

Healthcare Waste Management: The Current Issue in Menelik II Referral Hospital, Ethiopia

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ABSTRACT

Healthcare wastes generated in Hospitals from medical activities have not given sufficient attention. In developing countries, healthcare wastes are still handled and disposed indiscriminately creating an immense threat to the public health and the environment. This situation is much worse in Ethiopia where there is paucity of convincing evidence about healthcare waste generation rate and management system. A cross-sectional study was conducted in Menelik II hospital to evaluate the healthcare waste management system. Primary data on the healthcare waste management system was collected using observational checklist. Key informant interview guide was also employed on 11 selected informants to assess waste management practice and analyzed by thematic framework. The results revealed that there was no segregation of healthcare waste by type at the point of generation and disinfection of infectious waste before disposal. The main HCW treatment and disposal mechanism was incineration using low temperature, single chamber incinerator; open burning; burring in to amputation pit and open dumping on municipal dumping site as well as on the hospital back yard. Furthermore, there was negligence, attitudinal problem and low level of awareness about safe healthcare waste management. To diminish the risk of healthcare waste on public health and environment, a cost effective interventions include providing better medical waste management facilities, adherence to national regulatory and rising awareness of all concerned need to adopt in the hospital.

Keywords: Healthcare waste, Segregation, Treatment, Disposal, Waste management practice, Case team

INTRODUCTION

Hospital could be a place of almighty, an area to serve the patient. Since starting, the hospitals are legendary for the treatment of sick persons. However we are unaware the concerned the adverse effects of the rubbish and filth generated by them on land and atmosphere ¹. The last century witnessed the fast mushrooming of hospital within the public and private sector, set by the requirements of increasing population combined with the arrival and acceptance of “disposable materials” as a result rising incidence of HIV, hepatitis, ebola etc has created the bulk generation of healthcare

waste a major concern and agenda about current situation^{2,3}.

Healthcare waste includes all wastes generated in the course of healthcare activities in the health institution: diagnosis, treatment or immunization of both human beings and animals⁴. Healthcare facilities such as hospitals, research laboratories, medical and dental clinics, nursing homes, ambulance, mortuary and autopsy centers, etc. produce the tremendous amount healthcare waste containing a large component (75-90%) of general healthcare waste, which does not pose any risk to public health or the environment if properly

disposed^{1,4-6} is comparable to municipal solid waste and a smaller portion (10-25%) of hazardous waste¹. These HCW generated as a byproduct of treating patients contained infectious, bio-medical and chemical materials are the second dangerous after radiation wastes in the world causing infections, infertility, hormonally triggered cancers, genital deformities and neurological disorders both in the short and long-term exposure if not properly disposed^{5,7-9}.

Improper waste management generally results in adverse effects on the environment and the public health⁵. Numerous studies have reported that the inappropriate handling and disposal of HCW poses risks to health workers who may be directly exposed and people near health facilities, particularly children and scavengers who make a living of recycling materials from open dump sites accessed to infectious waste specially sharps waste which had higher risk of diseases like hepatitis and HIV/AIDS^{5,10-12}. The World Health Organization (WHO) estimated that unsterilized syringes caused between 8 to 16 million cases of hepatitis B, 2.3 to 4.7 million cases of hepatitis C, and 80,000 to 160,000 cases of HIV infections every year^{1,13}. The 5.2 million people in the world including 4 million children die each year from waste management related diseases⁵.

Majority of the healthcare facilities (HCFs) in developing countries suffer a variety of deprivations of healthcare waste management (HCWM) system from point of generation up to the final disposal. Huge amount of healthcare wastes deposited openly in waste dumping site together with municipal domestic non-hazardous solid waste indiscriminately¹⁴.

The management of healthcare waste in many developing countries has a high concern because of the risk to the public health and the environment as a result of the implementation of improper healthcare waste management and poor data recording concerning generation rate¹⁵.

Observation regarding the practices of healthcare waste management indicated that most of the health facilities had not put in place an organized management system to address healthcare waste management properly^{16,17}. This was true where the case medical waste was handled

like any other municipal waste in many urban settings of Ethiopia^{16,18-20}. Public healthcare facilities that are increasing from time to time in the city were not established with standardized buildings and infrastructures for safe treatment and disposal of wastes.

Most of the time it is disposed of in crude public dumps such as "Queshie" site in Addis Ababa and other solid waste left uncollected in the city dumped by generators everywhere in their premises and vacant space^{18,20}. Proper handling of waste during storage, transportation, treatment and disposal is therefore important for the promotion of public health^{3,5}.

In Ethiopia there was rapid opening of healthcare facilities in response to MDG goals and population growth which results in massive generation of HCW. However the management of healthcare waste which was given less attention by healthcare providers, managers and decision makers at hospitals in Addis Ababa city was improper resulting in percentage increase of the generation of hazardous HCW which far from UN report is poisonous to the public health and environment^{14,20}.

Issue of HCW generation rate which was inadequately studied in Ethiopia is one of the major reasons for inadequate and improper healthcare waste management¹⁵. Thus, there is need to assess the current situation of the healthcare waste management system and the main objective of this study was therefore, to evaluate healthcare waste management practice in Menelik II referral hospital, Ethiopia. The information generated from this is envisaged to enable policy makers, program designers and health workers to improve healthcare waste management systems and hence improve infection prevention and control at healthcare facilities in Ethiopia.

METHODS AND MATERIALS

Study Characteristics

A cross-sectional qualitative study was conducted to evaluate the HCW management system in Menelik II referral hospital, Addis Ababa City from February 17 to 24, 2015. The city is the

capital of Ethiopia as well as head quarter of African Union. There are 6 public hospitals under the city Administration Health Bureau that provide service for more than 3,384,569 people²¹. The hospital was opened in 1909 which has now 29 active specialized case teams with 199 numbers of beds.

The study was conducted on Menellik II referral hospital selected purposively because it is the only hospital providing forensic pathology in the country and has largest number of beds as well as staff, assuming increased rate of waste generation. A similar assumption was also followed by Haylamicheal et al. (2011).

Data collection tools and procedures

To evaluate the management practice, all sources of healthcare waste case teams as well as the hospital compound in where waste was temporally stored, treated and disposed off were observed and inspected using check list. A total of 11 key informant interviews were also conducted with the officer in charge of the facility and selected workers using semi-structured interview guide to understand the healthcare waste management culture of the facility.

Data quality assurance and analysis

Data quality was assured by relating all questions and checklist logically to the variables measured. The tool was designed to measure all components of the variables and also adapt an existing instrument that was already tested in other

studies. A content analysis of the data from key informant interviews and observation were analyzed using thematic framework manually by categorizing and organizing according to thematic similarities and differences to understand relationships in the overall context of the study.

Ethical consideration

Ethical approval and clearance was obtained from School of Public Health, Addis Ababa University. Written permission for data collection was taken from Addis Ababa City Administration Health Bureau and hospital administration. All respondents were informed about the study procedures and the interview was conducted after obtaining their informed consent. The participants were assured of the confidentiality as they participate in the study.

RESULTS

Healthcare waste segregation practice

The use of a color coding system for HCW containers (black, yellow, red, and blue) was practiced without labeling. However, there was no segregation of HCW in to waste categories to the available color coded waste containers at the point of generation except the sharp waste made at puncture proof safety box. The municipal garbage tank contained all mixture of waste was over full and droppings of refuse around the surrounding because of delay in offsite transportation service to the municipal disposal area (Figure 1).



Fig. 1: Municipal garbage tank with mixture of all type of HCW, over full and droppings of refuse around the surrounding in Menellik II hospital, February 2015

Interim storage on point of source

All case teams temporarily stored wastes in cleanable and closed dust bins. In most OPDs (especially ophthalmology, orthopedic), minor OR and food catering, the waste was stored for over 48 hrs without being treated while in EOPD and major OR stay only for 8 hours and all IPDs for 24 hours (Figure 2). All HCW categories sent to the facility dedicated place of onsite storage (municipal garbage tank capacity of 8 m³) mixing together in a manner potential to infection and hazard (Figure 1).

Healthcare waste handling, collection and transportation

In most studying case teams, HCW was collected daily at the morning except the major operating room and EOPD made within average of 8 hours. Most of the devices used for on-site transportation of HCW were closed bin with wheel. The waste on municipal garbage tank (totally infectious) was stored for minimum of a week and maximum of three weeks and transported by out sourced private company in to the city municipal disposal site “qoshe” unsanitary landfill site for open dumping. HCW bin put in the walkway and pedestrian was not emptied and clean daily (Figure 2).

Healthcare waste recycling and reusing

Healthcare waste minimization at the source of generation, reusing and recycling was

not employed by any of the case teams except recycling of plastic water bottles, film developer, reuse of packs, and suction tubes (Figure 3). Lack of commitment to initiate a recycling program was therefore the main factor of HCWM.

Healthcare waste treatment and disposal

Disinfection of waste before disposal, waste storage and collection utilities was non-existent always. The main treatment and disposal mechanism was incineration, open burning; burring in to amputation pit and open dumping on municipal dumping site as well as on the hospital back yard hyphen (Figure 4-7). The hospital has functional low combustion, single chamber incinerator incinerating all type of the wastes together without separating especially general waste (Figure 5). The incinerator was made of bricks, reinforced concrete slab and had air inlets for facilitation of combustion. The incinerator has relatively smaller chimney to its size, the door for the waste feeding opening had broken and no door for ash removal. There was no separate incinerator for sharps waste or needle pit. The incinerator was unable to burn waste completely; consequently the waste volume was not reduced significantly and produced air pollutant emission. At the forensic pathology case team, highly infectious waste was treated and burned openly emitting pollutants in the atmosphere (Figure 4). The pathological waste was buried into amputation pit with secured cover



Fig. 2: HCW interim(primary) storage and transportation materials of Menellik II hospital, February 2015

(Figure 7A). Furthermore, the hospital was not in compliance with applicable regulations such as prohibiting open burning, open dumping and malpractice of segregation of HCW etc.

Responsibilities, budget allocation and training on HCWM

The responsibility of HCW management was left only for the waste handlers and sanitarians in the facility. In service training about healthcare waste management was given for smaller number of staffs (63 support staff including waste handlers and 25 technical workers). HCWM regulations as well as any applicable facility based policy and strategy were not found. There was HCWM committee and HCWM guideline in the study health facility developed by ministry of health

Healthcare waste handling and processing practice (process flow of HCWM)

Healthcare Waste Risk and Occupational health Safety

All staffs had information about HAI occurred as a result of malpractice of HCWM. The hospital gave HVB vaccine of 3 doses to all staff and provides all the necessary protective devices except boots and goggle. However, it was observed that some workers were not wearing while handling HCW. As a result, 13 workers had sharps and needle stick injuries in the past 6 months. There was no allocation of safety precautions like material safety data sheet for employees and people. The open burning and

incomplete combustion of non segregated HCW that had PVC content at the yards of the facility was a potential to emit pollutant gases that attack the human organ.

Challenges of HCWM in the hospital

The main problems encountered in management of HCW in the study institution were low awareness, negligence and carelessness of the health workers, cleaners and patients. Poor commitment of the managerial personnel, bad attitude of health professionals in the segregation and disinfection of HCW, the resistance to wear protective gears and staff turnover were among the major one encountered.

DISCUSSION

Most healthcare facilities in developing countries do not adequately segregate infectious or hazardous waste from ordinary domestic waste stream, the total quantity of waste classified as infectious and thus needing special handling and treatment²⁻⁴. HCW must be appropriately labeled and segregated from the facility where it is generated to the point of treatment and disposal. Segregation which is the hallmark of HCWM offers protection to workers and the environment as well as reduces the cost of disposal^{22,23}.

In the study hospital, different colored bags have been provided but segregation of HCW



Fig. 3: Water bottle plastics stored for recycling dispersed near the incinerator open field in Menelik II Hospital, February 2015

at site of origin was not implemented satisfactorily and this causes a lot of problems for the people dealing with the final disposal. This was because of weak commitment, staff attitude as well as

negligence. Therefore the authorities must claim strict instructions given to the doctors and nurses involved in the generations. This was also reported in the same way by study conducted in Hawassa city



Fig. 4: Open burning of HCW practice in Forensic pathology and orthopedic ward case teams in Menellik II hospital, February 2015



Fig. 5: A newly built incinerator for HCW incineration of Menellik II Hospital, February 2015



Fig. 6: Open dumping of HCW at the back yard of the Hospital, February, 2015

that 67% of the HCFs did not segregate waste at source^{14-16,24,25}. This showing that implementation of healthcare waste management system is not given much priority and emphasis in the country. It is also due to inadequate orientation of auxiliary health workers. For example, research carried out on risk perception of healthcare workers towards healthcare waste management in Ethiopia showed that only a small proportion of healthcare workers adequately perceived the health risk of handling waste materials²⁶. This deficiency is linked with inadequate training and supervision of health workers and, lack of enforceable health regulations aimed at providing a safe waste handling and disposal.

All of the case teams in Menellik II hospital used safety boxes for collection of sharps waste. This was in line with what was reported by Debere et al¹⁴. It was also better than the study done by Hailemicheal et al, Hawassa city, 67% of the HCFs did not use safety boxes for sharps¹⁶. This variation may be due to difference in supply of safety boxes that is considerable in amount in government facilities than privet one. The risk of used needles and sharps injury associated with improper collection might be given better attention by governmental health system and other non-governmental supporters to reduce the transmission of HIV and other related disease, as shown by Azage et al⁷ and increased risk perception of sharps waste among workers in the hospital as supported by a study conducted in Gondar²⁶.

Different studies showed in developing countries that the data available related to sharps and needle stick injury was very few and under estimation of the real risks⁷. This might be true in the study hospital that sharps and needle stick injury was observed only on 13 workers within last six months even if the waste generated in the hospital is a heterogeneous mixture including sharps, needles, pathological, radiological, chemical etc which is very difficult to handle. The most important issue related to this fewer and under estimate needle stick injury is also that the hospital segregated its sharps & needles waste in an relatively proper manner. These sharps & needles are the commonest vehicle and contribute to spread of serious diseases like hepatitis, human immunodeficiency virus etc^{27,28}. The study by WHO strengthen this idea that unsterilized syringes cause 8 to 16 million cases of hepatitis B, 2.3 to 4.7 million cases of hepatitis C, and 80,000 to 160,000 cases of HIV every year^{1,13}. Five point two million People in the world (including 4 million children) also die each year from waste-related diseases⁵.

The way HCW transported in the hospital was better than Hawassa city facilities which used open plastic containers without wheel from the site of generation to the treatment area. In contrast to this relationship both types of waste (infectious and non-infectious) were also collected and transported once a day in the morning in most case teams in



A) Amputation pit



B) Qoshe unsanitary land fill

Fig. 7: Amputation pit for disposal of pathological waste in Menellik II hospital (A) and “Qoshe” unsanitary land fill site in Addis Ababa (B), February 2015

lesser regularity as compared to the Hawassa city that seven of the HCFs collect waste twice a day whereas the other two conduct collections three to four times a day ¹⁶. This was in agreement to the WHO recommendation of storage of HCW in warm climate for a maximum 48 hours during the cool season and maximum 24 hours during the hot season^{9,29}.

In the studied hospital, the main available treatment and final disposal mechanism of HCW was incineration using low combustion, single chamber incinerator made of bricks & reinforced concrete, open burning, burring in the pit and open dumping. This was similarly reported by MMIS project of HCFs in Ethiopia: open burning in a dug hole 54%, low-temperature incineration 52% and open-air burning 18% ³⁰. It was also supported by a study conducted in hospitals of Addis Ababa city (2012) that 83 % of the hospitals treat their HCW using low to medium combustion incinerators. The study in hospitals of two regions Ilala and Kinodoni in Tanzania showed that 70 % of HCFs in Ilala burn wastes in poorly designed incinerators and open pit while in Kinodoni 83 % of the facilities bury wastes in the pits ³¹. The reason behind may be lack of elaborated, legal policy and institutional framework that enables obligations & enforcement in installing standardized facilities for safe HCWM. These inadequate and sub-standard HCW facilities are also against Stockholm, Basel and

Rotterdam Conventions stating that the treatment and disposal of HCW does not cause harm to human health and the environment³². Such defective type of facilities are also associated with several problems have been reported specifically with single chamber brick-made incinerators, including emission of toxic substances into the environment that are a risk to public health^{33,34}. Therefore, there is a need for alternative solutions, such as De Montfort incinerator as used in Zimbabwe³⁵ as well as installation of irradiation, encapsulation and chemical disinfection¹⁷.

A study in Tanzania indicated that about 60 % in Ilala and 70% Kinondoni municipalities surveyed HCFs incinerators were not fenced. 50% of them being of low capacity with some parts missing as well as 9 and 47% of the healthcare facilities in Ilala and Kinondoni, respectively; do not have the standard operating procedures for incineration of HCW³¹ was supported what actually present in Menellik II hospital that the incinerator without fence worked polluting the environment, equipped with no ash pit, broken waste loading cover, no ash removing doors and sufficient air-inlets for complete combustion of HCW. This low combustion single-chamber incinerator which may release pollutant gasses: Dioxin, furans, heavy metal and acidic gasses was against the Stockholm convention on persistent organic pollutants (POPs)^{17,32}.

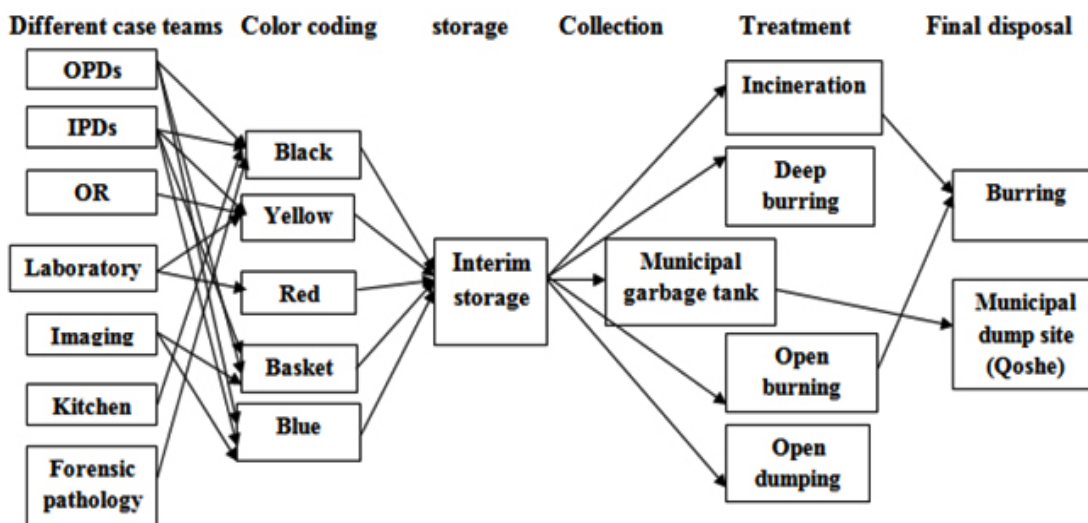


Fig. 8: Waste management practices flow chart in Menellik II hospital, February 2015

In addition to having the infrastructures for safe management of HCW, it is important to raise the awareness and built attitude of healthcare workers and waste handlers. Various studies have shown that raising awareness plays an essential role in proper HCW handling and management with simple and low-cost approaches^{26,36}. The present study revealed the main challenge of HCWM was staff turnover, staff attitudinal problem, negligence, absence of training, and low level of awareness of safe HCWM practices by both health professionals and support staff. Therefore ensuring training of the health care workers, advocating universal safety precautions like hand washing, wearing PPE and disinfection of wastes have been proposed to bridge the existing gap. This study was not without limitations. There might be observer bias during the assessment of HCW management system, although much effort is done to minimize it. The study also did not consider generation rate; so it is suggested that future research should focus on estimation of generation rate assisted with management practice at varies seasons of the year by considering ownership and random sampling method.

CONCLUSION

The generation of waste should be estimated for proper management. The segregation, collection, transportation and disposal of HCW is not being implemented properly as per the standards & norms in the studied hospital there for, the health care waste leaving from the hospital as a whole is both potentially infectious and hazardous to the environment and public health in particular. This is in contribution of workers less commitment, attitudinal problems and negligence as a result of absence of adequate refreshment training for capacity building as well as poor supervision by administrators. Thus, the waste should be classified according to their source, typology and risk factors associated with

their handling, storage and ultimate disposal. The waste categorization should be standardized and minimized for the convenience of its handling and cost reduction incurred by the hospital in terms of treatment and disposal. The wastes were collected and transported in most case teams using somewhat standard non labeled bins in spite of absence of separation practice. The main treatment and disposal method was incineration in to low combustion single chamber incinerator, open burning and open dumping. This low temperature incinerator is responsible for incomplete combustion and insignificant in volume reduction of waste. In such practice there is great potential to emit toxic pollutants from incineration to the atmosphere. An improved incinerator that has devices for the control of combustion should be encouraged. All in all, there is no a comprehensive healthcare waste management plan in the facility which is the key ingredient to a successful waste management. There for it is urgent to plan about HCWM essential to target and involve all the stakeholders: policy makers, hospital administrators, and health care personnel to ensure the safe handling and disposal of HCW waste, and thus preserve human health and limit environmental degradation.

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