

Analysis Of Health Care Waste Management Among Health Workers In Kanungu Town Council, Kanungu District In South Western Uganda: A Case Study Of Kanungu Health Centre IV

Friday Christopher¹, Ntirandekura Moses², Masembe Muhammad³, Kanyesigye Shallon⁴, Akakikunda Teddy⁵, Natwijuka Crispus⁶

¹Assistant Lecturer, Kampala International University/Metropolitan International University, Uganda

fridaychristopher@rocketmail.com

+256781447337

²Assistant Lecturer, Kampala International University/Metropolitan International University

³Human Resource Manager, Kampala International University

⁴Librarian, Kabale Secondary School

⁵Assistant Lecturer, Kabale University

⁶Assistant Lecturer, Kampala International University

Abstract: *The study was aimed at establishing the effect health care waste management among health workers. It was guided by the following objectives which were to identify the methods used to manage health wastes and to assess the effectiveness of the methods used to manage health waste. This study used a descriptive survey research design which utilized both qualitative research methods and quantitative approaches. A sample size of 67 respondents was used. Purposive and simple random sampling techniques were used in selecting samples. Data was collected using questionnaires, interviews and documentary review. Findings indicate that 40% of the respondents pointed out that health waste are stored in Pedal bins, 24% of the respondents pointed out black refuse plastic buckets, 18% of the respondents pointed out that red clinical waste plastic bag are used as a storage container for medical wastes while 14% cited black refuse plastic bag and only 4% of the medical facilities had standard metal dust bin. Generally, in all the surveyed healthcare facilities medical wastes are collected and stored in a common area awaiting disposal/treatment. It was observed that waste was not allowed to accumulate within the wards or treatment rooms, which is a good. It was furthermore reported that health waste is stored for a minimum of eight hours before disposal. It was observed that Pedal bins were used as temporary storage containers at both surveyed health posts and were used to transport clinical waste from point of generation to storage room are always cleaned and disinfected after use. However, the locations of the temporary storage receptacles are not secure and are accessible to both people and animals. It was reported that the regular mode of transport observed for transportation of medical waste to storage room in health facilities was indeed by red pedal bins. This was also supported by questionnaire respondents. It was reported by medical waste handlers that pedal rigid plastic bins are used to facilitate easier and safer waste transfer to the temporary storage room. According to the observation made by the researcher, these storage facilities were very few thus most of the wastes were mixed up in many health facilities. For example, many health centers ha one or two waste bins as shown in table 4.9 below and no health center more than three types of waste storage facilities. Effectiveness of health waste management in health facilities was reported in hospital compared to other health facilities because 30% of the respondents revealed that effectiveness of medical waste management was excellent in health centers, 40% indicated that it was very good, 20% indicated good while only 10% indicated poor. It was also indicated that 12% of respondents revealed that in clinics effectiveness of medical waste management was excellent followed by 20% who reported that it was very good, 20% indicated good, while 28% indicated poor. In health post, effectiveness in waste management was reported by 20% who revealed that it was excellent, 20% indicated very good, 30% indicated good while 30% revealed that it was poor. The above findings imply clinics and health posts do not have an effective management framework for collecting data on medical waste generated. Interview results reveal that all surveyed clinics and health posts do not keep or record any clinical waste management information. The study established that many waste handlers in health facilities did not have enough protective clothing because some workers were seen carrying medical wastes with bare hand while others used disposable gloves that are not strong enough to protect them. On the issue of waste treatment only incineration was used in some health centers but most of the leftovers at the incineration points show that it was in most cases incomplete. This causes risk to the waste handlers and the communities adjacent to health centers due to pollution. In addition, heap of medical wastes was commonly seen in the vicinity of different health centers meaning that dumping was also used to dispose of some wastes. This becomes a problem as many people were seen trying to scavenge through the rubbish looking for somethings that could be useable thus causing a threat to their lives and the environment in general. From findings effectiveness of health waste management in health facilities was reported in to be fair especially the hospital compared to other health facilities. This was attributed to the fact that they are better established in terms of space and equipment as they are government aided than other health facilities. The study recommendations that:*

- Clinics and health centers should have weighing facilities so as to have quantified statistics of clinical waste generated. This will assist them in making informed decisions regarding clinical waste generated and disposed of.

- Healthcare facilities should be benchmarked using a standard by which clinical waste may be measured in comparison to clinical waste management best practices at similar facilities. When benchmarks are established healthcare facilities will be able to monitor themselves and compare their performance with peer groups within the country, region or the whole world.
- Documents pertaining to quantity of clinical waste generated and health care waste management practices in clinics/health post should be maintained and updated.
- Proper training should be provided to healthcare workers, ancillary staff, patients and everyone involved in the clinical waste management process regarding appropriate segregation practices and potential hazards associated with improper procedures such as handling without personal protective equipment.
- Healthcare facilities managers should ensure that adequate protective clothing is available and waste handlers wear full protective clothing at all times when handling clinical waste.

Keywords: Health, Wastes, Management

SECTION ONE INTRODUCTION

Background of the study

Health care wastes also called medical wastes are by-products of health care activities. They comprise of sharp objects such as syringes, needles and blades; non-sharps, such as swabs and bandages; blood and body parts; chemicals, such as mercury, solvents and disinfectants; pharmaceuticals and radioactive materials. They also include expired, unused, split and contaminated pharmaceutical products such as drugs, vaccines, and sera that need to be disposed appropriately. In addition, they discarded items contaminated from use in the handling of pharmaceuticals, such as bottles or boxes with residues, masks, connecting tubing, syringe bodies and drug vials (WHO 2008). Failures in health care waste management (HCWM) are increasingly accumulating adverse environment and public health conditions in many developing world cities (UkamakaUwa 2014).

Health care is very important for our health and wellbeing. But the waste extracted from medical practice can be harmful, poisonous and even deadly because of their hazardous nature, high potential for diseases transmission and environmental degradation (Caniato, 2015). Thus, indiscriminate disposal of medical waste from health care facilities has been of growing concern worldwide.

Poor management of waste increases infections to humans in terms of injuries, spread of pathogens and diseases as well as environmental pollution. According to the United States Environmental Agency, medical waste has been identified as the 3rd largest known source of dioxin air emission and contributor of about 10% of mercury emissions to the environment from human activities (Patwaris, 2011). The study further noted that the generation of biomedical waste has increased and their management continues to be a major challenge in the recent decades.

There is a growing awareness across the world that waste is a resource which should not be abandoned and left to land filling sites. However, there exist certain types of waste such as infectious health-care waste that are considered too hazardous to be recycled and reused without pretreatment (Yay, 2015). According to World Health Organization, around 75% - 90% of the waste generated across healthcare facilities can be considered as non-hazardous; it is the remaining 10–25% which cannot be ignored (WHO, 2011). This may consist of infectious, radioactive, toxic or genotoxic items. Such waste items pose environmental and occupational health risks. It acts as an agent in the transmission of infections because it contains micro-organisms which can be communicated by invasion followed by multiplication in body tissues (Askarian, 2015). These transmitted pathogens can cause disease or diverse health impacts to humans. Improper healthcare waste management puts the patients, healthcare workers; waste handlers and community at risk in terms of risks from inadequate storage, transportation and disposal; and from the environmental perspective, risks arising from burning hazardous wastes in open pits or badly maintained incineration equipment cause a lot of pollution of the land water and air (Caniato, 2015).

In recent years, the generation of Health wastes has increased significantly owing to an increase in population. An increase in the number of healthcare facilities and use of disposable medical products has caused great harm to the environment (Taghipour and Mosaferi, 2015). Management of medical wastes is dominated by technology concerns comprising incineration, safe landfill; sterilization; autoclaves and microwaves, chemical disinfection; and transportation. Autoclaving is a process of disinfecting materials by using the intense amount of heat and pressurized steam (Tia, 2011). However, management of the generated waste is still a problem in many parts of the world. According to WHO (1999), the technology aspects should focus on safe, efficient and sustainable methods of handling, treatment and disposal of wastes from healthcare activities. The elements comprise segregation, packaging and treatment for reduction in volume, transporting, processing of (hazardous and nonhazardous waste) and disposal (UkamakaUwa 2014).

One of the problems Uganda faces today is the improper handling and disposal of solid wastes. In a study conducted in July 2003 established that more than 45% of the health care providers interviewed reported at least one needle stick injury in 12 months. The study further established that 38% of the health facilities visited had sharps and other wastes on ground or in other un-supervised areas, exposing the community to injuries (Ministry of Health 2012). During the evaluation of injection safety and health care waste management (HCWM) in Uganda, it was found out that 92% of waste handlers have poor waste disposal methods, 3.4 % have acceptable waste disposal methods and 4.6 % have good waste disposal methods (United States Agency for International Development, 2010). Therefore, medical waste management is one of the biggest challenges health facilities are facing in addressing the growing quantity of waste generated.

In Kanungu Town Council medical waste pose significant health hazards affecting many categories of people within the medical field and from outside if not handled properly. Though a number of strategies have been put in place such as segregation, mutilation, disinfection, storage, transportation and final disposal to manage medical wastes they have not been effective. Despite the efforts used to train medical workers on how to handle medical waste and provision of disposal facilities, medical waste management is still poor in Kanungu Town council. It is against this background that this study was conducted to assess the medical waste management practices used by health care facilities in Kanungu Town council, assess the effectiveness and suggest strategies for proper management of medical wastes.

Statement of the problem

The problem of health wastes is growing rapidly throughout the world as a direct result of rapid population and growth urbanization which has led to increase in the number of health care facilities such as hospitals, health centers, clinics and diagnostic laboratories that exert a tremendous negative impact on human health and the environment. Improper medical waste management puts the patients, healthcare workers, waste handlers and community at risk. In Kanungu district, basic handling and disposal procedures have not been adhered. There is continuous mixing of medical waste with other wastes handled by Kanungu Town council. Several efforts have been put in place such as legal and institutional framework to enhance good medical waste management; however, it is still evident that poor handling and disposal of medical wastes in the Town council rampant. Therefore, this study was conducted to identify the methods used to manage medical waste, assess the effectiveness of the management practices and suggest strategies that can be used to promote proper medical waste management in Kanungu Town Council.

Purpose of the study

The purpose of the study was to identify methods used to manage health wastes, assess their effectiveness and suggest strategies for proper health management in Kanungu Town Council.

Objectives of the study

- i. To identify the methods used to manage health wastes.
- ii. To assess the effectiveness of the methods used to manage health wastes.

SECTION TWO

RESEARCH METHODOLOGY

Research Design

The descriptive research design was employed in this research. Descriptive research design involves observing and describing the behavior of a subject without influencing it in any way. This was established by use of data for testing cause and effect relationship. The research design was supported by both qualitative and quantitative research approaches. Qualitative approach enabled the researcher to give a complete, detailed description of phenomenon while quantitative approach enabled the researcher to construct statistical models in an attempt to explain the findings. Quantitative approach provided comparisons and statistical aggregation of data.

Study population

The study population was 80 comprising of health care staff, patients' attendant, patients, Town council leaders and communities adjacent to the health care centers in Kanungu Town Council.

Sample Selection

Since it was difficult to carry out the study in the whole population, Purposive Sampling was used in selecting the study population such as health care staff, patients' attendant, patients, Town council leaders and communities adjacent to the health care centers in order for the researcher to obtain only reliable information for the study. It was suitable for this study due to the fact that there were specific respondents who serve specific purposes (roles) in their positions. Random sampling was used to select individual respondents in the sampled categories because it gave each of the subjects an equal chance of being selected thereby ensuring a high degree of representativeness. Simple random sampling was done by writing pieces of papers indicating Yes and No and was folded and mixed in a box. Respondents were allowed to pick one by one until the required sample is got.

Sample size

Sample size is the representative of the whole population. The researcher used a sample of 67 respondents which was reached using Israel Glen (2012) formula $n = \frac{N}{1 + N(e^2)}$ where N is the target population, n is the sample size, e is the margin of error (0.05)

$$\text{Sample size} = n = \frac{\text{Study population}}{1 + \text{Study population (Margin of Error)}}$$

$$n = \frac{80}{1 + 80(0.05^2)} = \quad n = \frac{80}{1 + 80(0.0025)} = \frac{80}{1.2} = 67$$

Data Collection Instruments

The researcher used different data collection instruments which included questionnaire, interview guide and documentary checklist.

Questionnaire

The data was obtained using questionnaire. The tool was used to collect information from only those respondents who know how to read and write. A research questionnaire containing carefully framed questions was used to collect data for the study. This tool was used because of being cheap to use in the limited time and collected responses with minimum errors and high level of confidentiality.

Interview Guide

The researcher conducted interviews with respondents in relation to the set objectives using a set of questions from the predesigned interview guide. This helped to get information from individuals who may have limited time to answer the questionnaire and those who may not know how to read and write. The guide was designed in English and was interpreted in the local language by the researcher. It also helped the research to observe the body language used during the interview and stimulate detailed discussion to get the required information.

Observation

This was an important technique for the study and it involved careful observing and recording the actual situation. In this approach, the researcher visited medical waste disposal areas and communities around health centers in Kanungu Town Council. During these visits, the researcher observed how medical wastes are disposed of. This method was used because the researcher needed to be in touch with what was taking place and know the actual methods and tools used by medical facilities in the area to manage different forms of wastes so as to determine their quality and effectiveness or appropriateness of the methods.

Focus Group Discussions

Focus group discussion is a research technique that collects information through group interaction on a topic designed by a researcher. In the Focus Group Discussions (FGDs), ten respondents on average were selected. With the researcher acting as a moderator, two discussions were conducted. This enabled the researcher to gather general views, emotions, feelings, perceptions and beliefs of respondents about the management of medical wastes. A discussion guide was used to direct the discussion. Respondents were purposively selected from all the categories sampled in order to capture information based on diversified opinion and perceptions regarding the subject matter.

Data Analysis

The data collected was edited and coded for quantitative analysis using Microsoft excel to generate tables, graphs and charts that were used to present the research results. Qualitative data was presented in form of explanations and statements as given by respondents.

CHAPTER FOUR

DATA PRESENTATION

Methods used to Manage health Wastes in Kanungu Town Council.

Segregation of various waste components including isolation of reusable, recyclable and non-reusable materials for safe storage in appropriate containers; transportation to waste treatment and final disposal were the appropriate methods recommended for waste management. However, the researcher investigated the number of storage bucket for medical wastes generated per day and observed that plastic buckets and pedal bins were the most commonly used in almost all medical facilities visited as presented in the table below.

4.1: Storage of medical wastes

	Frequency	Percentage
Pedal bins	20	40
Plastic buckets	12	24
Clinical waste plastic bag	9	18
Black refuse plastic bag	7	14
Standard metal dust bin	2	4
Yellow Sharp container	0	0
Total	50	100

Source: Field Data, 2015

Findings from the above indicate that 40% of the respondents pointed out that health waste are stored in Pedal bins, 24% of the respondents pointed out black refuse plastic buckets, 18% of the respondents pointed out that red clinical waste plastic bag are used as a storage container for medical wastes while 14% cited black refuse plastic bag and only 4% of the medical facilities had standard metal dust bin. Generally, in all the surveyed healthcare facilities medical wastes are collected and stored in a common area awaiting disposal/treatment. It was observed that waste was not allowed to accumulate within the wards or treatment rooms, which is a good. It was furthermore reported that health waste is stored for a minimum of eight hours before disposal. It was observed that Pedal bins were used as temporary storage containers at both surveyed health posts and were used to transport clinical waste from point of generation to storage room are always cleaned and disinfected after use. However, the locations of the temporary storage receptacles are not secure and are accessible to both people and animals. It was reported that the regular mode of transport observed for transportation of medical waste to storage room in health facilities was indeed by red pedal bins. This was also supported by questionnaire respondents. It was reported by medical waste handlers that pedal rigid plastic bins are used to facilitate easier and safer waste transfer to the temporary storage room. According to the observation made by the researcher, these storage facilities were very few thus most of the wastes were mixed up in many health facilities. For example, many health centers ha one or two waste bins as shown in table 4.9 below and no health center more than three types of waste storage facilities.

Table 4.2: Number of buckets of health wastes storage

Waste Storage containers	Frequency	Percentage
1	15	30
2	30	60
3	5	10
4 and above	0	0

Total	50	100
--------------	-----------	------------

Source: Field Data, 2015

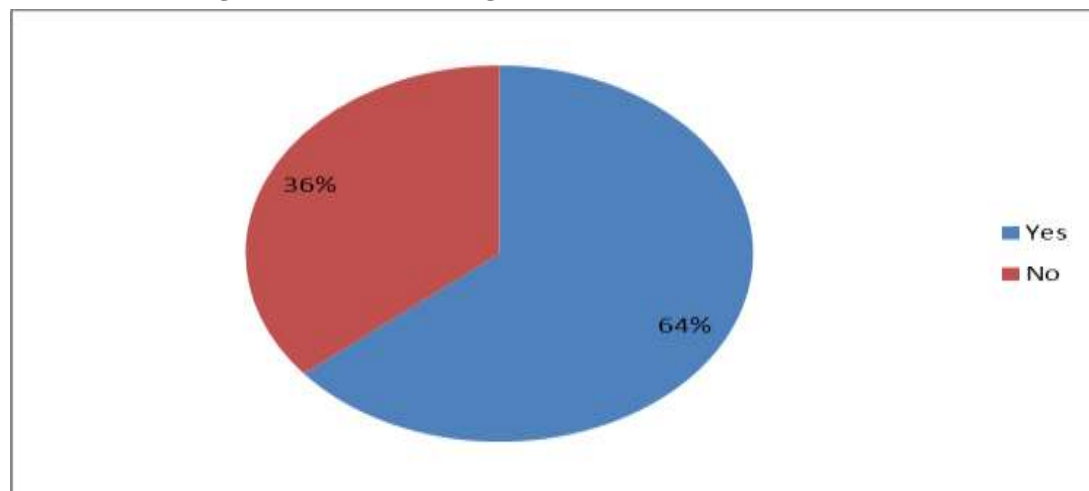
From the table above 60% of the respondents revealed that only two types of containers were used for storage medical wastes, 30% revealed that one container was used for all wastes while 10% reported that three containers were used. The bigger the health facility the more the number of containers for health wastes, the smaller the health facility the little the number of health wastes generated. Facility managers for surveyed clinics and health posts reported that waste handlers use complete personal protective clothing that is overall, gowns and boots. Furthermore, respondents reported that protective clothing like: aprons, boots, overalls and overshoes are supplied to waste handlers. It was further reported that disposable gloves, musk, apron, overshoes, laboratory coats and protective goggles are adequately provided. However, this is centrally to the researcher's observation in some clinics where medical waste was haphazardly handled. Cleaners were observed carrying clinical waste with their bare hands to storage containers without complete protective clothing. When asked to rate the level of service delivery majority of the respondents (40%) said that it is very poor while few (10%) said it was good shown in table 4.10 below.

4.3: Rate of handling health waste in health facilities in Kanungu Town Council.

Rate given	Frequency	Percentage
Very Poor	20	40
Poor	15	30
Fair	10	20
Good	5	10
Total	50	100

Source: Field Data, 2015

When asked to rate the handling of clinical waste, questionnaire respondents rated the handling of clinical waste as follows: 40% of the respondents revealed that the rate of handling medical waste in health facilities was very poor, 30% of the respondents revealed that the rate of handling medical waste in health facilities was poor, 20% reported that it was fair while the remaining 10% revealed that it was good. All respondents from clinics and health posts indicated that the common mode of transporting clinical waste to storage containers is by use of hands. Waste handlers in health facilities carry waste with their bare hands without protective clothing which indicates a possible lack of awareness or training about potential risks involved such as personal injuries and accidents or they are not provided with the necessary protectives. Cleaners in some health facilities were observed carrying clinical waste to municipal storage containers without adequate protective clothing. That is why they rated the methods of handling medical wastes in Kanungu Town Council as very poor by 40% of the respondents. Proper handling of different types of waste is of paramount importance for health and safety at workplace in order to minimize risks. It is therefore imperative for healthcare workers and operatives to be conversant with dangers and hazards that may occur during the course of the duty. They need to be trained or oriented on the health and safety measures. When respondents were asked whether medical waste handlers were trained on medical waste management, the following findings were presented in table 4.11 below.

Table 4.4: Training on health waste management

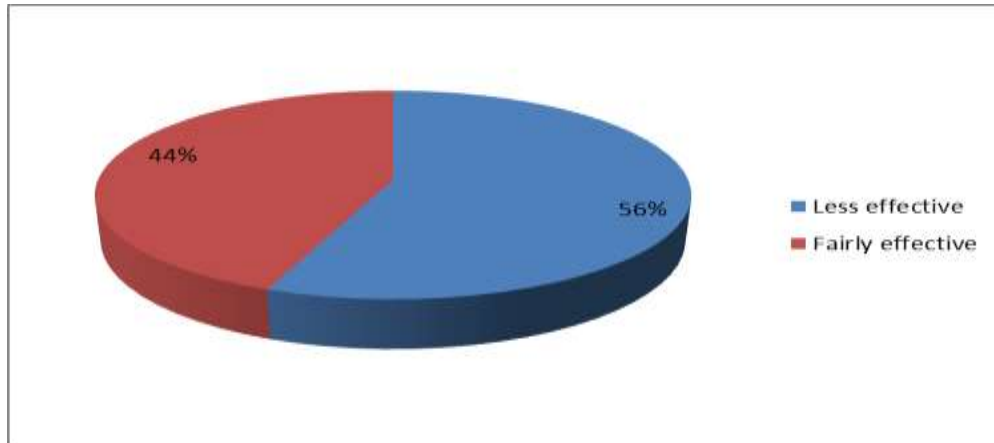
Source: Field Data, 2015

From the above chart 64% of the respondents revealed that waste handlers were trained on management of medical waste while 36% revealed that waste handlers were not trained. Medical facility managers for surveyed clinics reported that there are no scheduled programs for in service training or workshops on clinical waste management. Only on job induction on medical waste management was reported when new employees join. Interview results indicated that, although there are limited or no formal training programs in clinics healthcare workers have a good knowledge of medical waste management due to long service and experience which would have given them on job-training opportunities. Ministry of Health is responsible for provision of such trainings but for a long time no training has been done due to shortage of human and financial resources. It was reported that at Kanungu Health Centre iv training is offered upon first appointment of healthcare workers and later conducted periodically to ensure continuity as well as impart new knowledge to employees as it becomes available. Training and education programs were focused on all healthcare workers. According to the interviews conducted, all staff members are trained since in one way or another they end up contributing to medical waste generation and handling. However, health facilities administrators claimed that untrained officers usually are those who default scheduled training programs. The Infection control Officer reported that there is always a follow up for those persons who default the training programs. The treatment practices for clinical waste generated in surveyed healthcare facilities were investigated and it was revealed by all the respondents revealed that medical waste is burnt/incinerated. Open burning was commonly found among private clinics many of whom claimed have no access to incineration facilities due to limited operational space. Findings from interviews revealed that incineration provides an in-term solution especially for developing where option for waste disposal such as autoclaves, shredders microwaves are limited whatever the technology used, the best practice must be promoted to ensure optional operation of the system. In order reduce the exposure of toxic pollutants associated with the combustion process such as dioxins, nitrogen, sulphur-oxide. Although, treatment and disposal of health care waste aim at high risk may occur through the release of toxic pollutant into the environment through treatment or disposal Land filling can potentially result in the contamination of drinking water, occupation at risk may be examined with the operation of certain disposal facility, inadequate incineration or incineration of material unsuitable for incineration can result in the release pollutants into the air.

4.2 Effectiveness of the methods used to manage health wastes in Kanungu Town Council.

It was observed that the methods used to manage health wastes in Kabale Municipality were not effective. This was attributed to the challenges faced during waste handling by health workers, the community adjacent to where the wastes are dumped and the general environment due to the high risks of pollution, associated infections and injuries. That is why majority of the respondents rated the effectiveness of medical waste management as less effective by 56% and 44% fairly effective as shown in the chart below.

Table 4.5: Effectiveness of the methods used to manage health wastes



Source: Field Data, 2015

From the above table, it was revealed that by 56% of the respondents that medical waste management methods were less effective while 44% revealed that medical waste management methods were fairly effective. This is further confirmed by the challenges identified.

Table 4.6: Effectiveness of health waste management in health facilities

Health facility	Excellent		Very good		Good		Poor	
	Freq	%	Freq	%	Freq	%	Freq	%
Health Centre iv	15	30	20	40	10	20	5	10
Clinics	6	12	10	20	10	20	14	28
Other Health centers	10	20	10	30	15	30	15	30

Source: Field Data, 2015

From the above table effectiveness of health waste management in health facilities was reported in hospital compared to other health facilities because 30% of the respondents revealed that effectiveness of medical waste management was excellent in health centers, 40% indicated that it was very good, 20% indicated good while only 10% indicated poor. It was also indicated that 12% of respondents revealed that in clinics effectiveness of medical waste management was excellent followed by 20% who reported that it was very good, 20% indicated good, while 28% indicated poor. In health post, effectiveness in waste management was reported by 20% who revealed that it was excellent, 20% indicated very good, 30% indicated good while 30% revealed that it was poor. The above findings imply clinics and health posts do not have an effective management framework for collecting data on medical waste generated. Interview results reveal that all surveyed clinics and health posts do not keep or record any clinical waste management information.

SECTION FOUR

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study established that many waste handlers in health facilities did not have enough protective clothing because some workers were seen carrying medical wastes with bare hand while others used disposable gloves that are not strong enough to protect them. On the issue of waste treatment only incineration was used in some health centers but most of the leftovers at the incineration points show that it was in most cases incomplete. This causes risk to the waste handlers and the communities adjacent to health centers due to pollution. In addition, heap of medical wastes was commonly seen in the vicinity of different health centers meaning that dumping was also used to dispose of some wastes. This becomes a problem as many people were seen trying to scavenge through the rubbish looking for somethings that could be useable thus causing a threat to their lives and the environment in general. From findings effectiveness of health waste management in health facilities was reported in to be fair especially the hospital compared to other

health facilities. This was attributed to the fact that they are better established in terms of space and equipment as they are government aided than other health facilities.

Recommendations

- Clinics and health centers should have weighing facilities so as to have quantified statistics of clinical waste generated. This will assist them in making informed decisions regarding clinical waste generated and disposed of.
- Healthcare facilities should be benchmarked using a standard by which clinical waste may be measured in comparison to clinical waste management best practices at similar facilities. When benchmarks are established healthcare facilities will be able to monitor themselves and compare their performance with peer groups within the country, region or the whole world.
- Documents pertaining to quantity of clinical waste generated and health care waste management practices in clinics/health post should be maintained and updated.
- Proper training should be provided to healthcare workers, ancillary staff, patients and everyone involved in the clinical waste management process regarding appropriate segregation practices and potential hazards associated with improper procedures such as handling without personal protective equipment.
- Healthcare facilities managers should ensure that adequate protective clothing is available and waste handlers wear full protective clothing at all times when handling clinical waste.

REFERENCES

Acharya W. (2010) Definition and Characterization of Health-Care Waste. *Safe Management of Wastes from Health-Care Activities*: (Pg 2–46).

Al Emad (2011), Management of Cytotoxic Drugs Waste in Shiraz, Iran: An overview of all Government and Private Chemotherapy Settings and Comparison with National and Internal Guidelines. (Pg 541-548).

Almuneef W. and Memish E., (2013), Management of hospitals solid waste in Khartoum State. *Environmental Monitoring and Assessment* (Pg 8567–8582).

Askarian F. (2015). *Safe Management of Wastes from Healthcare Activities.* W1 10, Geneva. SBN 92 4 154525 9.

Askarian H. (2014) Proper Disposal (Management) of Medical Wastes. *The appropriate Management of Medical Waste in the Laboratory.* (Pg 39-46).

Bhuyian, W. (2013), Assessment of Medical waste Management Practice: A case study of the Northern part of Jordan. (Pg 746-759).

Caniato S. (2015), Disposal of Hospital Wastes in Bangalore and their impact on environment. In the third international conference on appropriate waste management technologies for Developing Countries Nagpur. (Pg839-42).

Coker (2009) Medical waste management in Ibadan, Nigeria: Obstacles and Prospects. (Pg 804- 811)

Gupta S and Boojh R (2008). Biomedical waste management practices at Chhatrapati Shahuji Maharaj medical University, Lucknow: a case study. *Res Environ Life Sci.* 2008(Pg 77-80)

Gupta S. (2009) Rules and Management of Biomedical Waste at Vivekananda Polyclinic: A case study waste management. (Pg 812-819).

Hangsin H., and Harding E., 2011 Handling, storage, treatment and disposal of medical waste on facilities and academic institutions. (Pg 66-76).

<http://www.who.int/mediacentre/factsheets/fs231/en/>

Malkan S and Nelson J. (2005) Global Trends in Responsible Healthcare Waste Management – A Perspective from Health Care without Harm. *Editorial J Waste Manage.* 2005; (Pg 570- 572).

Oke I.A. (2008). Management of immunization solid wastes in Kano state, Nigeria. (Pg 2512-2521).

Townend W.K and Cheeseman C.R. (2005) Guidelines for the Evaluation and Assessment of the Sustainable Use of Resources and of Wastes Management at Healthcare Facilities. 2005:(Pg398-408).