare waste segregation protocols was associated with the common incidence of mixing hazardous and non-hazardous waste among healthcare workers. The possible explanation might be due to the lack of necessary waste disposal equipment, color-coded bins, signage, or other infrastructure to facilitate proper segregation at the source. This could lead healthcare workers to take shortcuts and not follow the full waste segregation procedures. The study findings suggest to provide sufficient color-coded waste bins, liners, and other segregation equipment throughout the healthcare facility and to ensure adequate signage, labels, and visual cues to guide staff on proper waste segregation. The study findings are in line with other studies indicated poor waste segregation among healthcare workers (43,44).

In addition, the findings revealed non-adherence to the established protocols and procedures for the treatment of generated healthcare waste. WHO reported that the disposal of untreated health care wastes in landfills can lead to the contamination of drinking, surface, and ground waters if those landfills are not properly constructed (45). Moreover, non-compliance with healthcare waste treatment was associated with healthcare workers not ensuring that HCW are treated

before being transported elsewhere. Additionally, the treatment of wastes was never done in accordance with the requirements for each category of waste. The possible reason might be due to knowledge gap among staff regarding the importance of treatment before transportation and disposal. The study findings suggest provision of comprehensive training and education to healthcare workers on proper waste treatment. The study findings collaborate with previous studies conducted elsewhere (13,46).

The study findings demonstrated non-compliance among healthcare workers in the generation of healthcare waste. This was caused by the lack of any specific procedures to minimize the volume of healthcare waste (HCW) generated, the lack of any mechanism to restrict the purchase of supplies and materials that produce more HCW, and the absence of regular review and announcement of operating and treatment costs. The study findings highlight to establish a mechanism to evaluate the waste generation potential of supplies, equipment, and materials during the procurement phase. Studies reported presence of a sustainable stock purchasing policy and stock management policy are all basic metrics of HCW generation (UNDP–GEF, 2021). The study findings are in line with previous studies revealed on the lack of compliance on waste generation (47,48).

5.4 Determinants of the level of compliance with HCWM

The study found that healthcare workers aged 26-40 had higher odds of non-compliance to HCWM compared to other age groups. The possible reasons mighty be lack of experience, negligence, resistance to change and overconfidence, peer influence and workplace culture, limited training opportunities as well as workload and stress. The study findings suggest to establish mentorship programs where experienced healthcare workers can guide and support younger colleagues in understanding the importance of waste management and adhering to best practices. Additionally, integrate waste management practices into the ongoing professional development and continuing education programs for healthcare workers, ensuring that it remains a priority throughout their careers. The study findings differ from a previous study conducted in Ethiopia and Uganda, which reported that the 26-40 age group of healthcare workers were more likely to comply with healthcare waste management protocols compared to

other age groups (44,49). Such variation might be due to differences in sample size and geographical area between the studies.

Additionally, the findings of this study revealed that healthcare workers with no training had higher odds of non-compliance compared to those who received HCWM training. WHO reported that inadequate training in proper waste management is one among the most common problem connected with health-care waste management(45). The possible explanation might be lack of knowledge and awareness, absence of skills and competencies, lack of motivation and accountability as well as insufficient risk perception. The study findings highlight to implement regular refresher training sessions to reinforce HCWM knowledge and skills among healthcare workers. This can help to maintain compliance and address any gaps or changes in regulations and best practices over time. The study findings align with other studies which reported that lack of training is likely to lead to non-compliance (50–52).

Moreover, the results of this study indicated that healthcare workers with low motivation had higher odds of non-compliance with HCWM compared to those who were motivated regarding HCWM. This mighty be due lack of perceived importance, absence of ownership and accountability and lack of incentives and rewards and poor organizational culture and support. The study findings highlight addressing motivation, incentives, organizational culture, and policy enforcement towards enhancing compliance with HCWM and minimizing the risks associated with improper healthcare waste management at Mwananyamala regional referral hospital. The study findings are consistently with the finding conducted in Kenya and Uganda (53,54).

CHAPTER SIX

CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In summary, the study revealed that used gloves were mostly (19.33%) generated daily compared to other types of healthcare waste. Following the implementation of National Medical Waste Control Guidelines among healthcare workers at Mwananyamala regional referral hospital, the study found non-compliance with medical waste management practices from collection to final disposal. This was associated with age, lack of training, and lack of motivation among healthcare workers.

6.2 Recommendations

6.2.1 Regional level

The government through the office of the region medical officer should improve supervision to the regional referral hospitals regarding healthcare waste management through Region health management team (RHMT) since supervision as shown in this study is of paramount significance in health care waste management.

6.2.2 Facility level

There should be regular training at work regarding health care waste management and also a dedicated person trained in an Infection, prevention and control (focal person). Who will supervise and educate others in issues related to healthcare waste management. Also, there should be motivation as part of recognition by introducing competition among departments for 5S kaizen for infection, prevention and control within the hospital. Moreover, regular training on healthcare waste management should be put in place.

6.2.3 Areas for further study

More research should be done on how to minimize healthcare waste in hospitals with regard to the development in science and technology

REFERENCES

1. WHO. Protecting Health Through Health Care Waste Management. 2016;4(4):379–88.
2. World Health Organization. Chapter 4 Solid waste. Compend WHO other UN Guid Heal environmen. 2021;2021:0–7.
3. Ministry of Health Community Development Gender Elderly and Children. National Policy guidelines for Health Care waste Management in Tanzania. 2017;43.
4. Convention B. Healthcare or Medical Waste Healthcare or Medical Waste. (4).
5. UNDP. Benchmarking Health Care Waste Management and DRR Capacities in Five Asian Countries. Gavi, the Vaccine Alliance. 2023;
6. WHO. Safe management of wastes from health-care activities. 2014;329. Available from: http://www.who.int/water_sanitation_health/medicalwaste/wastemanag/en/
7. Of M, Community H. The United Republic of Tanzania Ministry Of Health Community Development , Gender , Elderly and. 2014;(March):1–28.
8. WHO. Management of Solid Health-Care Waste at Primary Health-Care Centres A Decision-Making Guide. WHO Libr Cat Data Manag [Internet]. 2005;54. Available from: http://www.who.int/water_sanitation_health/publications/manhcwm.pdf
9. WHO. Water, Sanitation and Hygiene in Health Care Facilities. World Heal Organ. 2015;38.
10. Guo YL, Shiao J, Chuang YC, Huang KY. Needlestick and sharps injuries among health-care workers in Taiwan. Epidemiol Infect. 1999;122(2):259–65.
11. Altrecia P, Lpn J, Msp B, Babineaux S, Bsn RN. Environmental Factors and Ventilation to Prevent Infectious Disease Spread Disclosure Statement : 2024;

12. Pongrácz E, Phillips PS, Keiski RL. Evolving the theory of waste management: Defining key concepts. Waste Manag Environ II. 2004;471–80.

13. Janik-karpinska E, Brancaleoni R, Niemcewicz M, Wojtas W, Foco M, Podogrocki M, et al. Healthcare Waste — A Serious Problem for Global Health. inheathcare. 2023;11(2):1–14.

14. Manyele S V., Anicetus H. Management of medical waste in Tanzanian hospitals. Tanzan Health Res Bull. 2006;8(3):177–82.

15. Attrah M, Elmanadely A, Akter D, Rene ER. A Review on Medical Waste Management: Treatment, Recycling, and Disposal Options. Environ - MDPI. 2022;9(11).

16. Anicetus H, Manyele S, Saria J, Habtu M. Performance of Healthcare Facilities of Different Levels towards Safe Healthcare Waste Management as Linked to Infection Prevention and Control Standards in Tanzania. 2022;732–49.

17. Bagagire N, Ddamulira C, Ndoboli F, Mutekanga DR, Katamba P. Predictors of Compliance to Biomedical Waste Segregation among Workers in Health Facilities in Jinja District , Uganda. 2022;1(2).

18. Millanzi WC, Herman PZ, Mtangi SA. Knowledge , attitude , and perceived practice of sanitary workers on healthcare waste management : A descriptive cross- sectional study in Dodoma region , Tanzania. 2023;

19. Tilahun D, Donacho DO, Zewdie A, Kera AM, Haile G. Healthcare waste management practice and its predictors among health workers in private health facilities in Ilu Aba Bor Zone, Oromia region, South West Ethiopia: A community-based cross-sectional study. BMJ Open. 2023;13(2):1–9.

20. Foundation THE, Safe FOR, Care PH, Wash B, Factor THEL, Issue THEQ, et al. WHO / UNICEF Report : Water , Sanitation and Hygiene in Health Care Facilities : status in low-and middle-income countries and way forward 10 Key Findings. Who. 2016;7–8.

21. TGF. Technical Brief : Sustainable Health Care Waste Management. Glob fund. 2020;(February):1–33.

22. Shareefdeen ZM. Medical Waste Management and Control. J Environ Prot (Irvine, Calif). 2012;03(12):1625–8.

23. Global Environment Facility, UNDP. MODULE 9 : Classification of Healthcare Waste Module Overview. 2021;11. Available from: https://www.who.int/water_ sanitation_health/ facilities/ waste/module9.pdf?ua=1

24. UNDP. MODULE 14: Off-site Transport and Storage of Healthcare Waste. 2014;

25. R. E. Kungu, Njogu PM, Kiptoo J. Evaluation of Health Care Waste Management. Heal care waste Manag. 2016;17(1):195–206.

26. Okweso JA. Report on the Review of the Kenya National Guidelines for Safe Management of Health Care Waste, Injection Safety and Safe Disposal of Medical Waste National Communication Strategy and Health Care Waste Management Standard Operating Procedures. Nairobi Minist Environ Nat Resour [Internet]. 2016;1–181. Available from: http://www.upops.environment.go.ke/wp-content/uploads/2020/06/ Review-of-National-Guidelines-for-Safe-Management-of-Health-Care-Waste-1.pdf

27. UN. C ompendium of T echnologies for T reatment / D estruction of H ealthcare W aste. 2012;

28. Mwaniki P, Solomon K, Shadrak O. Adherence to Healthcare Waste Management Guidelines among Nurses and Waste Handlers in Thika Sub-county- Kenya. 1999;

29. Pépin J, Chakra CNA, Pépin E, Nault V, Valiquette L. Evolution of the global burden of viral infections from unsafe medical injections, 2000-2010. PLoS One. 2014;9(6):1–8.

30. Wafula ST, Musiime J, Oporia F. Health care waste management among health workers and associated factors in primary health care facilities in Kampala City, Uganda: A cross-

sectional study. BMC Public Health. 2019;19(1):1–11.

31. Manyele S V, Lyasenga TJ. Factors affecting medical waste management in low- level health facilities in Tanzania. African J Environ Sci Technol [Internet]. 2010;4(5):304–18. Available from: http://www.academicjournals.org/AJEST

32. Managing F, Waste D. Laboratory Guide For Managing Dangerous Waste. 2015;(15).

33. Karmakar N, Datta SS, Datta A. A cross-sectional study on knowledge, attitude and practice of biomedical waste management by health care personnel in a tertiary care hospital of Agartala, Tripura. Natl J Res Community Med [Internet]. 2016;(November). Available from: http://www.commedjournal.in/article/Volume5Issue3Jul-Sep2016/fulltext/101NJRCM_karmakar_Vol. 5. Issue 3. July-Sep16.pdf

34. Manyele S V, Lyasenga TJ. Factors affecting medical waste management in low- level health facilities in Tanzania. African J Environ Sci Technol. 2010;4(5):304–18.

35. Mesfin D, Kassahun G, Andamlak A, Zemedu Trifa. Assessment of the health care waste generation rates and its management system in hospitals of. BMC Public Health. 2013;13(28):1–9.

36. Anicetus H, Saria J, Mohamed H. Estimation of Different Categories of Healthcare Waste Generated at Two Different Hospital Categories in Four Hospitals in Dar es Salaam City. J Environ Prot (Irvine, Calif). 2020;11(1):872–88.

37. World Health Organization. Management of Solid Health-Care Waste at Primary Health-Care Centres. Geneva; 2005.

38. Gizalew E, Girma M, Haftu D, Churko C, Girma Z. Health-care waste management and risk factors among health professionals in public health facilities of south Omo Zone, South West Ethiopia, 2018. J Healthc Leadersh. 2021;13:119–28.

39. Karmakar N, Datta SS, Datta A. A cross-sectional study on knowledge , attitude and practice of biomedical waste management by health care personnel in a tertiary care hospital of A cross-sectional study on knowledge , attitude and practice of biomedical waste management by health care. Natl J Res Community Med. 2016;5(2):189-195).

40. Patwary MA, Thomas W, Hare O, Street G, Elahi KM, Shahadat S, et al. Quantitative assessment of medical waste generation in the capital city of Bangladesh. Waste Manag. 2009;29(8):2392–7.

41. Silva CE Da, Hoppe AE, Ravanello MM, Mello N. Medical wastes management in the south of Brazil. Waste Manag. 2005;25(6):600–5.

42. Ibrahim M, Kebede M, Mengiste B. Healthcare Waste Segregation Practice and Associated Factors among Healthcare Professionals Working in Public and Private Hospitals , Dire Dawa , Eastern Ethiopia. 2023;2023.

43. Wassie B, Gintamo B, Mekuria ZN, Gizaw Z. Healthcare Waste Management Practices and Associated Factors in Private Clinics in Addis Ababa , Ethiopia. Environ Health Insights. 2022;16(1):1–10.

44. Sahiledengle B. Self-reported healthcare waste segregation practice and its correlate among healthcare workers in hospitals of Southeast Ethiopia. 2019;9:1–11.

45. World Health Organization. Global analysis of healthcare waste in the context of COVID-19: status, impacts and recommendations. World Health Organization; 2022.

46. Ghali H, Cheikh AB, Bhiri S, Bouzgarrou L, Rejeb MB, Gargouri I, et al. Health and Environmental Impact of Hospital Wastes : Systematic Review. Dubai Med Jouranl. 2023;6(1):67–80.

47. Golbaz S, Nabizadeh R, Sajadi HS. Comparative study of predicting hospital solid waste generation using multiple linear regression and artificial intelligence. J Environ Heal Sci Eng. 2019;17(1):41–51.

48. Tilahun D, Donacho DO, Zewdie A. Healthcare waste management practice and its predictors among health workers in private health facilities in Ilu Aba Bor Zone , Oromia region , South West Ethiopia : a community- - based cross- - sectional study. 2023;1–10.

49. Edinah T. Factors affecting Medical Waste Disposal at Ishaka Adventist Hospital, Bushenyi District. Kampala International University; 2016.

50. Mugivhisa LL, Dlamini N, Olowoyo JO. Adherence to safety practices and risks associated with health care waste management at an academic hospital , Pretoria , South Africa. Afr Health Sci. 2020;20(1):453–68.

51. Tilahun D, Donacho DO, Zewdie A, Kera AM, Degefa GH. Healthcare waste management practice and its predictors among health workers in private health facilities in Ilu Aba Bor Zone , Oromia region , South West Ethiopia : a community- - based cross- - sectional study. BMJ Open. 2023;13(e067752.):1–9.

52. Leonard CM, Chunga CC, Nkaama JM, Banda K, Mibenge C, Chalwe V, et al. Knowledge , attitudes , and practices of health care waste management among Zambian health care workers. PLOS Glob Public Heal. 2022;2(6):1–14.

53. Babirye J, Vuzi P, Mutekanga DR. Factors Influencing Adherence to Proper Health Care Waste Management Practices among Health Workers in Wakiso District , Uganda. 2020;4(2):96–111.

54. Issn E, No I. Individual-Related Factors Influencing Adherence to Hazardous Waste Management Policy Frameworks among Health Workers in Private Hospitals in Nairobi County – Kenya Individual-Related Factors Influencing Adherence to Hazardous Waste Management Policy Fram. J Environ ISSN. 2024;4(2):23–37.

APPENDECES

Appendix I: Questionnaire to Health Carders in the Hospital

Introduction

My name is Babere Benjamin from Muhimbili University of Health and Allied Science (MUHAS). I am a second-year student pursuing a Master's degree in Project Management Monitoring and Evaluation in Health (PMMEH). I am conducting a study that aims to appraise the level of compliance with health care waste management practices among health care staff at Mwananyamala Regional Hospital in Kinondoni Dare-es-Salaam. The results of the study will be submitted to MUHAS for fulfilment of academic requirements, not otherwise. I also assure you that the information you will provide will not affect your employment or personal affairs in any way. No name of the participant will be taken rather than assigned the information with codes to facilitate analysis.

On that note, I plead your voluntary participation in this study as one of the target respondents who can provide pertinent information on health care waste management at your operation section and to the hospital as a whole. The session will last for 6 to 10 minutes only.
May I have your consent to continue with this conversion?

[1]NO {If "NO" say thanks and wish him/her a good job}

[2] YES {If "YES" continues with the section below}

Section I: Demographic characteristics of the respondents

1. Respondents' Sex

[1] Male ()

[2] Females ( )

2. What is your current age in years?

[1] 19 – 25 ()

[2] 26 -40 ( )

[3]41-59 ( )

[4] 60+ ( )

3. What is your profession?

[1] Medical attendant ( )

[2]Trained nurse ( )

[3] Clinician ( )

[4] Trained laboratory personnel ()

[5] Trained pharmacy personnel ( )

[6] Environmental health officer ( )

[7] Assistant environmental health officer ( )

[8] Waste handler ( )

Radiographer ( )

[10] Physiotherapy ( )

[11] Cleaner ( )

4.In which operation/section are you currently working?

[1] OPD ( )

[2] IPD ( )

[3] RCH ( )

[4] CTC ( )

[5] Theatre ( )

[6] Laboratory ( )

[7] Main/sub-pharmacy ( )

[8] Laboratory ( )

[9] TB/leprosy unit ( )

[10] Radiology/X-ray unit ( )

[11] Dental unit ( )

[12] Eye unit ( )

5. How long have you worked in this hospital? Length of survival

[1] Less than 1 year ( )

[2] 1- 5 years ( )

[3] 6-8 years ( )

[4] 9- 20 years ( )

[5]21+ years ( )

6. What is your highest professional education level?

[1] Certificate ( )

[2] Diploma ( )

[3]Bachelor's degree/equivalent to degree ( )

[4] Master's degree/PHD ( )

7. How do you identify your category of employment?

[1] Casual laborers ( )

[2] Temporary/volunteer ( )

[3] Permanent/government employee ( )

Section II: Compliance with health care waste generation

This section contains questions on health care generation according to the Tanzania HCWM policy guidelines of 2017.

8.Please indicate which health care wastes are generated daily under this service unit in the course of health care

[1] Used gloves ( )

[2] Sharps ( )

(Used needles, cannulas, vial injections, syringes, and surgical blades)

[3] fluids ( )

[4] Excreta ( )

[5] used bandages ( )

[6] Human tissue and organs ( )

[7] Sanitary pads used ( )

[8] Absorbent, dressing swabs, genital swabs ( )

[9]Used toilet paper ( )

[10] Non-infectious/general wastes ( )

9. Please indicate the following practice for HCW generation based on five Likert scale points: [1] strongly disagree, [2] disagree, [3] neutral, [4] agree, [5] strongly agree.

Item of waste generation	1	2	3	4	5
(i). Do you use any specific procedure which minimize volume of HCW generated					

(ii)Does the hospital has any mechanism which restrict purchase of supplies/material which produce more HCW at this section					
(iii). Does this section always use separate color-coded container					
(iv)Does this section/hospital review and announce operating and treatment cost from time to time					
(v)Does this section collect data on waste generated routinely					

Section III: Compliance with HCWM practices from segregation to final disposal

10. Please indicate the following practice on HCW segregation at your service section based on a five-point Likert scale as indicated [1] Strongly disagree [2] Disagree [3] Neutral [4] Agree [5] Strongly agree

Practices on waste segregation	1	2	3	4	5
(i). All health care staff at this section always segregate waste they generate					
(ii). Does this section have displayed all SOPs for HCW segregation, packaging and labelling					
(iii). Does all health care workers consistently refer to any of the displayed SOPs for HCW segregation, packaging and labelling					
(iv). Did you segregate any waste generated in the recent two weeks					
(v). Segregation receptacles are always placed close as possible to waste generator at all times.					

(vi). Incidence of mixing hazardous waste and none hazardous is un common among health care worker					
(vii) Segregation of HCW by all health workers always consist of separating different waste materials based on the type, treatment and disposal or recyclable options					
(viii). Health care waste are sometime sorted after it has been placed in the bin or container					

11. Please indicate the following practice among health care workers on HCW storage at your service section based on five Likert scale points, as indicated [1]: Strongly disagree [2] Disagree [3] Neutral [4] Agree [5] Strongly agree

Practices on health care waste storage	1	2	3	4	5
(i). All waste generated here are stored in a bay until transport to disposal					
(ii). Waste are stored in generation point not more than 3 days					
(iii). All pathological wastes are not stored rather than being disposed immediately					
(iv). Hazardous waste is stored not more than 2 days from the times of generation at this section.					
(v). All health care workers in this section store each category of HCW separately.					

12. Please indicate the following practice on HCW onsite transport at your service section based on five Likert scale points: [1] strongly disagree, [2] disagree, [3] neutral, [4] agree, [5] strongly agree

Practices on onsite transport of HCW	1	2	3	4	5
(i). All waste generated in this section are transported through designated transportation means (trolley wheelbarrows or wheeled bins, bucket) as per standard guideline?					
(ii). Different types of waste generated are transported separately in designated trolleys, wheelbarrows or wheeled bins?					
(iii). All waste transportation facilities (i.e., trolleys, wheeled bins, wheelbarrows) are cleaned and disinfected by recommended disinfectants every day?					
(iv). High infectious wastes are transported daily from this service section					

13. Please indicate the following practices on HCW treatment at your service section based on a five-point Likert scale as indicated [1] strongly disagree [2] disagree [3] neutral [4] agree [5] strongly agree

Practices on HCW treatment	1	2	3	4	5
(i). Always all health care wastes are treated before disposal					
(ii). All health care workers in this section ensure that HCW are treated here before transported elsewhere					
(iii). Treatment of wastes is done in accordance to each category of wastes					
(iv). Chemical disinfection is always used by health care workers to treat wastes generated here					

14. Please indicate the following practices for HCW disposal based on five Likert scale points: [1] strongly disagree, [2] disagree, [3] neutral, [4] agree, [5] strongly agree.

Practices on HCW disposal	1	2	3	4	5
(i). Disposal site is exclusively used by all health care workers for medical waste only					
(ii). Health care worker ensure that medical wastes are disposed in a sanitary landfill					
(iii). Disposal site is not easily accessed by people/public					
(iv). All persons responsible for treatment and disposal of health care waste given milks					

Section IV

Determinants of the level of compliance with HCWM

15. Do all health care workers in this section comply with HCWM?

[1] YES ()

[2]NO ()

16. The five-point Likert scale below indicates how each factor influences compliance with HCWM in the service section of the hospital.

[1] Very low extent [2] Low extent [3] Neutral [4] Large extent [5] very large extent

Organization related determinants of compliance to HCWM	1	2	3	4	5
(i). Staff training and skill on HCWM					
(ii). Presence of active hospital HCWM team					
(iii). Level of supervision on HCWM					
(iv) Hospital management team commitment and support					
(v)Presence of HCWM plans and guidelines					
(vi) Staff motivation on HCWM					
(vii) Availability of person protective equipment's (PPEs) HCWM and facilities					
(viii). Fund allocated on HCWM					

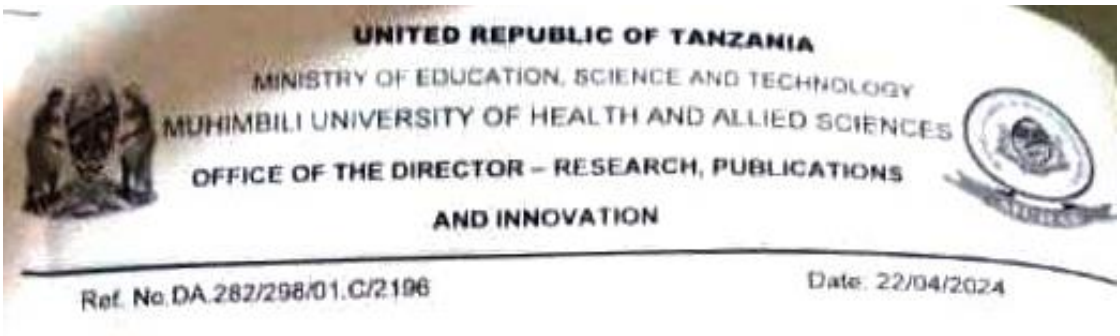
Appendix II: Observation checklist

The following aspects across the hospital sections were observed, and their presence or whether they were performed accordingly was indicated.

S/N	Observation items	Remarks
1	Standard color-coded waste bins and liners are used for waste segregation.	
2	Standard colours recommended are Red for highly infectious wastes, Yellow for infectious wastes, Black or Blue for non-infectious wastes	
3	Colour coded waste bins with appropriate bin liners, needle cutters, sharps containers, or other waste storage container shall be placed within reach of staff, at most within 1 m at every functional unit.	
4	Safety box shall not be filled beyond 75% of its capacity	
5	Health care waste shall not to be mixed with any other type of waste	
6	Whether each waste bin is labelled to direct users on proper waste storage	
7	SOP displayed against each waste bins on proper waste storage in every functional unit	
8	Presence of waste storage bay with a lockable door, has durable, roofing materials, fenced, and proper drainage system	
9	Whether each category of waste is stored separately	
10	Whether pathological waste is not be stored and are disposed of immediately	

11	Whether different types of waste are transported separately in designated trolleys or wheelbarrows	
12	Whether trolleys and wheeled bins shall be cleaned and disinfected by the recommended disinfectants at the end of each working day.	
13	Whether staff use appropriate PPE while handling, treating and disposing wastes	
14	Presence of a fenced incinerator with no sharp materials outside the fence	

Appendix III: Approval for ethical clearance



UNITED REPUBLIC OF TANZANIA
MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY
MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES
OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION

Ref. No.DA.282/298/01.C/2196 Date: 22/04/2024

MUHAS-REC-04-2024-2196
Babere Benjamin,
School of Public Health and Social Sciences,
MUHAS

RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: EVALUATING COMPLIANCE WITH THE NATIONAL MEDICAL WASTE MANAGEMENT GUIDELINE AMONG HEALTH CARE STAFFS AT MWANANYAMALA REGIONAL HOSPITAL, KINONDONI, DARE-ES-SALAAM.

Reference is made to the above heading.

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subject's research.

APPROVAL DATE: 22/04/2024
EXPIRATION DATE OF APPROVAL: 22/04/2025

STUDY DESCRIPTION:
Purpose:

The purpose of study is to evaluate the compliance with the national medical waste management guideline among health care staffs at Mwananyamala regional hospital, Kinondoni, Dar-es-salaam.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015363.pdf and in the MUHAS archives.

The PI is required to:

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.



Dr. Nahya Salim Mahfoud,
Chairperson, MUHAS Research and Ethics Committee

Appendix IV: Permission letter

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF HEALTH

Telephone Address:

Telephone: 022-2760500

Mwananyamala Regional
Referral Hospital,
P.O.Box 61665
Dar es Salaam.

RE: NO.: MA. 239/240/01/89

DATE: 03th May,2024

Director,
Muhimbili University of Health and,
Allied Sciences,
Clinical Medicine,
P.O.BOX 65001,
DAR ES SALAAM.

RE: BABERE BENJAMIN - TO CONDUCTI HIS RESEARCH IN MWANANYAMALA REGIONAL REFERRAL HOSPITAL

The captioned subject refers

2. May you be informed that your request to research Titled "***Evaluating compliance with the National Medical Waste Management Guideline among Health care staffs at Mwananyamala***" ***Start*** **to 6th May,2024**, to **6th June,2024** is asserted.

3. The Institution charges **50,000/=**, as Research fee as per student spent. The payments are to be made upon reporting.

4. May she report to the Administration and HR department head for further instruction.

Thanks.

For: MEDICAL OFFICER INCHARGE
Mwananyamala Regional Referral Hospital
P.O. Box 61665
DAR-ES-SALAAM

Dr. Mkiwa Akida
RESEARCH COORDINATOR
FOR: MEDICAL OFFICER INCHARGE
MWANANYAMALA REGIONAL REFERRAL HOSPITAL

COPY:
Heads of Quality Improvement Department - **MWANANYAMALA REGIONAL REFERRAL HOSPITA**

Babere Benjamin - **Report to the head of Quality Improvement Department**

Appendix V: Digital receipt

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

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EVALUATING COMPLIANCE WITH THE NATIONAL
MEDICAL WASTE CONTROL GUIDELINES AMONG
HEALTHCARE STAFF AT MWANANYAMALA REGION
REFERRAL HOSPITAL, KINONDONI, DAR ES SALAAM

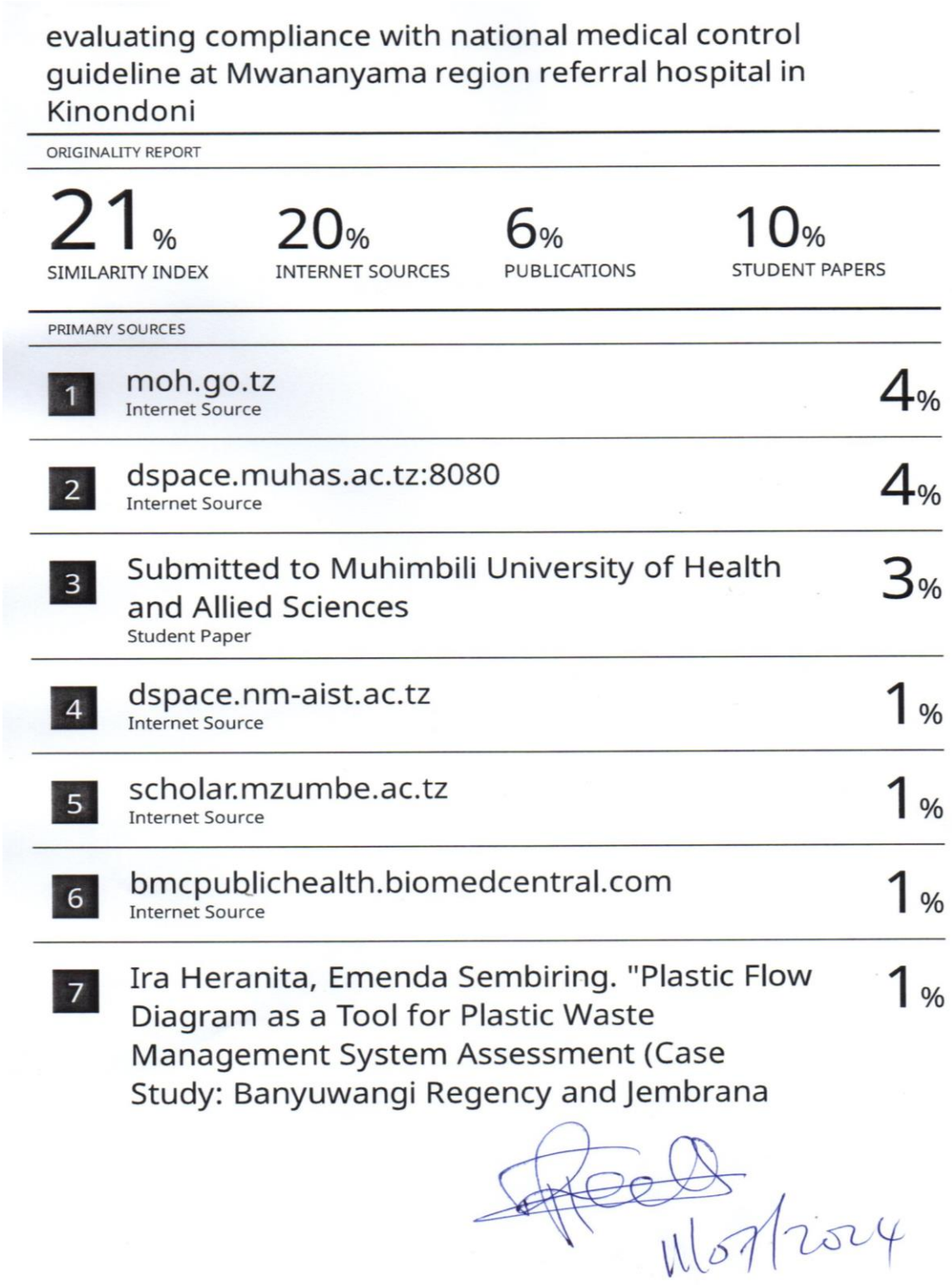
Babere Benjamin

Masters of Project Management, Monitoring and Evaluation in Health
Muhimbili University of Health and Allied Sciences
June 2024

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11/07/2024

Appendix VI: Plagiarism Report



evaluating compliance with national medical control guideline at Mwananyama region referral hospital in Kinondoni

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11/07/2024