COLLEGE OF MEDICINE

Assessing Adherence of Hospital Waste Disposal Management at Mangochi District Hospital

By

Mercy Susan Buluzi

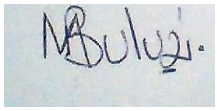
BSc Health Management

A Dissertation Submitted in Partial Fulfilment of the Requirements of the Master of Science in Global Health Implementation Degree

March 2022

DECLARATION

I, Mercy Susan Buluzi hereby declare that this dissertation is my original work and has not been presented for any other awards at the University of Malawi or any other university.

Signature 

Date 31th December 2020

CERTIFICATE OF APPROVAL

The dissertation of Mercy Susan Buluzi is approved by the Dissertation Examination Committee

_____

Associate Prof. Genesis Chorwe (Chairman, Post Graduate Committee)

_____

Daniel L Banda (Supervisor)

_____

Dr Vincent Jumbe (Supervisor)

_____

Dr Z Phiri (Internal Examiner)

_____

Dr Eric Umar (Head of Department)

ACKNOWLEDGEMENTS

I wish to thank Daniel L Banda my academic Supervisor and my secondary supervisor, Dr Vincent Jumbe my Service Advocate for their inputs during the preparation and writing of this dissertation. I also thank Mr Bob Milanzie Faque for his content analysis support. I am also very grateful to all Department of Public Health Staff as well as my colleagues in the MSc-GHI program for their support. My acknowledgements would be incomplete without the mention of my family the Buluzi's and Ruth Ngomba who have always been by my side, and my Friend Elizabeth Kalanga for providing me home throughout my school time.

ABSTRACT

Hospital waste management services are aimed at improving health status of hospital workers and also people surrounding the hospital. This study aimed at assessing adherence of hospital waste disposal management processes at Mangochi District Hospital. Questionnaire and Observations were used in the study to collect data. Results from the study is going to help in the adoption of the most efficient method of waste disposal utilization of health services and providing a basis for designing public health measures for Mangochi District Hospital. Needle prick incidences were high due to improper waste disposal management among workers at Mangochi District Hospital. 427people on ART prophylaxis between 2017 and 2019, 127people were due to needle prick incidences by June 2019 representing 29.7% (Prophylaxis hard cover 2017 to 2019). Therefore, this study's significance was that cleaners acquired knowledge on care to prevent risks and understand the process of waste disposal management, and the managers were reminded to do on job trainings for cleaners. The benefits of proper medical waste management minimized the spread of infections and reduced the risk of accidental injury to staff, patients, visitors and community.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

ART	Anti-Retroviral Therapy
COM	College of Medicine
COMREC	College of Medicine Research and Ethics Committee
CRF	Case Report Forms
DEHO	District Environmental Health Officer
FDG	Focused Group Discussion
IDI	In-Depth Interviews
MDH	Mangochi District Health workers
MK	Malawian Kwacha
OPD	Out Patient Department
SDG	Sustainable Development Goals
U.S. A	United States of America

CHAPTER 1: INTRODUCTION AND OBJECTIVES OF THE STUDY

1.1 Introduction and Background

Hospital waste disposal management is the process of collecting, transporting, processing or disposing, managing and monitoring of waste materials generated during diagnosis, treatment and immunizations of humans and animals with potential health and environment risks [1]. The waste materials include sharps, and non-sharps. Sharp waste contains items that could cause puncture wound, and cuts. Example of sharps include needles, broken glass ampoules, scalpel blades, infusion sets, etc. [2].

Globally 75 % to 90 % of hospital wastes are similar to household refuse or municipal waste and do not entail any particular hazard. The other 10% to 25% is called hazardous medical waste or special waste, and it is; this type of waste that entails health risks that needs to be handled with care. [3]

Poor hospital waste disposal occurs due to lack of awareness about the health hazards. The health hazards related to health-care waste include; inadequate training in proper waste management, absence of disposal systems, insufficient financial and human resources [4] .Addressing all these issues can lead into a good health system with good hospital waste disposal processes. Hospital workers' may be affected by limited interest from hospital administration [5], and hence need for hospital management to take a greater part in hospital waste disposal management. Poor management of health care wastes can pose negative impacts (e.g., injuries,) on patients and people who visit the hospital and those who stay near hospitals, as well as the environment (pollution of soil, air and water) [6].Medical waste management has the benefit of

minimizing the spread of infections and reduces the risk of accidental injury to staff, patients, visitors and community [4].

From the observation made on the ash contents, needles, surgical blades, blood slides, vacutainer tubes, vial bottles, ampoules are not completely destroyed though they are sterilized and denatured, as a result care should be taken when removing ashes in this case [2] The incineration process detoxifies hazardous wastes by destroying most of the organic compounds contained in the wastes. This process is usually selected to treat wastes that cannot be recycled, reused, or disposed of in a landfill site for example sharps [7]. Malawi's Ministry of Health emphasizes that great care should be taken when handling health care wastes as most serious risks are associated with injuries from sharps. When handling health care wastes, sanitary staff and cleaners should always wear protective clothing including (as a minimum) overalls or industrial aprons, boots and heavy duty gloves [8].

In general, hospital waste disposal management services are aimed at improving health status of hospital workers and also people surrounding any hospital. After an occupational injury, healthcare workers (HCW)run a risk of infection with HIV. The WHO estimates that approximately 3 million percutaneous exposures occur worldwide each year among HCWs [9]. Globally, two million health care workers suffer from accidental needle stick injury each year. An estimated 37% needle stick injuries are reported at some stage during health care workers career. Needle stick injury among health care workers could get to as high as 70.3% [10] .How ever no published statistics on needle stick injuries shown on Mangochi District Hospital in Malawi (Prophylaxis hard cover 2017 to 2019). but needle prick incidences are high by 29.7%

according to Prophylaxis hard cover 2017 to 2019 improper waste disposal management among workers at Mangochi District Hospital.

1.2 Statement of the Problem

Improper waste disposal management leads to infection and injuries. Assessing the adherence of waste management, strengths and challenges will help in the adoption of the most efficient method of waste disposal at Mangochi District Hospital.

1.3 Literature Review

1.3.1 Introduction

Hospital waste disposal management services have aimed at preventing infections and injuries. Improper waste disposal management leads to infection and injuries, and a greater portion of needle prick injuries amongst workers at Mangochi District Hospital [Post Exposure Prophylaxis regimen hand book]. This study aimed at assessing adherence of hospital waste disposal management processes among cleaners at Mangochi District Hospital. The following paragraphs discuss the training in health safety, waste containers, color coding and labels, incineration, health systems and hospital waste disposal, conceptual frame work(Donabedian) and recommendations.

1.3.2 Training in Health and Safety

Hospital waste disposal management follows a system of segregation while doing the work and it is continuous, where by all wastes are collected into a place for storage then transported for disposal to pit latrine or for incineration.

Health-care waste cleaners should be trained before starting globally, and routinely update knowledge of prevention and control. Training in health and safety is intended to ensure that workers know and understand the potential risks associated with health-care waste, and rules and procedures required for safe management [11].

Exposure to hazardous health care wastes has been associated with disease and injury. The groups at risk are medical care workers especially nurses, medical laboratory staff, patients, people visiting the hospital, those staying near the hospital and waste management operators outside the hospital. Epidemiological studies indicated that the main concern of infectious hospital wastes is the transmission of HIV and AIDS virus and more often Hepatitis B and C virus through injuries caused by syringes needles contaminated by human blood [12].

WHO estimates that unsafe usage of sharps and other inoculating equipment poses an annual global 20 million infections such as HIV, hepatitis B and C. On the other hand, the environmental pollutions related to hazardous hospital waste disposal have been explored in extensive studies. For example, unsafe transportation and disposal of hazardous hospital wastes such as solvents and reagents can release toxic chemicals into the environment and interrupt the ecological balance [13].

Training in health and safety is intended to ensure that workers know and understand the potential risks associated with health-care waste, and rules and procedures required for safe management. They should be informed of the importance of consistent use of personal protective equipment and should be aware of where to obtain post-exposure follow-up in case of a needle

prick injury or other blood exposures [11].

1.3.3 Waste Containers, Color Coding and Labels

WHO recommends waste container color coding and labels? Waste segregation practices should be standardized nationwide and should be informed by national guidelines/legislation for health-care waste management. Such waste segregation systems should rely on a uniform color coding system which provides a visual indication of the potential risk posed by the waste in that container. The system makes it easier to put waste items into the correct container and to maintain segregation during transport, storage, treatment and disposal [14]. Infectious waste bins should be located as close as possible to where waste is generated (e.g. nursing stations, procedure rooms or points of care). Placing sharps containers and segregation bins on treatment trolleys enables medical staff to segregate waste at the bedside or other treatment site. The simplest and safest waste segregation system is to separate all hazardous waste from non-hazardous general waste (which is generally of a larger quantity) at the point of generation. However, to ensure that staff and patients are protected, the hazardous waste portion is very commonly separated into two parts: used sharps and potentially infectious items, for easy collection into storage then transported for disposal. Poor practices with regard to non-infectious general waste, such as inadequate storage, poor collection and disposal can attract stray animals and waste-pickers thereby becoming breeding grounds for vector-borne, water-based and fecal-oral infections [15].

1.3.4 Incineration

Incinerator releases a wide variety of pollutants depending on the composition of the waste,

which leads to health deterioration and environmental degradation. The major impact on health is the high incidence global burden of diseases like cancer and respiratory symptoms. Other potential effects are congenital abnormalities, hormonal defects, and increase in sex ratio. The effect on the environmental pollution is in the form of global warming and climate change [16]. Hospital waste disposal management affects three sustainable development goals. SDG number three, good health and well-being, SDG number six, clean water and sanitation, SDG number 13, Climate change, SDG number 14, life below water and SDG number 15 life on land [17]. Mangochi is located to the southern part of Lake Malawi and contains life below water and on land and there is indeed need to take extra care in managing hospital wastes to maintain the sustainable development goals.

1.3.5 Health Systems and Hospital Waste Disposal

A well-functioning health system is needed for the hospital waste disposal management to work properly. There should be good governance for the trainings to be organized and for every cleaner to undergo the training before commencement of work. With good leadership, management of financing in resource procurement will be accountably done and documented for future use [18].

On medical supplies, vaccines and pharmaceuticals, a functional health system will make sure there is an availability of gloves, aprons, gumboots, masks and overalls, hepatitis B vaccine and also ARVs (post exposure prophylaxis) for safety in waste disposal management hence prevention of injuries such as needle pricks. All these supplies have to be documented, and information and technology should be used to keep data [18].

Financing should be there for procuring hospital waste disposal management materials like trolley for transportation, buckets for disposal, gloves, overalls, masks, gumboots and also payments for the workers. Health work force in this case cleaners and other waste generators need to be well trained to be skilled and dedicated on their job (Infection prevention trainings for example). Services of hospital waste disposal management has to be delivered daily for cleanliness and with caution for safety of cleaners. [19] Poor waste segregation on point of generation can lead to injuries upon collection for storage, for example one can confidently collects dry wastes bins while somebody has thrown used sharps and this can lead to needle prick injuries.

It is established that unlike health-care workers, waste handlers (mostly those employed by a subcontractor) are not aware of the hazardous nature of health-care waste. As a result, they are involved in inappropriate collection, storage, and hospital waste disposal which is often a major source of accident resulting in injury and infection[20]. The inappropriate hospital waste disposal management also often results in mixing of hazardous wastes and non-hazardous wastes, further exacerbating environmental health risks [20].

1.3.6 Conceptual Framework

This study has used the Donabedian (1980) framework of quality care which conceptualizes that there are three quality of care dimension. The dimensions include structure, process and outcome. Structures refers to the conditions in which care is provided. The structure attributes include, availability of workers (number, qualification of professionals) materials resources like gloves, aprons, gumboots, overalls, masks. These will be assessed through check list. Process

refers to activities that constitute health care interaction between client and care giver. Process include injection which involve collection and segregation of syringe and needle and also paper of these two at point of use from client, other activities include storage of wastes transportation and disposal. These are assessed by nonparticipant observation of hospital waste disposal standards based on factors such as safety of cleaners and other waste generators on collection segregation storage transportation as well as disposal.

The outcome of quality according to Donabedian means good or poor quality of caregiving services on health status. These were included on cleaners' and waste generators safety on service delivery by monitoring reduced accidents (needle prick injuries), and any acquired infection [21]. This was assessed using FDG guide on hospital waste disposal management [22]. Performance of both cleaners and waste generators needs to be assessed through performance staff appraisals to achieve quality waste disposal technique and clean surrounding.

1.4 Justification of the Study

Literature review shows that quality of hospital waste disposal management globally, has high impact on the health status of workers, surrounding people and also on climate change[6] Several studies conducted on hospital waste disposal management indicated that poor waste disposal management leads to needle prick injuries, air, soil and water pollution which result into climate change [8] .Assessing the adherence of hospital waste disposal management, would be used for improvement of hospital waste disposal. The strengths and challenges of waste disposal management helped in the adoption of the most efficient method of waste disposal at Mangochi Hospital.

1.5 Study Objectives

1.5.1 Summary

In this paragraph we have talked about training in health safety, waste containers, color coding and labels, incineration, health systems and hospital waste disposal, conceptual frame work (Donabedian) and summary. It is hence recommended that hospital waste disposal sensitization should be included in selection of waste handlers.

1.5.2 Broad Objective

The broad objective was to assess hospital waste management processes at Mangochi District Hospital.

1.5.3 Specific Objectives

1. To assess adherence of hospital waste disposal management processes by hospital cleaners and waste generators.
2. To assess Knowledge levels on waste disposal management by hospital cleaners and waste generators.
3. To evaluate hospital waste disposal standards among cleaners and other waste generator

CHAPTER 2: STUDY METHODOLOGY

2.1 Study Type

This is an exploratory Cross Sectional research study that used qualitative approach to gather and analyze data. Using this design, it helped researcher to compare the hospital waste disposal standards and what cleaners, Incinerator operators and other waste generators are doing at Mangochi District Hospital.

2.2 Study Place

Study was conducted at Mangochi District Hospital which is located at the center of Mangochi Boma. Mangochi is in the southern part of Malawi.

See the map

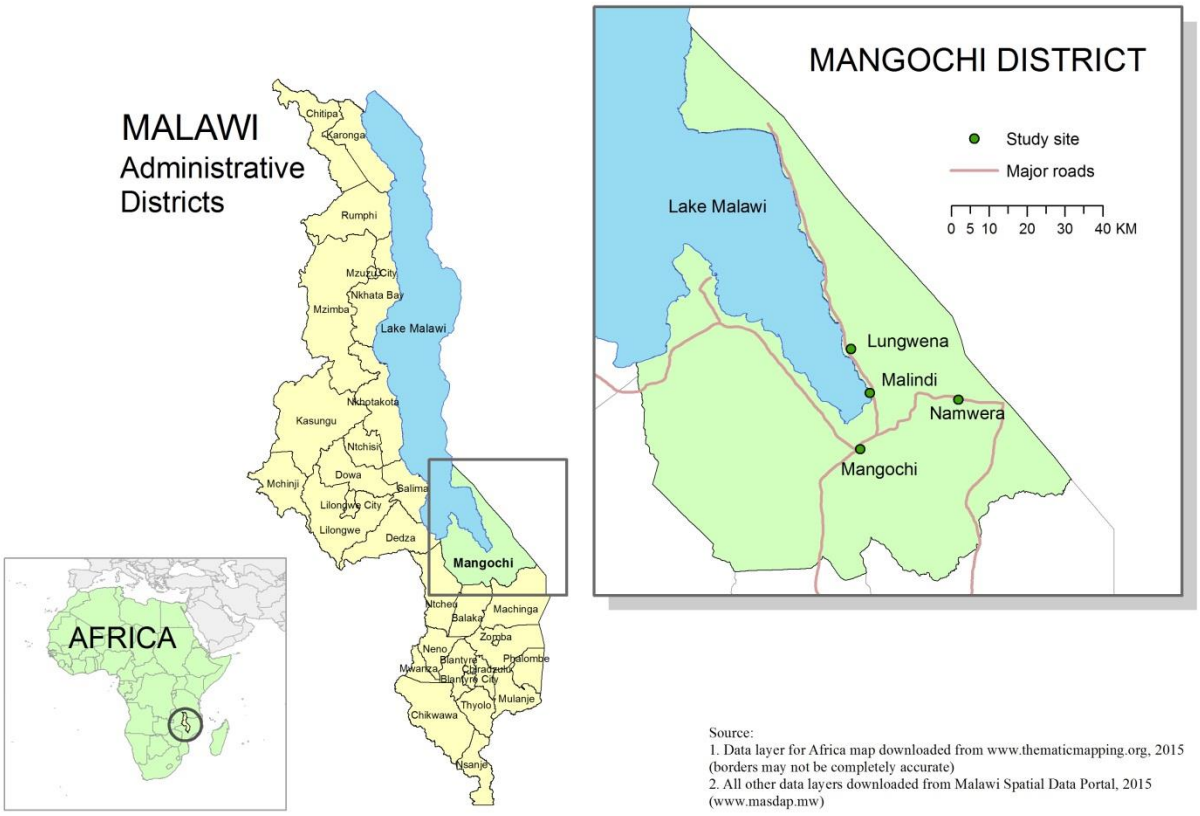


Figure 1: Map of Mangochi

2.3 Study Population

The study population were both male and female, ward in charge from; Pediatric ward, Female ward, Maternity ward, labor ward, theatre, OPD, lab manager and Infection Prevention Coordinator.

2.4 Study Period

The study was implemented between April 15,2020 to August 25, 2020. However, before that, as shown in table 5 below, prior activities were proposal writing and COMREC approval. The study proposal was submitted to the College of Medicine Research and Ethics Committee (COMREC)

in May 2020 for approval. In the interest of time most study activities were done concurrently. data collection, entry and analysis were done concurrently. The whole study (from Proposal development to COMREC approval) happened from 2019 to 2020.

2.5 Sample Size

Supposed to have two groups of 10 hospital attendants each group but two groups of 11 hospital attendants were done on first day and 8 hospital attendants were done on second day,8 other generators (3Nurses,2 from the wards and one Nurse from theatre, 2 Clinicians,1 laboratory technician) with 2 or more years' experience, one ward in charge from Theatre, OPD, pediatric and labor ward, a laboratory manager and Infection Prevention Coordinator. Mangochi District Hospital has a workers' population of 327 and Mangochi district has a cleaners' population of 128 and 22 ground labors and one incinerator assistant. This study used purposive sampling.

2.6 Data Collection

Permission to conduct research at Mangochi District Hospital was granted (Appendix 1). Researcher and purpose of the study was introduced in the participant information sheet (Appendix 2a or Appendix 2b). Informed consent was obtained from study participants (Appendix 3a or Appendix 3B). To collect data, checklist (Appendix 4) was used during observations. After consenting, interviews were recorded using a digital recorder. An interview guide was developed and was used to collect relevant information, no pretesting was done. A total of two FGDs were conducted with cleaners and other hospital waste generators (Appendix 5A or Appendix 5b). Each FGD comprised a maximum of six people, both male and female. In-depth interviews were done with lab Manager, Matron, and Infection Prevention Coordinator

(Appendix 6). Participant observation was also done to evaluate adherence to waste management protocols. Certificate was approved by COMREC (Appendix 7). Budget was prepared and justified (Appendix 8). Gant Chart to show all planned activities and their time frame was used (Appendix 9).Document review was the main part in this research and referencing was properly done.

2.7 Data Management and Analysis

Lockable cabinet were used for data storage and password was used on the study computer. Organizing the data for analysis started right from a write up or transcription of the first interview and a list of all the data was kept, the set of data from each interview or session which lists the place, date and time of the session was identified. Completeness was checked and made sure that the data from each session are complete with no missing pages. Quotations were provided, researchers have been included quotations from different participants to add transparency and trustworthiness to their findings and interpretations of the data [20]. Indexing by numbering each line on the document then sort the data into themes and category. The themes were described and analyzed. Thematic analysis method was found to align better with research aims and objectives, hence the Researcher used thematic analysis method to analyze research data.

Transcripts were initially read through and open coded. The text was read again and categorized into focused, conceptual nodes based on the emergent categories identified through open coding. Memoing was used to record the thoughts and ideas of the researcher throughout the coding process. Theoretical nodes were systematically compared, contrasted and iteratively refined. The

goal of the analysis was to identify core themes through the qualitative analytic technique of coding transcripts. Themes were contextualized with regard to their relationship and implications to the central phenomenon of the hospital waste disposal management.

The following is the step by step process how the thematic analysis was done: Familiarized myself with the data whereby data was transcribed, read and re-read while noting down initial ideas. Generation of initial codes: coded interesting features of the data in a systematic fashion across the entire data set while collating data relevant to each code. Searching for themes: codes were then collated into potential themes and gathered all data relevant to each potential theme that was developed. Reviewing themes: themes were then checked if they are working in relation to the coded extracts and the entire data set. Defining and naming themes: then there was an ongoing analysis to refine the specifics of each theme, and the overall story the analysis was telling. Clear definitions and names for each theme were also generated. Producing the report: analyzed selected extracts, relating analysis related back to the research question and literature then produced a scholarly report of the analysis.

Researcher used qualitative data software to assist with storage, searching and coding qualitative data. Setting up a coding system. Coding was used in every communication. Symbols, shapes, language, written words, gestures, colors, patterns, and images helps in communication[23] A conceptual analysis was used to sum up all codes .Researcher obtained feedback from participants in this case, using purposive sampling of two groups of cleaners including one incinerator person and one group of hospital waste generators (nurses or clinicians) , ward in charges from; Theatre, OPD, Pediatrics and Labor ward one lab manager and an infection

prevention coordinator on the research findings to add validity to the researchers' interpretation by ensuring that the participants' own meanings and perspective are represented by researchers own agenda and knowledge [20] make reference to a shared representation of an idea or concept and create a summary then a report shall be written.

2.8 Study Limitations

On verbal consenting of FDGs, there was a mindset that for every interview they were getting an allowance, hence prefer to be promised something after their involvement. In this study, we explained before everything that the researcher is a student so that such mind set was cleared. To avoid refusals, involvement with their immediate supervisors would helped the researcher, cleaners and managers to have confidence in each other.

2.9 Ethical Consideration

Informed consent was obtained from study participants (Appendix 3a). No names were used on the CRFs. The study was approved from COMREC and permission was granted from Mangochi District Health Ethics Committee.

2.10 Results Presentations

Themes and subthemes were reported. Direct quotes were used to substantiate the themes. A conceptual frame work was used to summarize the findings. Research assistant assisted in note taking during FGD.

Table 1: Observational checklist of results

Observation	**Result per Ward**						
	Female	**Laboratory**	**Labour**	**Male**	**OPD**	**Peads**	**Theatre**
Colour coding segregation if used	No	No	No	No	No	No	No
Segregation system	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Use of disinfection of infected items before disposal	**Yes**	Yes	Yes	No	No	Yes	Yes
Adequate light availability	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Infection prevention measures	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Use of protectives:							
-gloves	Yes	Yes	Yes	Yes	Yes	Yes	Yes
-Masks	Yes	Yes	Yes	Yes	No	Yes	Yes
-Overall	No	No	No	No	No	No	Yes
-Aprons	Yes	Yes	Yes	No	Yes	Yes	Yes
-Gumboots	No	No	No	No	No	No	Yes
Hospital wastes storage place availability	Yes	No	No	Yes	No	Yes	Yes
Hospital wastes treated before transportation	No	Yes	No	No	No	No	No
Mode of transportation for incineration availability	Yes	Yes	No	Yes	Yes	Yes	Yes
Incinerator Fenced	No	No	Yes	No	No	No	No

Cleaners and waste generators were found in their respective wards for observation on how they work using available resources, in charges were explained why researcher was there for. Mangochi District Hospital has two different parts, maternity new wing part with its own incinerator and the hospital itself with another incinerator.

CHAPTER 3: RESULTS

3.1 Introduction

A dissertation will be submitted to College of Medicine, University of Malawi for grading. There are also plans to disseminate the results at local seminars, and workshop as well as dissemination conferences organized by College of Medicine CoM. The report will also be distributed and discussed with Mangochi DHO, including cleaners. Main findings will be published in the Malawi Medical Journal.

This chapter presents findings of the study from Observational check list ,3 IDIs and 3FGDs with cleaners and other waste generators in hospital waste disposal who had about two years' experience. The second part presents themes that emerged in reflection to the research question followed by a summary of the findings.

3.2 Themes Summary

Training in health and safety, the meaning is that Health-care waste cleaners should be trained before starting globally, and routinely update knowledge of prevention and control. Training in health and safety is intended to ensure that workers know and understand the potential risks associated with health-care waste, and rules and procedures required for safe management

Evidence from data:

> *When we were starting, we had training on some things. In NRU, they decided to hire someone to work as locum, the person got sick, that very sickness…He contracted TB, Life was never the same until the person died. We squeeze the*

moppers with our hands, we are mopping the needle syringe may get stuck in the mopper and we are not aware, accidentally you get pricked. And when you get pricked it means you are in danger because you don't know why they injected the patient for. After finishing, whether it was accidental or what can I say maybe laziness, they left a razor on a patient cloth. So when the patient was getting up she grabbed all her things together with razor, and placed them in her bucket. When the guardian was washing, she got cut by it, a big cut that she needed stitches there.

Knowledge on hospital waste disposal management and evidence from data was that:

Sharps are like needles, a needle is pointy and can prick, those that can cut you like razors, and scalpel blades, some sort of ampules, for drugs It can harm us for example syringes, for example about diseases we cannot know what type of disease one suffered from for the used syringe, it can happen that you are taking that syringe home and accidentally it pricks you, automatically that disease can be transmitted to you. A nurse pricked a matress while inserting a cannula and left a cannula needle there. when a cleaner was collecting waste, found the needle there removed and throw it in safety box.

Incinertion meaning that, Incinerator releases a wide variety of pollutants depending on the composition of the waste, which leads to health deterioration and environmental degradation, the major impact on health is the higher incidence global burden of diseases like cancer and

respiratory symptoms; other potential effects are congenital abnormalities, hormonal defects, and increase in sex ratio. The effect on the environmental pollution is in the form of global warming and climate change. Evidence from data:

> *I was accidentally pricked at the incinerator because the safety bottle got open and syringes pierced the bin liner and I did not see that the syringe had pierced the bin liner. When I was lifting it to dump in the incinerator I realized I had pricked myself.*

Barriers to hospital waste disposal management, meaning that these are factors that prevent cleaners and other waste generators from waste disposal management per department. These include, lack of; gloves, gumboots, Aprons, big wheeled bin, bin liners. Evidence from data

> *Let me answer that question, ahh we can take hospital waste home for example if we don't have proper tools, we can take the waste home. am saying this because for example you don't have gumboots you are using your shoes and you want to clean the toilet someone have not properly use the toilet, and incidentally you have step on it so it will remain on the shoes and those feaces are example of waste which you have taken home. Blood, for example you are taking samples a patient and blood spitted onto your cloth and you are going home let's say the patient has hepatitis B if your wife wants to wash that cloth she can get that disease that means hospital waste has been taken home all these can happen due to shortage of proper preventive gear. Thank you very much.*

Health systems meaning that**,** a well function health system was needed for the hospital waste disposal management to work properly. Leadership and governance, there should be good governance for the trainings to be organized and for every cleaner to undergo the training before commencement of work. With good leadership, management of financing in resource procurement will be accountably done and documented for future use. Evidence from data:

> *But now neither matron nor the in charge is seen inspecting on how the floor has been prepared or how the toilets have been cleaned. We don't see that happening and that is why some of us are saying they stopped supervising us. And they just head straight in their offices; maybe about scrubbing yes they do say that tomorrow we should do scrubbing when they note untidiness somewhere. But day to day checks, that I do not know if it happens, maybe in the other wards. (Birds chirping)*

> *We have problems here at Mangochi hospital I don't know if our fellow friends have the same problems in their hospitals. As my fellow friends has explained just to add we don't have enough preventive wear (FDG 1.)*

3.3 Objective: To assess adherence of hospital waste disposal management processes by hospital cleaners and waste generators

3.3.1 Theme 1: Lack of Hospital Wastes Disposal Management Training in Health and Safety

3.3.1.1 Findings on Training in health and safety

Training in health and safety is intended to ensure that workers know and understand the potential risks associated with health-care waste, and rules and procedures required for safe management [11]. Availability of safety guidelines in the working department, use of personal protective equipment, access to safety guidelines and experience seem to be important [24].

Cleaners and other waste generators were all trained before job commencement so that everyone should know and understand the job requirements. Refresher courses are not done at Mangochi District on hospital waste management especially to cleaners to remind them and expose them to new things.

> *Aah on how to clean the hospital no-one taught us on how to work out but it just happened that they just say that as you are here this is how you will be working not us going for a training*.

> *Yes, I think if I am wrong, people, but I think they have been trained some of the staff. yAAH, We have already gone an orientation. Almost starting from the guards.*

Interpretation: Findings shows that no trainings were offered to cleaners before starting the job.

3.3.1.2 Safety is Important

Almost both the cleaners and other waste generators know that safety ii the most important aspect whilst on duty. Other waste generators when on duty do not consider other workers' safety.

> *After finishing, whether it was accidental or what can I say maybe laziness, they left a razor on a patient cloth. So when the patient was getting up she grabbed all her things together with razor, and placed them in her bucket. When the guardian was washing, she got cut by it, a big cut that she needed stitches there.*

Interpretation: No safety due to poor disposal

3.3.1.3 Lack of Protective Wear

Most of the time, cleaners work without full kit of protective wear, and expose themselves to accidents/injuries and their life at risk.

> *We squeeze the mop*pers and they work in hazardous environment with no full kit of protective.

> *In NRU, they decided to hire someone to work as locum. the person got sick, that very same sickness…He contracted TB, Life was never the same until the person died.*

Interpretation: Findings revealed poor protective wear use since they were squeezing mopper with bear hands.

3.4 Objective 2: To assess Knowledge levels on waste disposal management by hospital cleaners and waste generators

3.4.1 Theme 2: Inadequate Knowledge on Hospital Waste Disposal Management

3.4.2.1 Findings on Knowledge on Hospital Waste Disposal Management

Cleaners have little knowledge on hospital waste disposal, others just categorize them into two; wastes and shars while others knew there are three; wet waste, dry waste and sharps. Everybody knows that wastes are infectious, and when dealing with them they need protectives.

> *Waste at the hospital are materials that has been used and when its used, it becomes wastes. Somethings that comes from the person like feces and pus those are some of the wastes which can be found at the hospital (FDG 004)*

> *Waste at the hospital are materials which we use when helping the patient like cotton, gauze and syringes when these materials are used we can say it is hospital waste.*

Interpretation: Reveal many of the cleaners do not know hospital disposal management.

3.4.2.2 Findings on Poor Segregation

Segregation was done only for sharps, which was segregated at the point of generation[25].

No colour coding is used at Mangochi District Hospital. In many departments, waste generators separate the hospital wastes upon disposal into wet waste, dry waste and sharps. The cleaners mix the wet and dry waste upon collecting and tie them in one bin liner for storage, and the incineration man mixes them all upon incineration. At new maternity department, Labour Ward buckets were found dirty with blood all over on observation, due to lack of bin liners.at the department. There are colour coded at big storage bins but they are not used appropriately.

> *Like theater, we always have wet waste and dry waste. so when disposing those waste, we dispose according to those waste they go in wet boxes and dry, the wet goes into wet box and the sharp goes into sharp boxes, that's how we do it.* (FDG 008)

Figure 2: Maternity new wing incineration storage centre

Interpretation: Department had good segregation of wastes like maternity theatre and laboratory

3.4.2.3 Findings on Inadequate Processing and Poor Transportation

Infectious waste bins should be located as close as possible to where waste is generated (e.g. nursing stations, procedure rooms or points of care). Placing sharps containers and segregation bins on treatment trolleys enables medical staff to segregate waste at the bedside or other treatment site. The simplest and safest waste segregation system is to separate all hazardous waste from non-hazardous general waste (which is generally of a larger quantity) at the point of

generation. However, to ensure that staff and patients are protected, the hazardous waste portion is very commonly separated into two parts: used sharps and potentially infectious items, for easy collection into storage then transported for disposal.

Mangochi District Hospital uses wheel chairs for transportation of hospital waste from departments to incinerator for disposal.

> *For the metals or cloth of which are being used in the theatre room are dipped in the water of which 0.5% chlorine is added.*
>
> *They should empty the waste bucket and clean them; if there are some bin liners they need to put them in inside. For the person who is on day duty including covering lunch hour activities should clear the bin including the bin liners. And the one who is taking over from lunch hour should clear everything before knocking off around 17:00 hours.*
>
> *This how we are doing at labor ward and we don't leave them the whole day not at all so when you have used that wheel chair to dispose wastes when the patient comes to, do you use the same wheel chair?*
>
> *A-yes we use the same wheel chair we just wipe it with chlorine (FDG 004)*

Interpretation: Findings revealed lack of transportation for the for the wastes, wheel chair is used for transportation.

3.5 Objective 3: To evaluate hospital waste disposal standards among cleaners and other waste generator

3.5.1 Theme 3: Incineration Problems

3.5.1.1 Findings on Lack of a Hoe at Manual Incinerator

Mangochi District Hospital has two types of incinerators; a manual one at main hospital and an electric one at new maternity wing. All these incinerators work perfectly well only that the manual incinerator needs a hoe for ash removal, there is no hoe, he used only a shovel and he was complaining that this exposes him sometimes to needle prick injuries from unburned needles.

The manual incinerator pollutes air in Mangochi whilst electric incinerator is climate friendly, it was constructed by an expert constructor. It produces less smoke as all the wastes are burnt completely on high temperatures.

> *All: wheelchair same wheel chair can be used to the lab the same as for me from incinerator I don't have to hide we asked one which have tires which we use it to remove wastes from theater to incinerator when the other one was worn out.*
> (FDG 004)

Myself from incinerator the needle pricked me but to say the truth the Clinician helped me he wrote those drugs that we call testing from Tikondane.

Interpretation: Findings confirmed of lack of a hoe at manual incinerator for removal of ashes. However, no problems at the new incinerator.

3.5.1.2 Findings on Injuries

Due to lack of protective wear, it exposes cleaners to so many injuries whilst working.

And our Incinerator is worn out any time it can fall down and also we don't have e hoe used to remove ash, thank you. I was accidentally pricked at the incinerator because the safety bottle got open and syringes pierced the bin liner and I did not see that the syringe had pierced the bin liner. When I was lifting it to dump in the incinerator I realized I had pricked myself. But I did not know for whose patient it was from because it was amongst many things. When I got back to the ward I explained to them that I got pricked by a syringe when I went to dispose waste. They asked me if I had seen the type of syringe to which I responded that I had indeed seen it but could not tell who it was used on. So they tested me and later I was given PEP, 10 tablets which I could not finish the dose. When I finish the dose they said I should get tested again, I did the tests 3 times.(FDG 004).

Interpretation: Findings confirms injuries whilst working like needle prick injuries.

3.5.1.3 Findings on Poor Climate Change Source

Incinerator releases a wide variety of pollutants depending on the composition of the waste, which leads to health deterioration and environmental degradation, The effect on the environmental pollution is in the form of global warming and climate change[16]Electric incinerators are climate friendly.

Mangochi District Hospital has two incinerators, an electric one which is climate friendly and a local one which pollutes air and is a source of air pollution disturbing ozone layer hence climate change.

Interpretation: Findings confirmed that Mangochi is upgrading from air pollution to climate friendly since new wing has electric incinerator.

3.5.2 Theme 4: Poor Health Systems

3.5.2.1 Findings on Inadequate Leadership and Governance

A well function health system was needed for the hospital waste disposal management to work properly. Leadership and governance, there should be good governance for the trainings and supportive supervision to be organized and for every cleaner to undergo the training before commencement of work. With good leadership, management of financing in resource procurement will be accountably done and documented for future use[18].

> *But now neither matron nor the in charge is seen inspecting on how the floor has been prepared or how the toilets have been cleaned. We don't see that happening*

and that is why some of us are saying they stopped supervising us. And they just head straight in their offices; maybe about scrubbing yes they do say that tomorrow we should do scrubbing when they note untidiness somewhere. But day to day checks, that I do not know if it happens, maybe in the other wards. (Birds chirping)

Interpretation: Findings confirms inadequate leadership and governance as no supervision, no refresher courses were happening.

3.5.2.2 Findings on Lack of Medical Supplies, Vaccines and Pharmaceuticals

A functional health system will make sure availability of gloves, aprons, gumboots, masks and overalls, hepatitis B vaccine and also ARVs (post exposure prophylaxis) for safety in waste disposal management. All these supplies have to be documented, and information and technology should be used to keep data [18].

We have problems here at Mangochi hospital I don't know if our fellow friends have the same problems in their hospitals. As my fellow friends has explained just to add we don't have enough preventive wear (FDG 1).

Interpretation: Findings revealed lack of Medical supplies, vaccines and pharmaceuticals as there were no protective wear.

3.5.2.3 Findings on Inadequate Financing

Financing should be there for procuring hospital waste disposal management materials like trolley for transportation, buckets for disposal, gloves, overalls, masks, gumboots and also payments for the workers.

> *They searched and that person from NRU… Volunteered and he was promised to be given two Locum allowances. at the end of doing that chore the person got sick, that very sickness… he contracted TB, Life was never the same until the person died.*

Interpretation: Findings confirmed inadequate financing to have a permanent person with knowledge on that particular ward.

3.5.2.4 Findings on Lack of Performance Appraisal

Assessing performance of both cleaners and waste generators through performance staff appraisals could help to achieve quality waste disposal technique and clean surrounding.

> *The biggest thing they look is that, is the place clean? have they mopped today? are windows clean? but on how we are working we just know on our own that if my friend found these wastes, he/she might not be happy, let me work just to make the place look good but without being appraised, they just see how the department is looking okay.*

Interpretation: Findings confirms lack of performance appraisal.

CHAPTER 4: DISCUSSION OF STUDY FINDINGS

4.1 Introduction

This chapter presents discussion of the study findings. The study findings have been analyzed in relation to the research study's objective, Conceptual framework (Six building blocks) and reviewed literature on assessing adherence of hospital waste disposal management at Mangochi District Hospital.

4.2 Discussion of Findings

This study gives an insight into the exploration of perceptions and experiences of cleaners and waste generators on assessing adherence of waste disposal management at Mangochi District Hospital [26].

About 89 workers out of 338 on ART prophylaxis between 2017 and 2018 were due to needle prick incidences and in 2019 by June 38 workers out of 89 were due to needle prick injuries representing 42.6% (Prophylaxis hard cover 2017 to 2019). Therefore, this study's significance was that cleaners acquired knowledge on care to prevent injuries and understand the process of waste disposal management, and the managers were reminded to do on job trainings for cleaners. The benefits of proper hospital disposal waste management minimized the spread of infections and reduced the risk of accidental injury to staff, patients, visitors and community [27].

This study had several limitations that need to be considered when interpreting the results. First, the estimated compliance of HCWs segregation practice and their associated factors may be subject to reporting errors, because all the information came from the self-reports of the survey

participants. Second, social desirability bias may have been present in the form of the over-reporting of HCW segregation compliance in the survey [28].The study findings suggest that other cleaners were recruited and start working without proper training on their job.one of the cleaners revealed that no trainings are offered on recruitment.

A research on waste and garbage treatment in Istanbul Spain which has been made to evaluate the level of information of hospital health personnel on waste management revealed that, in general, among the professional health employees, 62.1% of medical doctors, 54.5% of nurses and 47.6% of laboratory technicians had more information on hospital waste disposal management [29]. In a similar manner, a study showed that medical doctors, nurses and laboratory technicians were better informed on waste disposal than the cleaning personnel [29].

Due to lack of knowledge and waste disposal materials such as buckets and bin liners there is improper segregation of waste at Mangochi District hospital and hence they mix the wastes in most of the surveyed departments. In some departments even though segregation is performed, sharp wastes are later found mixed with general waste during incineration. So in some departments, segregation is not perfectly performed, despite the availability of specific containers for waste collection. In most of the departments no proper segregation as general waste and sharps waste were observed mixed in common collection buckets. However, Theatre and Laboratory departments try to segregate accordingly, but still wastes were mixed during incineration. Proper segregation of healthcare waste must follow the standardized procedures, according to national guidelines. It is important to segregate waste because it fosters the reduction of risks to healthcare workers, and enhances cost control for hazardous waste disposal by decreasing treatment costs.

In some of these departments the bins were overfilled especially labor ward and female ward. Despite the availability of enough bins in some departments color coding practices were poor. Only an estimation of 10% to 11% practice color coding. This implies that wastes are segregated into infectious and non-infectious wastes but the process does not put into consideration color of the containers, contributing to poor waste disposal management in the departments.

The recommended color coding states that yellow color should be applied to the safety boxes used to collect sharp wastes, needles and syringes and also radioactive waste; red color should be used for containers used to collect infectious wastes and blue/green color should be used for containers used to collect non-infectious wastes. Thus monitoring hospital waste disposal management should be a continuous process involving generation or collection, segregation, transportation, and disposal of hospital waste. Buckets and bin liners of waste collected must be replaced immediately by new ones of the same type. That's, a supply of fresh waste collection buckets and bin liners must be readily available at all times where hospital wastes are produced.

Some of the health problems associated with improper collection; treatment and disposal of health care wastes include typhoid fever, cholera, skin disease malaria, intestinal parasitosis, and hepatitis[30].And also respiratory conditions [31].

WHO guide lines emphases the following; assessment of waste generation, strategies of waste minimization, improved waste segregation, color coding of waste receptacles, closing and tagging of bags, schedules for waste pickup, internal waste transport, storage areas for wastes, management of liquid wastes, economics of healthcare waste management, hospital hygiene, infection control, safe practices for cleaners and waste generators, training, education and public

awareness, healthcare waste management in emergencies, inventory management, personnel management including recruitments, evaluation, feedback and improvement [32]. Adequate knowledge of biomedical waste management would prevent infection and ensure appropriate management of biomedical waste management among cleaners and waste generators [33, 34]. Transportation of hospital wastes is a major problem at Mangochi District Hospital. An incinerator operator collects the hospital wastes using one big black bucket which is placed on patient's wheel chair for transportation, from theatre and it collects from OPD, Female ward, male ward and pediatric ward.

Transporting the waste on hands is a hazardous process because it can harm the waste collectors if not well packed and treated. This can easily lead to transmission of infectious diseases to the health workers [35, 36]. During onsite transportation, hospital waste should be transported within the hospital by means of wheeled trolleys, containers or carts that are not used for other purposes [37].

Colour coding is one of the waste segregation method. Due to lack of knowledge and waste disposal materials such as buckets and bin liners there is improper segregation of waste at Mangochi District hospital and hence they mix the wastes. A nurse pricked a mattress while inserting a cannula and left a cannula needle there. when a cleaner was collecting waste, found the needle there removed and throw it in safety box. Adequate knowledge of biomedical waste management will prevent infection and ensure appropriate management of biomedical waste management among staff nurses [33].

A study revealed on lack of knowledge. The lack of segregation between HW and non-HW, an absence of rules and regulations applying to the collection of waste and the on-site transport to a temporary storage location, lack of proper waste treatment, disposal of MW along with municipal garbage, insufficient training of personnel, insufficient personal protective equipment (PPE) and lack of knowledge about the proper use of such equipment are among the factors contributing to poor HCW management [38, 39]. Our findings are similar to other studies in which technically qualified personnel like the doctors, nurses and lab staffs have high knowledge regarding this rules but was low among sanitary staff [40].

Mangochi District Hospital has two separate buildings as new wing (maternity) and main hospital. Main hospital consists of manual incinerators and new wing has an electric incinerator. The manual incinerators pollute air in Mangochi whilst electric incinerator is climate friendly, it was constructed by an expert constructor. It produces less smoke as all the wastes are burnt completely on high temperatures.

Most of the manual incinerators lack covers for the waste feeding door and in the ashes removing door. And the incinerators are not fenced. Most of the manual incinerators have no ash pits for ashes collection, so he uses a hoe and shovel for ash collection which is hazardous if not completely burnt Improper or incomplete combustion by incinerators can produce pollutant gases which are not environmentally friendly.

Hospital waste handling is a hazardous waste activity which requires a high standard of training [21]. It calls for specific training that depends on the nature of the work in the hospital, the hazards and possibility of worker exposure, and the responsibilities of individual workers [35].

In this study, one of the cleaners who is an incinerator attendant got pricked hence predisposing himself to injuries.

As noted in another study in Libya of sharps injury, it is likely that there is substantial under-reporting of injuries [25]. In this study injuries were caused by hypodermic needles spilling from improperly closed or protruding from overfilled sharps boxes [25], or from sharps incorrectly discarded into thin walled plastic sacks intended only for soft waste. Audit of sharps injuries among a cohort of clinical waste handlers working for a single waste management contractor identified 40 sharps injuries over a three-year study period [25].

Low reporting of injuries may be attributed to the fact that most of the doctors and other technical and nontechnical staff are unaware about a formal system of injury reporting which should be established within the hospital [46]. Mangochi District Hospital has also low reporting injuries which can also be attributed to the fact that most of the waste genarators and cleaners are unaware about a formal system of injury reporting.

This means there is poor waste management disposal management starting from segregation up to disposal. Healthcare facilities should provide periodic training and adequate supplies for the waste handlers [41].

There is need to have a dedicated waste manager. The supervisor in charge of general services and has waste management as part of his job schedule [42]. Hepatitis B and Tetanus immunization should be mandatory for all the staff members especially for those at risk, due to handling of infectious waste [42].

The study done in Nigeria noticed several reasons for poor HCWM in the hospitals but the most prevalent challenges highlighted during the interview section were lack of definite policies/ legislation, lack of budget allocation, lack of rules and regulations, poor training of some hospital staff and lack of implementation/enforcement [43]. Needle stick and sharps injuries can be reduced by taking such measures as supplying standard and safe equipment, holding training workshops regarding safety issues at work environment, providing enough staffing, and cutting down working hours [44, 45].

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion and Recommendations

The study concluded that there is low compliance with standard of hospital waste disposal management at Mangochi District Hospital. Segregation of wastes into infectious and non-infectious waste and color coding practices in the surveyed departments was poor, no regular training and furthermore, untrained cleaners were involved in the process of medical waste management. some lack ash pits for ashes collection, in manual incinerators some parts are missing, e.g., chimneys, covers for the waste feeding door and covers for ashes removing door. The facility is facing financial crisis and receives no enough external funds to support hospital waste disposal management.

It was recommended that hospital waste disposal management guide lines for collection, segregation, storage up to incineration should be followed. Another recommendation is that, all staff should be properly trained, adequate and all materials should be procured to promote safe work environment. Efforts have to be made in reinforcement or implementation of the existing waste management guidelines in each department.

Manual incinerators should be fenced. Healthcare waste handlers need to be adequately trained and provided with enough Personal Protective Equipment. Enough external funds are needed to support hospital waste management (monitoring and evaluation). To make the disposal mechanism of the medical waste effective, action should be taken by the responsible personnel to make sure that all incinerators are in a good working condition and with ash pits for ashes collection.

5.2 Further Research

There is a need for further research on assessing adherence of hospital waste disposal management as a comparison study with other districts in Malawi.

REFERENCES

[1] Chaudhary N, Mahato SK, Chaudhary S, Bhatiya BD. Biomedical waste management in Nepal: a review. Journal of Universal College of Medical Sciences. 2014;2(4):45-52.

[2] Doylo T, Alemayehu T, Baraki N. Knowledge and practice of health workers about healthcare waste management in public health facilities in Eastern Ethiopia. Journal of Community Health. 2019 Apr;44(2):284-91.

[3] Ali M, Wang W, Chaudhry N, et al. Hospital waste management in developing countries: a mini review. Waste Manag Res. 2017;10:1–12.

[4] Garba T. Poor medical waste management (MWM) practices and its risks to human health and the environment: a literature review. Int J Environ Chem Ecol Geol Geophys Eng. 2013;-7:-538–545.

[5] 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;9:1–10.

[6] Hassan AA, Tudor T, Vaccari M. Healthcare waste management: a case study from Sudan. Environments. 2018 Aug;5(8):89.

[7] Manyele SV, Kagonji IS, Mrisho J. Assessment of medical waste incinerator performance based on physical characteristics of ashes. Engineering. 2011 Oct 1;3(10):1045.

[8] Chang SH, Cataldo J. A systematic review of global cultural variations in knowledge, attitudes and health responses to tuberculosis stigma. The International Journal of Tuberculosis and Lung Disease. 2014 Feb 1;18(2):168-73.

[9] van der Maaten GC, Nyirenda M, Beadsworth MJ, Chitani A, Allain T, van Oosterhout JJ. Post exposure prophylaxis of HIV transmission after occupational injuries in Queen Elizabeth Central Hospital, Blantyre, Malawi, 2003–2008. Malawi Medical Journal. 2010;22(1).

[10] Abebe AM, Kassaw MW, Shewangashaw NE. Prevalence of needle-stick and sharp object injuries and its associated factors among staff nurses in Dessie Referral Hospital Amhara region, Ethiopia, 2018. BMC Research Notes. 2018 Dec;11(1):1-6.

[11] Hosny G, Samir S, El-Sharkawy R. An intervention significantly improves medical waste handling and management: a consequence of raising knowledge and practical skills of health care workers. International Journal of Health Sciences. 2018 Jul;12(4):56.

[12] Shaibu SI. An assessment of hospital wastes management in Minna: towards a waste management approach in a growing urban area. Greener Journal of Medical Sciences. 2014;4(1):1-5.

[13] Ansari M, Ehrampoush MH, Farzadkia M, Ahmadi E. Dynamic assessment of economic and environmental performance index and generation, composition, environmental and human health risks of hospital solid waste in developing countries: a state of the art of review. Environment International. 2019 Nov 1; 132:105073.

[14] World Health Organization. Safe management of wastes from health-care activities: a summary. Geneva: World Health Organization; 2017.

[15] Halsnæs K, Trærup S. Development and climate change: a mainstreaming approach for assessing economic, social, and environmental impacts of adaptation measures. Environmental management. 2009 May;43(5):765-78.

[16] Sharma R, Sharma M, Sharma R, Sharma V. The impact of incinerators on human health and environment. Reviews on Environmental Health. 2013 Apr 1;28(1):67-72.

[17] Hák T, Janoušková S, Moldan B. Sustainable Development Goals: a need for relevant indicators. Ecological Indicators. 2016 Jan 1; 60:565-73.

[18] Said SA. Health management information system data quality in the reproductive and child health programs; case study of Mjini district, Zanzibar (Doctoral dissertation), Muhimbili University of Health and Allied Sciences, Tanzania.

[19] World Health Organization. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. Geneva: World Health Organization; 2010.

[20] Tu R, Elling H, Behnke N, Tseka JM, Kafanikhale H, Mofolo I, Hoffman I, Cronk R. A qualitative study of barriers and facilitators to adequate environmental health conditions and infection control for healthcare workers in Malawi. H_2open Journal. 2022 Jan 6.

21] Manyele SV, Kagonji IS. Analysis of medical waste incinerator performance based on fuel consumption and cycle times. Engineering.2012;4:625-635.

[22] Rakhmanova N, Bouchet B. Quality improvement handbook: a guide for enhancing the performance of health care systems. FHI 360; 2017.

[23] Kilmann K, Cataldo F, Seeley J. Introduction to qualitative research methodology: a training manual. United Kingdom: Department for International Development (DfID). 2012. pp.1-4.

[24] Bekele T, Gebremariam A, Kaso M, Ahmed K. Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in Bale Zone, Southeast Ethiopia. PLoS One. 2015 Oct 15;10(10): e0140382.

[25] Karawad L, Elwahaishi S, Elhamrouh A, Altabet A. Assessment of medical solid waste management in misrata healthcare centers and hospitals.

[26] de Casterlé BD, Gastmans C, Bryon E, Denier Y. QUAGOL: a guide for qualitative data analysis. International Journal of Nursing Studies. 2012 Mar 1;49(3):360-71.

[27] Halvorsen T, Munthali A, Braathen SH, Rød JK, Eide AH. Using locational data in a novel mixed-methods sequence design: Identifying critical health care barriers for people with disabilities in Malawi. Social Science & Medicine. 2021. Aug 1;283:114127.

[28] Sahiledengle B. Self-reported healthcare waste segregation practice and its correlate among healthcare workers in hospitals of southeast Ethiopia. BMC Health Services Research. 2019 Dec;19(1):1-1.

[29] Ozder A, Teker B, Eker HH, Altındis S, Kocaakman M, Karabay O. Medical waste management training for healthcare managers-a necessity? Journal of Environmental Health Science and Engineering. 2013 Dec;11(1):1-8

[30] Bassey BE, Benka-Coker MO, Aluyi HS. Characterization and management of solid medical wastes in the Federal Capital Territory, Abuja Nigeria. African Health Sciences. 2006 Jun 13;6(1):59-63.

[31] Ranzi A, Fano V, Erspamer L, Lauriola P, Perucci CA, Forastiere F. Mortality and morbidity among people living close to incinerators: a cohort study based on dispersion modeling for exposure assessment. Environmental Health. 2011 Dec;10(1):1-2.

[32] Doiphode SM, Hinduja IN, Ahuja HS. Developing a novel, sustainable and beneficial system for the systematic management of hospital wastes. Journal of Clinical and Diagnostic Research. 2016 Sep;10(9):LC06.

[33] Dhasarathi K. A study to access the knowledge level on bio-medical waste management among the nurses in Tamilnadu. Junior Research Fellow, School of Public Health, SRM Institute of Science and Technology, Chennai, Tamil Nadu, Hindistan; 2018.

[34] Liu F, Liu HQ, Wei GX, Zhang R, Zeng TT, Liu GS, Zhou JH. Characteristics and treatment methods of medical waste incinerator fly ash: a review. Processes. 2018 Oct;6(10):173.

[35] Manyele S, Lyasenga T. Factors affecting medical waste management in low-level health facilities in Tanzania. Afr J Environ Waste Manag. 2013 Oct; 1:42-55.

[36] Farooq MT, Omar N, Shahid F, Khizar S, Khan A, Manzoor I. Assessment of hospital waste management protocols in tertiary care hospitals of Lahore. Biomedica. 2017 Apr;33(2):136-42.

[37] Ashtari A, Tabrizi JS, Rezapour R, Maleki MR, Azami-Aghdash S. Health care waste management improvement interventions specifications and results: a systematic review and meta-analysis. Iranian Journal of Public Health. 2020 Sep;49(9):1611.

[38] de Lima Moura L, Mahler CF, Caulliraux HM. Development and application of a protocol to assess healthcare waste management. Detritus. 2018 Nov 23(4):157

[39] Ksentin, FZ Adverse effects of the illicit movement and dumping of hazardous, toxic, and dangerous wastes and products on the enjoyment of human rights. Geneva: UN; 2001.

[40] Maina SM, Andrew NK, Caroline WN. Assessment of level of knowledge in medical waste management in selected hospitals in Kenya. Appli Micro Open Access. 2016;2(124):2.

[41] Deress T, Jemal M, Girma M, Adane K. Knowledge, attitude, and practice of waste handlers about medical waste management in Debre Markos town healthcare facilities, northwest Ethiopia. BMC Research Notes. 2019 Dec;12(1):1-7.

[42] Njiru MW. Assessment of the awareness and practice on medical waste management among healthcare personnel at Kenyatta National Hospital, In Nairobi (Doctoral dissertation), Jommo Kenyatta University of Agriculture and Technology, Kenya; 2001.

[43] Sapkota B, Gupta GK, Mainali D. Impact of intervention on healthcare waste management practices in a tertiary care governmental hospital of Nepal. BMC Public Health. 2014 Dec;14(1):1-8.

[44] Ghanei Gheshlagh R, Aslani M, Shabani F, Dalvand S, Parizad N. Prevalence of needlestick and sharps injuries in the healthcare workers of Iranian hospitals: an updated meta-analysis. Environmental Health and Preventive Medicine. 2018 Dec;23(1):1-1.

[45] Lakbala P, Azar FE, Kamali H. Needlestick and sharps injuries among housekeeping workers in hospitals of Shiraz, Iran. BMC research notes. 2012 Dec;5(1):1-5.

[46] Madhukumar S, Ramesh G. Study about awareness and practices about health care waste management among hospital staff in a medical college hospital, Bangalore. Iranian Journal of Basic Medical Sciences. 2012 Apr;3(1):7-11.

APPENDICES

Appendix 1: Letter of Permission to Conduct Research at Mangochi District Hospital.

Telephone: 01 [illegible]
Fax: 01 [illegible]
e-mail: mangochi.hmis@malawi.net

All correspondence should be addressed to The Director of Health and Social Services

In reply please quote Ref. No.

MINISTRY OF HEALTH
MANGOCHI DISTRICT HOSPITAL
P.O. BOX 42
MANGOCHI

Director of Health and Social-Welfare Services

Our Ref.:
Your Ref.:

02nd March, 2020

Dear Ms. Mercy Susan Buluzi,

RE: "ASSESSING ADHERENCE OF HOSPITAL WASTE DISPOSAL MANAGEMENT IMPLEMENTATION AT MANGOCHI DISTRICT HOSPITAL"

I write to inform you that Mangochi District Health Office Research and Ethics Committee reviewed the proposal which you submitted for the above mentioned study. I am pleased to inform you that your proposal **was approved.**

As you proceed with the study, I would like you take note of the following:

1. The Research and Ethics Committee will monitor the conduct of the approved study within the mentioned study period, and any deviation from the approved study may result in your study being stopped.
2. You will be required to submit a copy of the final report at the end of the study to Mangochi District Health Office through the Research and Ethics Committee.

Yours sincerely,

2020/03/02

Dr. Chimwemwe Thambo
For. Director of Health and Social Services

MINISTRY OF HEALTH
MANGOCHI DISTRICT HOSPITAL
02 MAR 2020
DIRECTOR OF HEALTH AND SOCIAL SERVICES
P. O. BOX 42, MANGOCHI

Appendix 2a: Participant Information Sheet

Introduction and purpose of the study

Hie, my name is **Mercy Susan Buluzi,** I'm currently conducting a research study to collect information on Assessing adherence of hospital waste disposal management Implementation at Mangochi District Hospital. I hope the information gathered will help in coming up with the adoption of the most efficient method of waste disposal utilization of health services and providing a basis for designing public health measures for Mangochi Hospital

I would like to request for your time to answer a number of questions about yourself, your work and things that happened here at the work place

Once you understand the study and ask questions, you will be asked to sign the consent form or make your mark or finger print in front of myself. I will give you a copy of this document to keep.

If you agree to participate have a self-administered questionnaire that I would like to complete with you. Most of the questions asked is about your work place on training, infection prevention, incineration and your supervisors. The questionnaire will take about 10-15 minutes to answer all the questions.

All the information that you will provide will be treated with confidentiality. Names will not be used; instead you will be given a code that will be used.

You are selected to participate in the study because your age is between 24 and 45 and you work as a cleaner/in charge/laboratory manager/DEHO (circle where applicable) here at Mangochi District Hospital.

If you choose not to respond to any of my questions, there will be no problem and your decision will not in any way affect your working activities or your salary. If you agree to participate in the study, I will read out a consent form to you and request you to sign/thumbprint to prove that you have voluntarily participated.

If you have any further questions now or after the research, please contact me or my Supervisors on the following address below:

Mercy Susan Buluzi, College of Medicine, Private Bag 360, Blantyre. Cell: 0999 282 816, 0880 624 466. email: buluzim@yahoo.com

Daniel L. Banda, College of Medicine, Private Bag 360, Blantyre. Chichiri, Cell: 0997 295 898, 0884 596 936; Email: bandadl@medcol.mw

Dr Vincent Jumbe, College of Medicine, Private Bag 360, Chichiri, Blantyre. Cell: 0888310655; Email: vjumbe@medcol.mw

College of Medicine Research and Ethics Committee(COMREC), Private Bag 360, Chichiri, Blantyre. Phone:0118711911. Email: comrec@medcol.mw

Appendix 2b: Participant Information Sheet Translated to Chichewa

UTHENGA KWA OTENGA NAWO MBALI MKAFUKUFUKU

Chiyambi ndi cholinga cha kafukufuku

Moni, dzina langa ndine **Mercy Susan Buluzi**, ndikupanga kafukufuku wofuna kupeza zifukwa zomwe Okonza pachipatala amakanikira kutsata ndondomeko za mmene ayenera kukonzera zoyipa za m'chipatala, mutauni ya Mangochi. Ndikukhulupirira kuti zosatira za kafukufukuyu zidzathandiza kupeza njira zothetsera vuto limeneli m'bomali.

Ndikufuna ndikupempheni nthawi yanu pang'ono kuti muyankhe mafunso okhuzana ndi ntchito yanu,aphunziro aliwonse okhudza ntchitoi,zokhudza kuntaya kootcha komanso amene amakuyang'anirani.

Mutatha kumvetsetsa ndondomeko ya kafukufukuyu ndi kufunsa mafunso omwe mungakhale nawo, ndizakupemphani kuti musayine, kapena kuika chizindikilo, kapena kudinda chala pa chikalata chopemphera chilolezo pa maso pa mboni ngati mwasankha kutenga mbali pakafukufukuyu. Muzalandira chimodzi mwazikalata ziwirizi, zomwe mutasinire kuti mukasunge kunyumba kwanu

Ngati mwavomera kutenga nawo mbali mukafukufuku ameneyu, muzapemphedwa kuyankha mafunso. Ambiri mwa mafunso amenewa akhuza za kukanika kutsata ndondomeko za mmene ayenera kukonzera zoyipa za m'chipatala, mutauni ya Mangochi.

Zikutengerani phindi pakati pa khumi ndi khumi ndi zisanu kuti muyankhe mafunso amenewa. Mbiri yanu yonse izasungidwa mwachinsinsi. Dzina lanu silidzagwiritsidwa ntchito, m'malo mwake mudzadziwika pogwiritsa ntchito nambala yomwe mudzapatsidwe.

Mwasankhidwa kutenga nawo gawo pa kafukufuku ameneyu chifukwa mumagwira ntchito pa chipatala pano ndipo muli ndi zaka zapakati pa 24 ndi 45.

Muli ndi ufulu kusankha kutenga nawo mbali kapena osatenga nawo mbali mukafukufukuyu. Ngati mwasankha kusatenga nawo mbali, sizingasokoneze malipiro anu kapena ntchito yanu.Ngati mwasankha kutenga mbali ndidzakuwelengerani chikalata chopempha chilolezo chanu ndipo mudzadinda kapena kusainira, kuonetsa kuti simunakakamizidwe kutengapo mbali mukafukufukuyu.

Ngati muli ndi mafunso aliwonse wokhuzana ndi ufulu wanu monga wotenga nawo mbali mukafukufuku mukhoza kufunsa panopa kapena kudzalemba kalata ndi kutumiza kwa ;

Mercy Susan Buluzi, College of Medicine, Private Bag 360, Blantyre. Cell: 0999 282 816, 0880 624 466. email: buluzim@yahoo.com

Daniel L. Banda, College of Medicine, Private Bag 360, Blantyre. Chichiri, Cell: 0997 295 898, 0884 596 936; Email: bandadl@medcol.mw

Dr Vincent Jumbe, College of Medicine, Private Bag 360, Chichiri, Blantyre. Cell: 0888310655; Email: vjumbe@medcol.mw

College of Medicine Research and Ethics Committee(COMREC), Private Bag 360, Chichiri, Blantyre. Phone:0118711911. Email: comrec@medcol.mw

Appendix 3a: Informed Consent

Dear participant,

Introduction and purpose of study

My name is **Mercy Susan Buluzi;** I am currently studying Master in Global Health Implementation at College of Medicine, University of Malawi.

I am conducting a research study on ***'Assessing adherence of hospital waste disposal management Implementation among cleaners at Mangochi District Hospital'***. I would be grateful if you would help by participating in this study.

The aim of the study is to Assess adherence of hospital waste disposal management processes among cleaners at Mangochi District Hospital

You have been selected to participate in this study because your age is between 24 and 45 and you work as a cleaner/in charge/laboratory manager/DEHO (circle where applicable) here at Mangochi District Hospital.

Study procedures

By participating in this study, you will be requested to answer questions on adherence of hospital waste disposal management Implementation among cleaner. The questionnaire will take about 10-15 minutes of your time.

Potential risks/discomforts

There are no known direct risks and discomforts associated with the study. We will make sure that we are not disturbing your work.

Alternatives to participate

Your decision to participation in this study or not is voluntary. If you choose to participate in the study, you are free to withdraw at any time. Your decision to participate or decline will not affect your job salary.

Potential benefits

There will be no direct benefit to you as a participant at the moment. However, findings from the study will help in coming up with the adoption of the most efficient method of waste disposal utilization of health services and providing a basis for designing public health measures for Mangochi Hospital

Confidentiality

Information that you give will be treated with confidentiality and numbers will be used instead of names to ensure anonymity. In addition, there will be no link between individuals and questionnaires. When we analyze your answers we will put them together with answers from other participants. All the questionnaires will be locked away. However, your answers may be viewed by the College of Medicine Research and Ethics Committee and other authorized agents.

Further information and clarification.

For questions or any inquiry that you may think may be related to the research, you can contact me or my Supervisor on the contacts below:

Mercy Susan Buluzi, College of Medicine, Private Bag 360, Blantyre. Cell: 0999 282 816, 0880 624 466. email: buluzim@yahoo.com

Daniel L. Banda, College of Medicine, Private Bag 360, Blantyre. Chichiri, Cell: 0997 295 898, 0884 596 936; Email: bandadl@medcol.mw

Dr Vincent Jumbe, College of Medicine, Private Bag 360, Chichiri, Blantyre. Cell: 0888310655; Email: vjumbe@medcol.mw

College of Medicine Research and Ethics Committee(COMREC), Private Bag 360, Chichiri, Blantyre. Phone:0118711911. Email: comrec@medcol.mw

Signing this consent form indicates that you have read the consent form (or have it read to you), that your questions have been answered to your satisfaction and that you voluntarily agree to participate in this research study. You will receive a copy of this signed consent form.

I ……. have read the above information or had it read to me, understood it fully and wish to voluntarily participate in this study.

Signature…….

(Or thumb print)

Date …….....

Witness……. (For illiterate participant only)

Participant code: ……

Name of person obtaining Consent: ……

Signature: ……

Appendix 3b: Informed Consent Form Translated to Chichewa

CHIKALATA CHOPEMPHA CHILOLEZO KWA OTENGA NAWO MBALI.

Mutu wa kafukufuku: ***Kafukufuku wofuna kupeza zifukwa zomwe Okonza pachipatala amakanikira kutsata ndondomeko za mmene ayenera kukonzera zoyipa za m'chipatala, mutauni ya Mangochi***

Ine ndine **Mercy Susan Buluzi**, ndikupanda kafukufuku wofuna kupeza zifukwa zomwe Okonza pachipatala amakanikira kutsata ndondomeko za mmene ayenera kukonzera zoyipa za m'chipatala, mutauni ya Mangochi. Ndikukhulupilira kuti zotsatira zakezidzathandiza kupeza njira zoyenerera zomwe Okonza pachipatala amakanikira kutsata ndondomeko za mmene ayenera kukonzera zoyipa za m'chipatala, mutauni ya Mangochi.

Ndondomeko ya Kafukufuku

Mutatha kumvetsetsa ndondomeko ya kafukufuyu ndi kufunsa mafunso onse omwe mungakhale nawo ndizakupemphani kuti musayine, kapena kuyika chizindikilo, kapena kudinda ndi chala pa chikalata chopemphela chilolezo, pa maso pa mboni ngati mwasankha kutenga mbali pa kafukufukuyu.

Mukupemphedwa kutenga nawo mbali chifukwa ndinu: chifukwa mumagwira ntchito pa chipatala pano ndipo muli ndi zaka zapakati pa 24 ndi 45.

Chiopsyezo pakutenga nawo mbali

Palibe chiopsyezo chinachilichonse pakutenga nawo mbali mukafukufuku ameneyu. Tiyesetsa posakusokonezani ntchito zomwe mukugwira pa chipatala pano.

Phindu potenga nawo gawo

Palibe phindu la chuma kapena phindu limene mungaliwone pompo pompo mukatenga nawo mbali. Koma zotsatira za kafukufuku ameneyu zidzathandiza kupeza njira zothetsera vuto

lokanikira kutsata ndondomeko za mmene ayenera kukonzera zoyipa za m'chipatala, mutauni ya Mangochi.

Chinsinsi

Mbili yanu yonse izasungidwa mwachinsinsi. Dzina lanu silidzagwilitsidwa ntchito, m'malo mwake muzaziwika pogwiritsa ntchito nambala yomwe mudzapatsidwe.

Ufulu wotenga nawo mbali/osatenge nawo mbali

Muli ndi ufulu kusankha kutenga nawo mbali kapena osatenga nawo mbali mukafukufukuyu. Ngati mwasankha kusatenga nawo mbali, sizingasokoneze alipilo anu apamwezi.. Ngati mwasankha kutenga mbali ndidzakuwelengerani chikalata chopempha chilolezo chanu ndipo mudzadinda kapena kusainira, kuonetsa kuti simunakakamizidwe kutengapo mbali mukafukufukuyu.

Mafunso ndi zina zokhuza kafukufuku

Ngati muli ndi mafunso aliwonse wokhuzana ndi ufulu wanu monga wotenga nawo mbali mukafukufuku mukhoza kufunsa panopa kapena kudzalemba kalata ndi kutumiza kwa ine

Mercy Susan Buluzi, College of Medicine, Private Bag 360, Blantyre. Cell: 0999 282 816, 0880 624 466. email: buluzim@yahoo.com

Daniel L. Banda, College of Medicine, Private Bag 360, Blantyre. Chichiri, Cell: 0997 295 898, 0884 596 936; Email: bandadl@medcol.mw

Dr Vincent Jumbe, College of Medicine, Private Bag 360, Chichiri, Blantyre. Cell: 0888310655; Email: vjumbe@medcol.mw

College of Medicine Research and Ethics Committee(COMREC), Private Bag 360, Chichiri, Blantyre. Phone:0118711911. Email: comrec@medcol.mw

Mulinso ndi ufulu wofunsa wapampando wa COMREC, polembera ku keyala iyi: COMREC, P/Bag 360, Chichiri Blantyre 3 kapena pa lamya iyi; 01 871 911.

Mukasayina chikalata chopempha chilolezo zikutanthauza kuti mwawerenga (kuwelengedwa kwa inu) mafunso anu onse ayankhidwa ndipo mwakhutitsidwa bwino lomwe, ndipo inu mwasankha mosakakamizidwa kutenga nawo mbali mukafukufukuyu.

Ine……..

ndikuvomereza kuti ndondomoke yonse, ndi cholinga, zokhuzana ndi kafukufuku zafotokozedwa mwatsatanetsatane ndipo ndikuvomera kutenga nawo mbali mukafukufuku ameneyu.

Sayini _____ Tsiku _____

Kudinda chala _____

Mboni_____ (Kwa amene samatha kuwerenga ndi kulemba)

Nambala ya wotenga nawo mbali _____

Dzina la munthu amene akupempha chilolezo_____

Sayini_____ Tsiku_____

Appendix 4: Observation Check List

Code……. Date: ___ / ___ / ___ Day Month Year

Instruction: tick everything that is observed available that which is done

A. Surrounding

1. Colour coding segregation if used

2. Segregation system

3. Use of disinfection of infected items before disposal

4. Adequate light availability

5. Infection Prevention measures

6. Use of Protectives: -Gloves

-Masks

-Overall,

-Aprons

-Gumboots

7. Hospital wastes storage place availability

8. Hospital wastes treated before transportation

9.Mode of transportation for incineration availability

10. Incinerator Fenced

Appendix 5a: Focused Group Discussion Guide

NAME OF DEPARTMENT…….....

CADRE…….

DATE OF INTERVIEW

NUMBER OF PRTICIPANTS……

1.Define hospital Waste?

Answer:

2. Where do hospital wastes come from?

Answer:

3.**explain on waste regulations at Mangochi District Hospital**

Answer:

4. Explain the procedure of hospital waste disposal?

Answer:

5.How is hospital waste Regulated at Mangochi hospital?

Answer:

6. Can you mention 3 hospital wastes that you know and where exactly are they generated?

Answer:

7. What Are "sharps"?

Answer:

8.How should sharps be disposed?

Answer:

9.Who as allowed to dispose of sharps?

Answer

10.What are hospital packaging and labeling requirements?

Answer:

11.How Should hospital waste Be Stored?

Answer:

12.What should be done with used waste containers?

Answer:

13.Can hospital wastes be mixed with other wastes?

Answer:

14. What are the waste tracking requirements?

Answer:

15.Explain why it is not good for hospitals to let patients take home hospital waste?

Answer:

16. How many times a year do you receive the training?

Answer:

17. Explain how performance appraisals are arranged and done.

Answer:

18. Any history of disease due to poor waste disposal at this hospital?

Answer:

19. How many needle prick incidences this month?

Appendix 5b: Focus Group Discussion Guide Translated in Chichewa

KUKAMBIRANA M'MAGULU

NAME OF DEPARTMENT…….....

CADRE…….

DATE OF INTERVIEW

NUMBER OF PRTICIPANTS……

1.Kodi zoipa za m'chipatala nchiani?

Yankho:

2.Nanga zoipa za m'chiapatalazi zimachokera kuti?

Yankho**:**

3.Fotokozani Ndondomeko ya kakaonzedwe ka zoipa m'chpatala cha Mangochi pano?

Yankho:

4. Tatchulani Mitundu itatu ya zoipa za m'chipatala ndi malo omwe zimapangidwira?

Yankho:

5.Kodi zoipa za m'chipatala zingasungidwe bwanji podikilira kutayidwa?

Yankho:

6.Zoipa zobayazi zitayidwe bwanji?

Yankho**:**

7.Kodi zoipa za zobaya n'chiani?

Yankho:

8.Kodi zobaya za m'chipatala zitayidwe motani

Yankho:

9.Kodi amayenera kutaya zoipa za m'chipatala ndi ndani?

Yankho:

10.Talongosolani ndondomeko ya kanyamulidwe ka zoipa mchipatala kuchokera malo omwe zapangidwa.

Yankho:

11.Kodi zoipa za m'chipatala zisungidwe bwanji?

Yankho:

12.Kodi ma kontena/ma bikiri otayiramo zoipa za m'chipatala asamalidwe bwanji mukataya zoipa?

Yankho:

13.Kodi zoipa za m'chipatala zikhoza kusakanizidwa?

Yankho:

14. Kodi zochitira kalondolondo wa zoipa za m'chipatala ndi ziti?

Yankho:

15.Fotokozani kuipa kotenga zoipa za m'chipatala kupita nazo kunyumba

Yankho:

16. Kodi mumalandira maphuziro a zoipa za m'chipatala kangati pachaka?

Yankho:

17.Fotokozani za mmene amayezera kagwiridwe kanu ka ntchito.

Yankho:

18.Alipo adadwakako chifukwa cha kusasamalira zoipa pa chipatala pano?

Yankho:

19.Mwenzi uno wobayidwa ndi za majakisoni analipo angati?

Appendix 6: Managers Interview Guide

DATE OF INTERVIEW: …….

DEPARTMENT…….

MANAGER CODE: …….

Instruction: tick the appropriate attribute as the interviewee responds

DEMOGRAPHIC DATA

Sex of interviewee

Age in years

Years of experience

Cadre

Level of education

a. PERIOD OF EXPERIENCE

How long have you been working as a manager? .....

MANAGER ROLE IN HOSPITAL WASTE MANAGEMENT SERVICES

1. What role do you play in the provision of these services?

.....

.....

2.What history do you ask on enrollment of cleaners?

……

……

3. What do you check on their certificate on enrollment?

.....

.....

4. What information do you give to cleaners before and after training?

.....

.....

5.How long ago did you give the cleaners and other waste generators a training on hospital waste disposal management

……

……

……..

6.When last did you give a refresher or in service training?

.....

.....

.....

7.How often do you perform staff appraisals in a year?

.....

8. Any history of disease due to poor waste disposal at this hospital?

.....

9. How many needle prick incidences this month?

.....

D. PROBLEMS ENCOUNTERED WHEN PROVIDING TRAININGS ON HOSPITAL WASTE DISPOSAL

1. What problems do you encounter

……..

……

2. What are the general comment?.....

Appendix 7: Certificate of Approval

aproval letter.pdf

Appendix 8: Budget and Justification

8.1 Budget for the Study

Table 2: Proposed budget for the study

ITEM	QUANTITY	AMOUNT (MK)
Sensitization Hospital Ethics team		**108,000.00**
Stationery		**30,000.00**
Airtime		**20,000.00**
Comrec 10 %		**15,800**
Total		**173,800.00**

A total of MK158,000.00 will be needed for stationery, airtime, and sensitization of Mangochi hospital research committee.

8.2 Justification of Budget

Investigator used her own funds since there was no external funding. The total budget for the study was MK158.000.00. The study needed sensitization to the Mangochi research committee upon approval by COMREC for snacks and drinks, Air time for communication with Mangochi research team and also with study participants. A rim of paper was bought for questionnaires and printing was done for both English and Chichewa questionnaires.

In order for this study to be conducted, the researcher needed to get approval from COMREC since data needed confidentiality. In this case, she needed COMREC processes in order for the board to review the proposal, and proposal was approved.

Appendix 9: **Gantt Chart Showing Planned Activities and Time Frame**

Activity	Time Frame					
	April to Sept 2019	**October 2019**	**Nov 2019 to March 2020**	**April to June2020**	**June to December 2020**	**January 2021**
2 pager proposal development and presentation						
Full proposal dev.						
Full proposal dev. and COMREC submission						
Data Collection on hospital waste disposal						
Data cleaning Data Analysis						
Report writing						
COMREC Submission for grading						
Results dissemination						

Appendix 10: Manuscript

COLLEGE OF MEDICINE

Assessing adherence of hospital waste disposal management at Mangochi District Hospital

By

Mercy Susan Buluzi

BSc Health Management

(Msc-GHI 201870094905)

A Manuscript Submitted in Partial Fulfilment of the Requirements of the Master of Science in Global Health Implementation Degree

ABSTRACT

Background. Hospital waste management services are aimed at improving health status of hospital workers and also people surrounding the hospital. Needle prick incidences are high due to improper waste disposal management among workers at Mangochi District Hospital. This study aimed at assessing adherence of hospital waste disposal management processes at Mangochi District Hospital.

Method. Questionnaire and Observations were used in the study to collect data.

Conclusion: The benefits of proper medical waste management minimize the spread of infections and reduce the risk of accidental injury to staff, patients, visitors and community.

INTRODUCTION

Hospital waste disposal management is the process of collecting, transporting, processing or disposing, managing and monitoring of waste materials generated during diagnosis, treatment and immunizations of humans and animals with potential health and environment risks (1). The waste materials include sharps, and non-sharps. Sharps waste contains items that could cause puncture wound, and cuts. Example of sharps include needles, broken glass ampoules, scalpel blades, infusion sets, etc(2).

Globally 75 % to 90 % of hospital wastes are similar to household refuse or municipal waste and do not entail any particular hazard. The other 10% to 25% is called hazardous medical waste or special waste, and it is this type of waste that entails health risks that need to be handled with care. (3)

Poor hospital waste disposal occurs due to lack of awareness about the health hazards. The health hazards related to health-care waste include; inadequate training in proper waste

management, absence of disposal systems, insufficient financial and human resources (4). Addressing all these issues can lead into a good health system with good hospital waste disposal processes.

Hospital workers' may be affected by limited interest from hospital administration(5) and hence need for hospital management to take a greater part in hospital waste disposal management.

Poor management of health care wastes can pose negative impacts (e.g., injuries) on patients and the community, as well as the environment (pollution of soil, air and water)(6).

Medical waste management has the benefit of minimizing the spread of infections and reduces the risk of accidental injury to staff, patients, visitors and community (4).

From the observation made on the ash contents, needles, surgical blades, blood slides, vacutainer tubes, vial bottles, ampoules are not completely destroyed though they are sterilized and denatured, as a result care should be taken when removing ashes in this case (2)

The incineration process detoxifies hazardous wastes by destroying most of the organic compounds contained in the wastes. This process is usually selected to treat wastes that cannot be recycled, reused, or disposed of in a landfill site for example sharps(7).

Malawi's Ministry of Health emphasizes that great care should be taken when handling health care wastes as most serious risks are associated with injuries from sharps. When handling health care wastes, sanitary staff and cleaners should always wear protective clothing including (as a minimum) overalls or industrial aprons, boots and heavy duty gloves(8)

Hospital waste disposal management services strive to improve the health of hospital employees as well as the general public. After an occupational injury, healthcare workers (HCW)run a risk

of infection with HIV. The WHO estimates that approximately 3 million percutaneous exposures occur worldwide each year among HCWs(9). Globally, two million health care workers suffer from accidental needle stick injury each year. An estimated 37% needle stick injuries are reported at some stage during health care workers career. Needle stick injury among health care workers could get to as high as 70.3%(10). However, the adherence of hospital waste disposal management processes by hospital cleaners and waste generators at Mangochi District Hospital has been rated due to a lack of hospital waste disposal management training in health and safety.

METHODOLOGY

This was an exploratory cross-sectional research study that gathered and analyzed data using a qualitative approach. A group of eight other generators (nurses or clinicians) with two or more years of experience, two groups of ten hospital attendants each (supposed to have 10 hospital generators too but due to busy that day only 8 made it), And was supposed to have one ward in charge from Theatre, OPD, pediatric, and labor wards, as well as a laboratory manager and an infection prevention coordinator for one-on-one interviews, but only the Infection Prevention Coordinator, Laboratory manager, and Matron representing all the wards were available, resulting in a total of 31 participants. At Mangochi District Hospital, a researcher compared hospital waste disposal standards with what cleaners and other trash sources are doing.

Results

Researcher used thematic analysis method to analyze research data. Transcripts were initially read through and open coded. The text was read again and categorized into focused, conceptual nodes based on the emergent categories identified through open coding. The goal of the analysis was to identify core themes through the qualitative analytic technique of coding transcripts.

Themes were contextualized with regard to their relationship and implications to the central phenomenon of the hospital waste disposal management.

FINDINGS

Objective 1: To assess adherence of hospital waste disposal management processes by hospital cleaners and waste generators.

No code segregation was applied in all of the wards at Mangochi District Hospital, according to the observation check list. Use of disinfection of items before disposal was done in most of the wards. In all of the wards, adequate lighting was provided, and all procedures were clearly visible. Infection prevention measures like use of protectives gloves was being used by most of the wards at Mangochi District Hospital. Masks were being used by most of the wards except outpatient department. Overalls are used in theatre only. Aprons were being used by most of the wards. Gumboots in use in theatre only at Mangochi District Hospital. Wastes were stored in most of the wards at Mangochi hospital, and wastes were only processed before transportation in the laboratory section of Mangochi District Hospital. At Mangochi District Hospital, only one bin with wheels was utilized to transport incineration to all wards save the maternity department. Only at the maternity department of the Mangochi District Hospital is the incinerator fenced.

Results -Lack of hospital wastes disposal management Training in health and safety.

Findings: Three focus groups with cleaners with around two years of experience in hospital waste disposal were used. During the FGDs, a note taker aided in taking notes. According to the findings, refresher training on hospital waste management are not provided in the Mangochi District, particularly for cleaners, to remind them of their responsibilities and introduce them to new information.

CHAPTER 5: DISCUSSION OF STUDY FINDINGS

The findings of the study revealed the need for Mangochi District Hospital to implement the most efficient waste disposal and health-care use methods, as well as serve as a platform for the creation of public-health programs. As a result of this study cleaners gained knowledge about how to avoid dangers and understand the waste disposal process, and supervisors were reminded to provide on-the-job trainings for cleaners. Literature revealed that, Training in health and safety is intended to ensure that workers know and understand the potential risks associated with health-care waste, and rules and procedures required for safe management(11). Availability of safety guidelines in the working department, use of personal protective equipment, access to safety guidelines and experience seem to be important(12).It is important that Cleaners and other waste generators were all trained before job commencement so that everyone should know and understand the job requirements. The Donabedian (1980) framework of quality care was employed in this study, which conceptualizes three quality of care dimensions. The system makes it easier to properly dispose of garbage and maintain segregation during transportation, storage, treatment, and disposal(13).

This research looks into the perceptions and experiences of cleaners and trash generators when it comes to evaluating waste disposal management at Mangochi District Hospital(14).

Other cleaners may have been hired and started working without sufficient training, according to the findings of the investigation. One of the cleaners claimed that no recruitment training is provided. One cleaner said "*In NRU, They decided to hire someone to work as locum the person got sick, that very sickness…He contracted TB, Life was never the same until the person died."* Training in health and safety is intended to ensure that workers know and understand the potential risks associated with health-care waste, and rules and procedures required for safe

management. The inappropriate segregation of trash at Mangochi District Hospital is due to a lack of expertise and waste disposal supplies such as buckets and bin liners, and as a result, the wastes are mixed in majority of the assessed departments. Sharp wastes are later found intermingled with ordinary waste during incineration in several departments, despite isolation. As a result, despite the availability of specific trash collection containers, segregation is not ideal in some departments. In most departments, there was no effective segregation, and general waste and sharps waste were mixed in the same collecting containers. However, despite the efforts of the Theatre and Laboratory departments to segregate trash appropriately, wastes were still intermingled during incineration. According to national requirements, proper segregation of healthcare waste must adhere to defined protocols. Segregating waste is crucial because it reduces risks to healthcare workers and improves cost control for hazardous waste disposal by lowering treatment costs.one cleaner narrated "*After finishing, whether it was accidental or what can I say maybe laziness, they left a razor on a patient cloth. So when the patient was getting up she grabbed all her things together with razor, and placed them in her bucket. When the guardian was washing, she got cut by it, a big cut that she needed stitches there."* Monitoring hospital waste disposal management should be a continuous activity that includes waste generation, segregation, transportation, and disposal. Waste collection buckets and bin liners must be replaced immediately with new ones of the same type. That is, where hospital waste is generated, a supply of new trash collecting buckets and bin liners must be readily available at all times.

Typhoid fever, cholera, skin illness malaria, intestinal parasitosis, and hepatitis are some of the health concerns linked to poor collection, treatment, and disposal of health care wastes (15) and

also respiratory conditions(16). These would drastically be minimized if proper waste management is enforced at Mangochi District Hospital.

Assessment of waste generation, waste minimization strategies, improved waste segregation, color coding of waste receptacles, closing and tagging of bags, schedules for waste pickup, internal waste transport, waste storage areas, management of liquid wastes, economics of healthcare waste management, hospital hygiene, infection control, and safe practices are all highlighted in the WHO guide lines(17). Cleaners and garbage generators with adequate knowledge of biomedical waste management would be able to avoid infection and ensure proper biomedical waste management(18,19).

At the Mangochi District Hospital, transportation of hospital trash is a big issue. An incinerator operator gathers hospital garbage from theatre, OPD, female ward, male ward, and pediatric ward using one large black bucket that is placed on the patient's wheel chair for transportation.

Transporting waste by hand is dangerous because, if not properly packed and managed, it might harm waste collectors. Infectious infections can easily be transmitted to health care personnel as a result of this.(20,21) Hospital garbage should be transferred within the hospital using wheeled trolleys, bins, or carts that are not being used for other purposes during onsite transit(22).

One of the trash segregation methods is color coding. The inappropriate segregation of trash at Mangochi District Hospital is due to a lack of information and waste disposal supplies such as buckets and bin liners. As a result, the wastes are mixed. While inserting a cannula, a nurse pierced a mattress and left a cannula needle there. When a cleaner was collecting trash, he discovered a needle that had been withdrawn and thrown away in a safety box. Staff nurses with

adequate understanding of biomedical waste management will be able to avoid infection and ensure proper biomedical waste management(18).

Our research revealed a knowledge gap on waste management at Mangochi District Hospital. The health care workers lacked knowledge of separation between hazardous and non-hazardous waste. the lack of rules and regulations governing waste collection and on-site transport to a temporary storage location, the lack of proper waste treatment, the disposal of wastes with municipal garbage, insufficient personnel training, insufficient personal protective equipment (PPE) and a lack of knowledge about how to use such equipment(23,24) Our findings are comparable to those of other studies, in which technically qualified individuals such as doctors, nurses, and lab technicians have a high level of awareness about the rules, whereas sanitation workers have a low level of understanding(25).

The new wing (maternity) and the main hospital at Mangochi District Hospital are two independent buildings. Manual incinerators are used in the main hospital, whereas an electric incinerator is used in the new wing. Manual incinerators harm the air in Mangochi, but an electric incinerator is environmentally benign and was built by a professional constructor. It emits less smoke since all of the wastes are thoroughly burned at high temperatures.The garbage feeding door and the ashes removing door on most manual incinerators are both missing covers. In addition, there are no fences around the incinerators. Because most manual incinerators lack ash pits for ash collection, he collects ashes with a hoe and shovel, which is dangerous if not entirely burned. Incinerator combustion that is improper or incomplete can release pollutant gases that are harmful to the environment.

Hospital waste disposal is a hazardous waste activity that necessitates extensive expertise(26). It calls for specialized training based on the nature of hospital work, the hazards and potential for worker exposure, and individual worker duties. (20).

In this investigation, one of the cleaners, who works as an incinerator attendant, was pricked, putting him at risk of injury. He narrated "*I was accidentally pricked at the incinerator because the safety bottle got open and syringes pierced the bin liner and I did not see that the syringe had pierced the bin liner. When I was lifting it to dump in the incinerator I realized I had pricked myself"*

Another research of sharps injuries in Libya found that there is likely to be significant under-reporting of injuries [25]. Hypodermic needles overflowing from poorly closed or protruding from overfilled sharps boxes caused injuries in this investigation [25], or from sharps that were mistakenly thrown out in thin-walled plastic sacks meant only for soft garbage. Over the course of a three-year investigation, a cohort of clinical waste handlers working for a single waste management contractor discovered 40 sharps injuries [25].

Mangochi District Hospital likewise has a low injury reporting rate, which can be explained by the fact that most waste generators and cleaners are ignorant of a formal injury reporting system.

This indicates that there is a lack of waste management, starting with segregation and ending with disposal. Healthcare facilities should provide waste handlers with regular training and adequate supplies.(27).

There is a requirement for a full-time trash manager. The supervisor in charge of general services is also in charge of garbage management(28). Immunization against Hepatitis B and Tetanus

should be required for all employees, particularly those who are at risk from infectious waste handling (28).

The study in Nigeria discovered a number of reasons for poor HCWM in hospitals, but the most common issues raised during the interview section were a lack of clear policies/legislation, a lack of budget allocation, a lack of rules and regulations, poor training of some hospital staff, and a lack of implementation/enforcement (29). Needle stick and sharps injuries can be decreased by providing standard and safe equipment, offering training seminars on workplace safety issues, having enough staffing, and reducing working hours, among other things (30)(31).

CONCLUSION

The study found that in Mangochi District Hospital, there is a low level of compliance with hospital waste disposal management standards. In the assessed departments, waste segregation into contagious and non-infectious waste and color coding practices were poor, there was no regular training, and untrained cleaners were involved in the medical waste management process. Some lack ash pits for ash collection, and some equipment, such as chimneys, covers for the waste feeding door, and covers for the ashes removing door, are missing from manual incinerators. The facility doesn't have enough external source of funding to finance hospital waste management. It was suggested that hospital waste disposal management guidelines be followed for collection, segregation, storage, and combustion. Another suggestion is that all employees be adequately taught and that all materials be obtained in order to foster a safe working environment. In each department, efforts must be made to strengthen or implement the existing waste management rules. Another suggestion is that with good leadership, resource acquisition financing will be more accountable and documented for future use (32). In terms of medical supplies, vaccines, and pharmaceuticals, a well-functioning health system will ensure

the availability of gloves, aprons, gumboots, masks, and overalls, as well as the hepatitis B vaccine and ARVs (antiretroviral therapy) for waste disposal safety and the prevention of injuries like needle pricks (32).

Manual incinerators should be surrounded by a fence. Healthcare waste handlers must be properly trained and provided with suitable PPE. To support hospital waste management, sufficient finances are required (monitoring and evaluation). To ensure that the medical waste disposal system is effective, responsible staff should ensure that all incinerators are in good operating order and equipped with ash pits for ash collecting.

Further research

There is a need for further research on assessing adherence of hospital waste disposal management as a comparison study with other districts in Malawi.

REFERENCES

[1] Chaudhary N, Mahato SK, Chaudhary S, Bhatiya BD. Biomedical waste management in Nepal: a review. Journal of Universal College of Medical Sciences. 2014;2(4):45-52.

[2] Doylo T, Alemayehu T, Baraki N. Knowledge and practice of health workers about healthcare waste management in public health facilities in Eastern Ethiopia. Journal of Community Health. 2019 Apr;44(2):284-91.

[3]Ali M, Wang W, Chaudhry N, et al. Hospital waste management in developing countries: amini review. Waste Manag Res. 2017;10:1–12.

[4] Garba T. Poor medical waste management (MWM) practices and its risks to human health and the environment: a Literature review. Int J Environ Chem Ecol Geol Geophys Eng. 2013;-7:-538–545.

[5] 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: 1–10

[6] Hassan AA, Tudor T, Vaccari M. Healthcare waste management: a case study from Sudan. Environments. 2018 Aug;5(8):89.

[7] Manyele SV, Kagonji IS, Mrisho J. Assessment of medical waste incinerator performance based on physical characteristics of ashes. Engineering. 2011 Oct 1;3(10):1045.

[8] Chang SH, Cataldo J. A systematic review of global cultural variations in knowledge, attitudes and health responses to tuberculosis stigma. The International Journal of Tuberculosis and Lung Disease. 2014 Feb 1;18(2):168-73.

[9] van der Maaten GC, Nyirenda M, Beadsworth MJ, Chitani A, Allain T, van Oosterhout JJ. Post exposure prophylaxis of HIV transmission after occupational injuries in Queen Elizabeth Central Hospital, Blantyre, Malawi, 2003–2008. Malawi Medical Journal. 2010;22(1).

[10] Abebe AM, Kassaw MW, Shewangashaw NE. Prevalence of needle-stick and sharp object injuries and its associated factors among staff nurses in Dessie Referral Hospital Amhara region, Ethiopia, 2018. BMC Research Notes. 2018 Dec;11(1):1-6.

[11] Hosny G, Samir S, El-Sharkawy R. An intervention significantly improves medical waste handling and management: a consequence of raising knowledge and practical skills of health care workers. International Journal of Health Sciences. 2018 Jul;12(4):56.

[12] Shaibu SI. An assessment of hospital wastes management in Minna: towards a waste management approach in a growing urban area. Greener Journal of Medical Sciences. 2014;4(1):1-5.

[13] Ansari M, Ehrampoush MH, Farzadkia M, Ahmadi E. Dynamic assessment of economic and environmental performance index and generation, composition, environmental and human health risks of hospital solid waste in developing countries: a state of the art of review. Environment nternational. 2019 Nov 1; 132:105073.

[14] World Health Organization. Safe management of wastes from health-care activities: a summary. Geneva: World Health Organization; 2017.

[15] Halsnæs K, Trærup S. Development and climate change: a mainstreaming approach for assessing economic, social, and environmental impacts of adaptation measures. Environmental management. 2009 May;43(5):765-78

[16] Sharma R, Sharma M, Sharma R, Sharma V. The impact of incinerators on human health and environment. Reviews on environmental Health. 2013 Apr 1;28(1):67-72.

[17] Hák T, Janoušková S, Moldan B. Sustainable Development Goals: A need for relevant indicators. Ecological indicators. 2016 Jan 1; 60:565-73.

[18] Said SA. Health management information system data quality in the reproductive and child health programs; case study of Mjini district, Zanzibar (Doctoral dissertation), Muhimbili University of Health and Allied Sciences, Tanzania.

[19] World Health Organization. Monitoring the building blocks of health systems: a handbook of indicators and their measurement strategies. Geneva: World Health Organization; 2010.

[20] Tu R, Elling H, Behnke N, Tseka JM, Kafanikhale H, Mofolo I, Hoffman I, Cronk R. A qualitative study of barriers and facilitators to adequate environmental health conditions and infection control for healthcare workers in Malawi.H_2open Journal. 2022 Jan 6.

21] Manyele SV, Kagonji IS. Analysis of medical waste incinerator performance based on fuel consumption and cycle times. Engineering.2012;4:625-635.

[22] Rakhmanova N, Bouchet B. Quality improvement handbook: a guide for enhancing the performance of health care systems. FHI 360; 2017.

[23] Kilmann K, Cataldo F, Seeley J. Introduction to qualitative research methodology: a training manual. United Kingdom: Department for International Development (DfID). 2012 P.1-4

[24] Bekele T, Gebremariam A, Kaso M, Ahmed K. Factors associated with occupational needle stick and sharps injuries among hospital healthcare workers in Bale Zone, Southeast Ethiopia. PloS One. 2015 Oct 15;10(10): e0140382.

[25] Karawad L, Elwahaishi S, Elhamrouh A, Altabet A. Assessment of medical solid waste management in misrata healthcare centers and hospitals.

[26] de Casterlé BD, Gastmans C, Bryon E, Denier Y. QUAGOL: a guide for qualitative data analysis. International Journal of Nursing Studies. 2012 Mar 1;49(3):360-71.

[27] Halvorsen T, Munthali A, Braathen SH, Rød JK, Eide AH. Using locational data in a novel mixed-methods sequence design: Identifying critical health care barriers for people with disabilities in Malawi. Social Science & Medicine. 2021. Aug 1;283:114127.

[28] Sahiledengle B. Self-reported healthcare waste segregation practice and its correlate among healthcare workers in hospitals of southeast Ethiopia. BMC Health Services Research. 2019 Dec;19(1):1-1.

[29] Ozder A, Teker B, Eker HH, Altındis S, Kocaakman M, Karabay O. Medical waste management training for healthcare managers-a necessity? Journal of Environmental Health Science and Engineering. 2013 Dec;11(1):1-8

[30] Bassey BE, Benka-Coker MO, Aluyi HS. Characterization and management of solid medical wastes in the Federal Capital Territory, Abuja Nigeria. African Health Sciences. 2006 Jun 13;6(1):59-63.

[31] Ranzi A, Fano V, Erspamer L, Lauriola P, Perucci CA, Forastiere F. Mortality and morbidity among people living close to incinerators: a cohort study based on dispersion modeling for exposure assessment. Environmental Health. 2011 Dec;10(1):1-2.

[32] Doiphode SM, Hinduja IN, Ahuja HS. Developing a novel, sustainable and beneficial system for the systematic management of hospital wastes. Journal of Clinical and Diagnostic Research. 2016 Sep;10(9):LC06.