

Benefits of medical waste management methods



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ABSTRACT

Medical waste management is a critical problem around Africa continent. The problem is observed in Tanzania in all levels of health facilities. Medical waste is one of the major health safety and environmental problem. This is a result of lack of awareness on among generators and handlers of medical waste. This calls for an urgent attention to understand the extent and magnitude of the problem and to develop strategies to properly manage medical waste generated. Various measures have been taken in Tanzania including construction of 13 pilot small scale incinerators at various parts of the country, yet the problem is still persisting. Unfortunately, the effectiveness of medical waste management methods is not clearly known and practiced in many health facilities. Therefore, this study was carried out to examine the effectiveness of medical waste management. Data were collected through interviews using structured, observation and abstraction of documentation. Solid medical wastes were collected in plastics bags and measure three times a day from each occupied bed. The collected waster was measured using a common household balance with a precision of a two decimal places . A total of 64 respondents were interviewed using questionnaire. The result indicated that average generation rate of medical waste was 0. 01kg/person/day in dispensaries, 0. 02kg/person/day in urban health centres to 0. 5 kg/bed/day in Hospitals. Inadequate staff, insufficient and inefficiency of tools led to poor management of medical waste. Poor segregation and colour coding of storage instruments was observed at low level of healthcare centres, lack of medical waste treatment pit and substandard incinerators which produce obnoxious gases affecting the

community. In view of the findings, medical management is not given sufficient priority. However, health workers are knowledgeable on the consequences of medical waste. It's recommended that strategies for management of medical waste be established to include provision of facilities, infrastructures, staffing and funding to reduce environmental and medical problems associated.

Keywords: medical waste, waste management, health facilities, storage instruments

BACKGROUND

Medical waste management (MWM) is a public health and environmental problem that attract attention in both developed and developing countries (Askarian et. al., 2004). Medical waste are generated in a wide variety of sources, starting from the hospital (a primary target), human and animal clinics, health centers, intermediate facilities, physician offices, research institute (animal and human health), and homes (especially diabetic homes) (USEPA, 1986).

Medical wastes include several different waste streams, some of which require more care and disposal (Manyele, 2008). They contains different items making it a special type of mixed waste. Medical wastes include all infectious waste, hazardous (including low-level radioactive) wastes, and any other wastes that are generated from all types of health care institutions, including hospitals, clinics, doctor (including dental and veterinary) offices, and medical laboratories. Longe and Williams (2006) referred to medical waste as the municipal solid waste of peculiar characteristics which need to be sorted properly during handling. Medical waste may also contain soiled or

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blood soaked bandages, culture dishes and other glassware, discarded surgical gloves and surgical instruments, needles used to give shots or draw blood, cultures, stocks and swabs used to inoculate cultures. These are the most common trash/litter in medical waste and well known to the health-care staff. Waste from operation theaters contain removed body organs like tonsils, appendices, limbs etc which renders the medical waste scary, and nuisance. Medical waste also contains lancets that are little blades which are used to prick finger to get a drop of blood. During immunization campaigns medical waste contains leftovers of empty boxes, cotton wool and bandages. Thus, if the waste is not segregated properly at the point of generation it will be a mixture of all these garbage plus kitchen waste, office waste and other wastes which do not arise as a result of patients being attended (Lloyds, 2003).

Inadequate and inappropriate handling of medical wastes has serious public health consequences and impact on the environment. It has been medically proved that unprotected exposure to healthcare waste such as used syringes, needles and cotton can cause health hazards, and, indeed, is a source of transmission of HIV/AIDS, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and other diseases. Proper management of medical waste is crucial to minimize health risks. Medical waste requires specialized treatment and management from its source to final disposal destination. Simply disposing of it into dustbins, drains, and canals or dumping it to the outskirts of human settlement poses a serious public health and environmental hazards. Thus, there is a need to initiate a concentrated effort to improve the medical waste

management to reduce the negative impact of waste on environment, public health and safety at health care facilities (Griffin, 1989).

The amount of medical waste generated differs according to the level of health facilities, bed capacity, occupancy rate, and socio-economic status of the society. According to Christen (1996), the average quantities estimated from a survey conducted in several health care facilities in Dar es Salaam hospital generated an average of 0.06kg/patient/day and 0.08kg/patient/day, respectively non hazardous and hazardous waste while for both health centers and dispensaries waste generated 0.01kg/patient/day. Mato and Kassenga (1997) estimated that waste generation rate in Tanzania was 0.84 kg/bed/day. In a survey conducted nationwide in Tanzania indicates that the increase in medical waste generated due to increase in population, poor management of MWM systems and expanded use of disposable (Manyele and Anicetus, 2006),

Developing comprehensive waste management practices in health facilities in developing world is a challenging problem. For example, Leonard (2003) and Manyele, (2003) noted that in Africa the problem appears to be more critical as reports indicate poor medical waste management. It is a challenge because of little information on the number of bed, hospitals, health centers, dispensaries and other facilities and the type of waste generated. It should be noted that there is no single management method that can “solve” all medical waste problems; rather, each medical waste management problem must be assessed independently to develop a viable and sound solution.

However, the responsibility for the effective disposal of the wastes generated by the various health facilities lies on the facility generating the waste.

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Medical waste management requires monitoring and control at all levels of production in order to minimize effects to the community (Van, 1988). Most of the non-infectious medical wastes are land filled, while infectious wastes from hospitals are incinerated. The degree of risks posed by medical wastes is not known. Proper handling, treatment, and disposal of these wastes are believed to result in minimal health and environmental risks.

In Tanzania medical waste management (MWM) is poor and awareness on its related consequences is lacking among generators and handlers (Manyele, 2003, Manyele and Anicetus, 2006). However, in recent years Tanzania government has made efforts to manage medical wastes from its generation to final disposal or treatment by training health workers, increasing funds for procurement of tools and improvement of infrastructure (Manyele, 2004). Despite the efforts made by the government to minimize the dangers of medical waste, the problem is persisting in most areas. This study examined MWM practices in health facilities located in Sumbawanga Municipal Council and provides recommendations that can be adopted in other health facilities. The study assessed the type and quantity of waste generated and examined performance of MWM. It also determined effectiveness of MWM practices in collection, storage, transportation and disposal. In addition it examined the role of knowledge of health workers on management of medical waste.

MATERIALS AND METHODS

The study was conducted in Sumbawanga Municipal Council in South West Tanzania which is located between latitude 07°45' and 08°31' S and longitude 30°29' and 31°49' E. The Municipality lies along Ufipa plateau with the average altitude of 1700m above mean sea level. Sumbawanga

Municipality enjoys a dry sub humid climate for a greater part of the year. The maximum temperature is 27°C and the minimum is 16°C, during month of July. The rainfall ranges from 900-1000mm per annum (MD, 2008). Health facilities are owned by different institutions which include government, voluntary agencies and private. According to MMOH (2008) Sumbawanga Municipal Health services were provided through two hospitals (one owned by government and the other by voluntary agency), two urban health centre (one owned by government and other by voluntary agency) and 28 dispensaries (18 owned by Government, two by voluntary agency and eight owned by private entities).

Ballot sampling technique was used to select 10 out of 32 health facilities (one hospital, one health centre and eight dispensaries) located in different parts of the Municipal for this study. Respondent were selected by using probability sampling based on Yamane formula (1967) given as:

Where n_0 = sample size

z = confidence interval = 2 correspond to 95% level of confidence

p = population proportion

N = Population size and,

e = precision or error limit

Given a total population of 517 health workers, the study used 50% proportion ($p = 0.5$) and error limit of 11%, the minimum acceptable sample size was 64 health workers. A systematic random sampling procedure was

used to select respondents from a sampling frame based on the distribution of sample size. The sample size of respondents was 32, 10, and 22 out of 263, 78 and 176 from hospitals, health centres and dispensaries, respectively.

Primary data were collected from the field survey by using structured questionnaire of 37 questions. On the knowledge on medical waste management two question were set up to test the knowledge of health worker and the answer were given score of which if response is between 5 – 10, 2 -4 and 1 is ranked highly, moderate and low knowledgeable, respectively. Other method used in data collected is participatory observations . Abstraction and summarization of documents were used for collection of secondary data on medical waste management especially on the capacity of staff on handling waste. Interviews were used to collect data on the efficiency of medical waste management, tools for collection, storage, transportation; and treatment, to determine effectiveness of medical waste management practices; and to examine knowledge of health workers towards sorting, collection, storage and treatment of medical waste. Observation method was used to assess tools available, their efficiency and effectiveness for medical waste management and attitude and practice towards sorting, collection, storage, and treatment of medical waste. Information gathered was analysed using SPSS programme.

The solid Medical Waste were collected from occupied beds three time in a day (0830, 1330, 1830), at each ward, right prior to their collection and disposal by attendant. A common household balance with a precision of two decimal places was used to weigh wastes. The medical waste produced from <https://assignbuster.com/benefits-of-medical-waste-management-methods/>

each bed was weighed as disposed of in plastic bags. The measurements were carried in a period of 30 days and varied depending on the number of the beds occupied, hence average were used in the analysis.

Descriptive analysis was carried out for the data collected using SPSS vers. 11. 6 where frequencies were used to present the results. ANOVA was carried out to test significance of parameters on knowledge versus altitude and altitude of health workers on waste management practices.

RESULTS AND DISCUSSION

Characteristics of Respondents

Characteristics of the respondents were analyzed based on age, education and working experience. Data in table 1 shows that majority of the staff (42. 2%) were aged between 31 – 40 years. These results imply that most of respondents were at the middle age. The results show that 42. 2 % of respondents had primary school education, 35. 9% had secondary school education. The holders of diploma and advanced diploma or above were 15. 6% and 6. 3%, respectively. The high proportion of respondents with primary school education could have an effect towards management of medical waste. It was further revealed that around 40% of the staff had an experience of over 10 years. Working experience could bring good performance in management of medical waste while low experience could results into poor performance.

Type and volume of medical waste generated

The type of medical waste generated differs according to the level of health facility, characteristics of people and level of income. In Sumbawanga

Municipality the type of medical waste generated for hospital included; needles and prickers, syringes, plastic materials, bottle and ampoules, paper material, cotton wool, gauze, post delivery waste (placenta and the associate), specimen from laboratory, amputated organs/parts from theatre and garbage from admission ward. Those from urban health centre and dispensary included all wastes mentioned earlier excluding plastics, post delivery waste, amputated organs and garbage.

The results in Table 2 show that the amount of waste generated from Regional hospital was recorded from admission ward, the result revealed that the amount of medical waste generated was 0.5kg/bed/day for non sharps and garbage, 0.015kg/bed/day of sharp containers and 1.8kg/bed/day of garbage. Medical waste from the health centre was 0.02kg/person/day excluding sharp and garbage, and 0.02kg/person/day of sharp container. For dispensaries the results revealed that the amount of waste generated was 0.01kg/person/day of healthcare waste excluding sharps and 0.01kg/person/day of sharp containers. These results differ with an average of that is generated in Botswana where in hospitals recorded amount generated were 0.75kg/bed/day excluding sharps, 0.05kg/bed/day of sharp containers and 3kg/bed/day of garbage from admission ward (NCSA, 1996).

Type of facilities available for storage of solid medical waste

During the study different sections of health facilities were assessed through observation complemented by interview of health workers. The results in Table 3 reveal that medical waste storage facilities were determined by the characteristic of the waste produced. Health workers reported that common

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type of storage facilities were safety boxes, plastic material, and metal. These resulted into spillage of medical waste to the environment as they were easily blown by wind or directly accessed by insects and other vermin's. The same results were reported in India by Patil and Shekdar (2001) that, authorities were failing to install appropriate systems for a variety of reasons such as non availability of appropriate technologies, inadequate resources and absence of professional training on waste management. The study established that 81. 7% of the storage facilities were not in good state. This resulted into difficulties in the management of medical waste (Figure 1 and Table 3). Respondent from hospital observed the adequacy of facilities in terms of capacity to handle waste generated and conforming to required standards having handles, covers lid and presence of waste pits, while the status was contrary in health centers and dispensaries.

Performance of medical waste management tools

The performance of the existing health care waste management facilities for storage and treatment were assessed through their capacity in terms of sizes, handling mechanism, cover (protect waste from spillage) and pit where waste are to be deposited. Considering the sizes of equipments the results vis. waste generated, the results in Table 3 indicates that medical waste storage facilities, in relation to storage size were considered adequate by 75. 9%, 71. 4% and 66. 7% for hospital, dispensaries and health centre, respectively. Handling mechanism is also a factor which influences good performance of medical waste management equipment. Through observation of the storage facilities with handles were 65. 5%, 22. 2% and 28. 6% in hospital, health center and dispensaries, respectively. Lack of

handle to medical waste storage facilities brought difficulties in transporting healthcare waste that could lead to contamination of handlers during lifting.

Further, assessment of performance was made on availability of lid for medical waste storage tools where it was observed that (86. 2%) of hospital tools had lid and (13. 8 %) was running without lid. (11. 1%) had lid for health centre and (88. 9%) was operating without lid and 14. 3% was noted to have lid for dispensaries while 85. 7% had no lid. Lack of lid on medical waste storage tools is dangerous to health because it is easy to be accessed by insects which transmit diseases and also medical waste is unsightly because it contains waste which may cause repugnant. Poor performance of equipments could be due to inadequate funds for procurement of standard tools and availability of standard tools. Inefficiency of waste equipment created difficulties in management of medical waste that had higher probability of exposing infection to healthcare workers, patients and the environment. WHO (2005) suggested that for cost effectiveness and efficiency medical waste equipment it is advisable to purchase item which qualify the National standards for management of medical waste or approved by World Health Organization such as safety boxes and other waste containers and protective equipment.

Respondent from those health facilities which hadn't waste treatment pit the result shows that 84. 2% dispose waste in pit latrine and 15. 8% in a dug pit. Disposal of medical waste in pit latrine was a great mistake because are not meant for that purposes. Sometimes, medical waste such as post delivery waste emitted foul smell which led to further environmental pollution. WHO, (1999) also noticed that despite of its infectious medical waste was not being

properly disposed off by the concerned agencies as it was often disposed on open dumps along with other waste.

Effectiveness of practices in storage and treatment of medical waste

Effectiveness of the waste management practices of the surveyed health facilities were assessed based on the number of trained workers available, time spent to collect, store and treatment/disposal of the waste and the cleanliness and attractiveness of the health facilities.

The results indicated that for hospital trained staff versus patients was at the ratio of 1: 34 while National guideline requires the ratio of 1: 10. WHO (2008) revealed that inadequate human resources for healthcare tend to weaken healthcare delivery systems with suboptimal infrastructure, poor management capacity and under-equipped health facilities have brought about a situation where the likelihood of adverse events become high. The number of staffs who were engaged in management of medical waste was two staff for each section in hospitals, health centre and dispensaries. Medical waste management is a dangerous and tiresome job. The small number of staff are engaged in management of healthcare waste failed to manage properly. This situation in Sumbawanga Municipality is contrary to WHO (2002) recommendations, that health care waste management is first of all management issues that require the commitment of the entire staff within health care facilities.

The study results show that respondent perception and understanding on time spent for management of medical waste vary from hospital to

dispensaries. 81. 8% of respondents from hospital indicates that time spent to manage MW is between six to eight hours in a day, as compared to health centers where 80% of respondent indicates that time spent is between three to five hours. Dispensaries all respondents indicate that time taken for management of MW is one to two hours (Table 4). Time spent was sufficient for hospital while insufficient for health centre and dispensaries. Time spent for hospital was high compared to other levels because had a special group of employee (casual laborers) purposely for medical waste and environmental management activities who are required to work a minimum of 8 hrs in a day according to job requirements. On contrary for health centre and dispensaries were permanent employee whose work was for both service deliver, then on medical waste management activities and environmental care.

Clean and attractive health facilities determine the effectiveness and efficiency of medical waste management activities to all levels of health services. During the research, the result revealed that 59. 4% responded that hospitals were very clean, 40. 6% responded moderate, and 100% responded moderate for health centre while 59. 1% responded moderate for dispensary and 40. 9% responded poor sanitation (Table 5). This situation is contrary to National health care waste management policy guideline which requires proper management of medical waste for prevention of diseases, environmental protection and beautification (MOHSW, 2006). To triangulate perception of respondents who are health workers, cross tabulation was indicating that hours spent for management of medical waste and cleanliness (appearance) of health facilities has relationship. The correlation

between working hours and the state of cleanliness is highly significant ($p < 0.000$) thus the more the working hours the higher the cleanliness and vice versa.

Knowledge of health workers towards management of medical waste

As regard to knowledge on consequences of medical waste 95.5% of respondents from hospital had high knowledge on the consequences of medical waste, 4.5% had moderate knowledge, 90% of health centre study group were highly knowledgeable, 10% had moderate knowledge and 78.1% were highly knowledgeable for dispensary, 15.6% moderate knowledge and 6.3% had poor knowledge (Table 6). Importance of knowledgeable health workers is on waste in highly required in segregation and coding storage materials used for medical waste management. The level of education was highly associated with knowledge of health workers on medical waste as hazardous material that the correlation was statistically significant ($p < 0.049$). These results suggest that the high knowledge on medical waste as hazardous material was due to the familiarity of health. In the study conducted in South Africa it was also observed that poor medical waste management was attributed by lack of information and awareness about the risks posed by healthcare waste (Tshabalala, 2003).

Medical Waste Segregation

The need for proper segregation and the extent, to which segregation is required, is primarily dictated by the technology and this is one of important step in reducing the volume of hazardous waste. Most treatment technologies have some limitations in terms of processing capability. This

limitation depends much on design restrictions, compatibility with certain components, legal prohibitions, and possible negative environmental impact, social and ethical reasons.

Table 7 shows that percentage of quantity of medical waste recorded segregated at hospital, health centers and dispensaries were 93.8, 70 and 27, respectively. While waste that was found mixed was 6.2%, 27.3% and 72.7% at hospital, health centers and dispensaries. Segregation of hazardous/infectious waste is the key to achieving sound medical waste management. Poor segregation of medical waste poses serious health risks to the personnel handling them, and this could lead to possibility of surface and ground water contamination. Mujahid et. al., (2005) and Mohamed et. al., (2006) observed a serious health problem in Dhaka because medical waste was disposed in Municipal without segregating them. Also, Manyele et al (2003) contended that lack of plan for management of medical waste, lack of recording the amount of medical waste generated, reduction of quantity and toxicity of waste at the source and segregation were the challenges facing Tanzania in management of medical waste. The high performance of hospital compared to health centre and dispensaries was influenced by availability of tools, number of staff engaged, hours spent in management of medical waste and knowledge of health workers.

Color coding

Color coding system aim at ensuring an immediate separation and identification of the hazardous associated with the type of healthcare waste which also determines the treatment method to be employed. The results revealed that 90.6% of hospital medical waste equipment were colour coded

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or provided with label and 9. 4% was not colour coded, 30% of health centre tools were colour coded and 70% were not colour coded while 100% of dispensary medical waste storage tools were not color coded or labeled (Table 8). Lack of coloration of medical waste tools to dispensary level was contrary to healthcare waste management policy guideline which requires coloration of medical waste storage facilities (MOHSW, 2006). Longe and Williams (2006) observed that in Nigeria, private owned hospitals has the most efficient colour coding system, where colored buckets were used: red for sharp and broken glass, green for syringes and needles and blue for all blood stained cottons, gauze and bandages.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Medical waste generated in healthcare facilities differs from type and ownership of facilities but there is no composition distinction between private and public hospitals. The performance of medical waste management tools were inefficient due to the reason that most of them were below National and World Health Organization standards. The effectiveness of medical waste management practices was highly affected by inadequate staff and time spent in management of medical waste which resulted into poor cleanliness of some health facilities. Knowledge of health workers on management of medical waste was high but was not highly applied due to inadequate and low standard of healthcare waste management tools.

Generally Medical waste management activities in Sumbawanga Municipal Council were not given sufficient priority or concern because of unimproved system of medical waste management. Inadequate staff, insufficient and

poor performance of supplies for storage of medical waste, poor infrastructure such as incinerator and treatment pit for treatment of medical waste, lack of segregation and coloration of tools is a major reason to draw this conclusion. However most of healthcare workers had knowledge on medical waste management with small gap which need to be improved.

Recommendations

Based on the findings and discussions, the following recommendations are made to the Regional Medical Officer, Municipal Medical Officer, Diocesan Health Coordinator and other Stakeholders to improve healthcare waste management whereby in order to achieve the goal, the Hospital Management Team , Council Health management team and other stakeholders should fulfill the following:

Medical waste management infrastructure which includes incinerators and treatment pit should be made available to all health facilities. They should be well constructed to ensure efficiency and minimizes the immediate and long term public health risk and hazards associated with medical waste and which has the lowest impact on the environment.

Build capacity by employing more qualified staff who will be responsible for service delivery, healthcare waste management and environmental management of health facilities..

For proper disposal of waste knowledge on the color codes for storage facilities should be provided to all stakeholders in health facilities based on the agreed National and WHO Guidelines.