

Assessing the Generation and Composition of Medical Waste in a University Teaching Hospital

Olubunmi A. Mokuolu*¹, Hannah O. Olawumi², Bolaji F. Sule¹

^{*1}Department of Water Resources and Environmental Engineering,
University of Ilorin, Ilorin, Kwara State, Nigeria,
mokuolu.aa@unilorin.edu.ng

¹Department of Water Resources and Environmental Engineering, University
of Ilorin, Ilorin, Kwara State, Nigeria, bfsuleiman@gmail.com

²Department of Hematology and Blood Transfusion, University of Ilorin
Teaching Hospital, Ilorin, Kwara State, Nigeria, toyem66@yahoo.com

Abstract

Medical wastes are special category of waste with potential to harm if not properly managed. The importance of these types of waste is of concern to the global community with special interest in the developing world. An institutional based study was carried out at the University of Ilorin Teaching Hospital (UTH) and determine the waste management practices, determine total stream of medical waste generated and proffer solutions to the observed inadequacies. The study approach involved obtaining the total quantity of waste generated, its composition by categories and observation on segregation practices. Information on employee's knowledge and practices on hospital waste management was obtained using structured questionnaire, and in depth interview of a cross section of staff, infection control officers, waste handlers and off site vehicle drivers. The result showed that the average daily waste generated was 554kg/day (202.21tons/year). While average waste generation rate per bed per day was 1.68kg/bed/day. The composition by waste type was 25(4.5%) pathological, 111(20%) infectious, and 9(1.6%) were sharps, while 410(73.9%) were non-infectious or general waste. The hospital was not practicing segregation** hence the entire waste generated is risk waste. This study proposes an overhaul of waste management of the hospital to reduce risk to employees, handlers and the public at large.

Keywords

Hospital waste, Segregation, Risk waste, daily waste, Ilorin

1. Introduction

Management of medical waste has caught the attention of Government all over the world. In March 2009, 240 people in the Indian state of Gujarat contracted hepatitis B following medical care delivered with previously used syringes later discovered to have been acquired through the black market trade of unregulated health care waste (Harhay *et al.*, 2009). Further investigation found evidence from a 2004 study conducted by the Indian Clinical Epidemiology Network suggesting that more than 30% of the 3–6 billion injections administered each year in India were done with used equipments. Also studies in Pakistan showed that around 2.0 Kg of waste/bed/day is produced out of which 0.1-0.5 can be categorized as risk waste (Hassan *et al.*, 2008).

Over the past two decades, health-care waste has been identified as one of the major problems that negatively impact both human health and the environment when improperly stored, transported and disposed. For many years, the World Health Organization has advocated that medical waste be regarded as special waste, and it is now commonly acknowledged that certain categories of health-care waste are among the most hazardous and potentially dangerous of all waste arising in communities (Mehtap *et al.*, 2011). Harhay *et al* (2009), in their study commented that Medical workers were undertrained, uninformed, and had limited access to waste segregation systems.

Waste segregation is the separation or sorting of different types of waste at the point of generation and keeping them isolated from each other. Management of such waste involves safe handling from point of generation to disposal. The most appropriate way of identifying the categories of health care waste is by sorting the waste into colour-coded plastic bags or containers. WHO recommended colour coding for biomedical and healthcare waste are: red for highly infectious waste, yellow for other infectious waste, yellow marked “SHARPS” for sharps waste, brown for pharmaceutical waste, lead box labeled with radioactive symbol for radioactive waste, and black for general or non infectious waste (Pruss *et al* 1999, WHO 2013). This study revealed the generation, composition and medical waste management practices in a Nigerian tertiary Hospital.

2. Methodology

This study was carried out as a cross-sectional descriptive study in University of Ilorin Teaching Hospital (UTH) based on the modified methods of Pruss *et al.*(1999) and WHO (2013). The health facility is a 600 bed medical health institution which trains medical students and offers health care services. The Hospital has over a thousand employees which include various professionals like Doctors, Nurses, Laboratory Scientists, Pharmacists, Physiotherapists and Imaging Scientists. Others are: social workers, nutritionists, caterers, accountants, administrators, security and cleaners. The different types of wastes generated in each ward were collected and weighed daily for 42days on an inventory form (Pruss *et al.*1999, WHO 2013). The quantities of the different categories of waste were deduced by estimation while the types of wastes were identified through direct observation. Average quantity of waste per bed per day was calculated by dividing the quantity of waste generated in each ward by the number of beds in that ward.

Information on knowledge and practices on hospital waste management was obtained using structured questionnaire, and in depth interview of a cross section of staff, infection control officers, waste handlers and off site vehicle drivers. The questionnaire was developed to elicit information on personnel involved in the management of Hospital solid waste, and Hospital waste management policy. The qualitative data obtained was expressed in narrative form. In addition the total quantities of wastes generated were tabulated according to the wards or units from which they were obtained.

3. Results

3.1 Generation and Composition

Average daily waste generated was 554kg/day (202.21tons/year). Table 1 and Figure 1 shows average daily generated according to ward/building. Average waste generation rate per bed per day was 1.68 kg/bed/day. Generation by waste type was 4.5% pathological, 20% infectious, and 1.6% were sharps, while 73.9% were non-infectious or general waste. (Figure 1).

Table 1 Daily waste quantities from hospital wards

Ward	Av. Daily Quantity (kg/Day)
Orthopedic	28
Nursery/children ward	70
Surgical wards	40
Theaters	45
Accident and emergency	37
Isolation	33
Out patient	17
Medical	38
Pharmacy	30
Clinics	38
Laboratories	33
Psychiatric	10
Intensive care	7
Labour ward	33
Ante and post natal	42
Medical records / Admin.	4
Gynae	13
Family planning	9
Mortuary	6
Physiotherapy	6
Renal and ultra sound	15
TOTAL	554

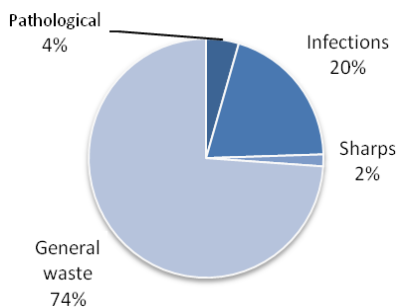


Figure 1: Generated waste composition

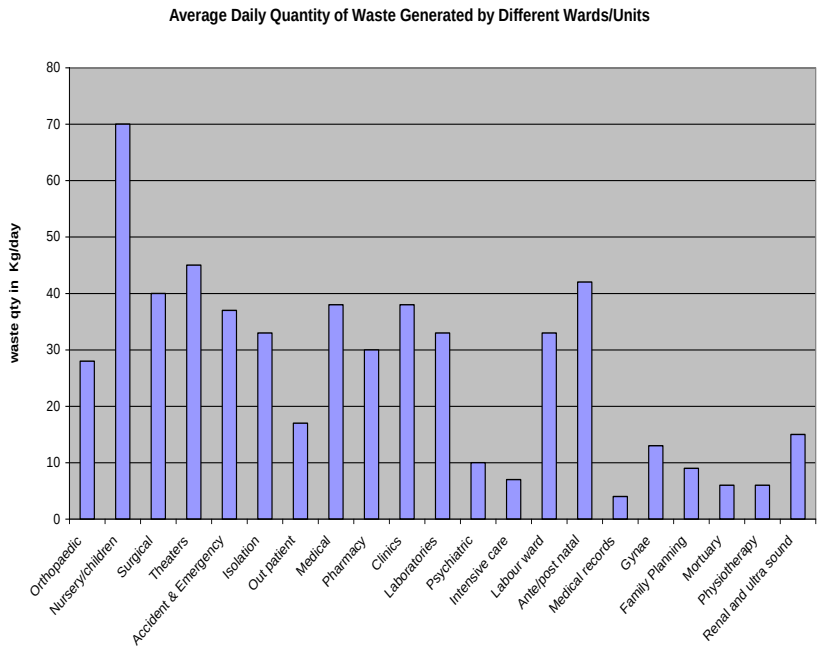


Figure 2: Daily waste quantities from wards

3.2 Management Practice

There was no policy/ regulation guiding hospital waste at the time of obtaining data. Also there was no definite budget for disposal of Hospital waste. There has not been any public outcry or diseases outbreak attribute to hospital waste disposal practice. This may be as a result of lack of records, literacy level of the populace and absence of government policy.

There were no records of method of collection, amount of waste and disposal methods used to perform this important task. The hospital did not have a waste management plan. There were three team leaders in the waste management team with ten other members including the truck driver. All these personnel were yet to undergo proper hospital waste management training.

4. Discussion of Results

This study revealed that 26.1% of total waste generated from the hospital are hazardous and therefore require special attention for their disposal. This is a little higher than WHO classification of 10-25%. Average waste generation rate of 1.68kg/bed/day was obtained from this study; this is comparative to other Hospitals in cities like Dhaka with 1.9kg/bed/day (Hassan *et al.*, 2008) Segregation of waste is not practiced hence this lower quantity of hazardous waste when lumped together with other categories of waste makes the entire waste emanating from the hospital unsafe. A similar study by Coker *et al.* (1998) in Ibadan showed a near-total absence of institutional arrangements for the management of Hospital waste. A five- stage model for waste management was proposed by Habib-Ullah and Khan (2011) based on the poor handling of medical waste in Lahore, Pakistan. Currently there are no regulations, legislation or special edicts on medical waste management in Nigeria.

Treatment and disposal of medical waste are essential ingredients in the management of this category of waste. Incineration with use of double chambered incinerators is being proposed in this study, Nosheen *et al.* (2011) holds a similar view in a study conducted in Pakistan. However Gautam *et al.* (2010) have a different view considering environmental pollution. Non-incineration treatment technologies are a growing and developing field especially in the developing world.

5. Conclusion and Recommendations

Wastes emanating from healthcare activities can have adverse effects if not properly managed. Segregation of hospital wastes involves separating different types of waste at the point of generation and keeping them isolated from each other. It is the most important step in the entire process of hospital waste management. There is the need for special attention to be given to the relatively small quantities of infectious and hazardous waste, thereby reducing not only the risks but also providing for the proper treatment and disposal of such wastes. Development of waste management policy and training of staff on waste handling is recommended.

References

BISWAS (2008), Pattern of medical waste management: existing scenario in Dhaka City, Bangladesh BMC Public Health 2008, 8, 36pp.

Coker, A. O, Sangodoyin, A. Y, and Ogunlowo, O.O. (1998), Managing Hospital Wastes in Nigeria. Proceedings of 24th WEDC Conference, Islamabad, Pakistan, pp.70-72.

Gautam, V, Thapar, R and Sharma, M. (2010), Biomedical waste management: Incineration Vs. environmental safety, Indian Journal of Medical Microbiology, Vol.28, No.3, pp.191-192.

Habib-Ullah J, Khan M. A. (2011), Proposed Model for Healthcare Waste Management. Pak J Med Science, Vol.27, No.4, pp.901-905.

Harhay, O M., Scott, D. H., Jason, S. H and Piero, L. Olliaro (2009), Health care waste management: a neglected and growing publichealth problem worldwide. Tropical Medicine and International Health, Vol.14, No.11, pp.1414–1417.

Hassan, M. M., Shafiul, A. A., Rahman, K. A. and Tarit, K. (2008). Pattern of medical waste management: existing scenario in Dhaka City, Bangladesh. BMC Public Health 8:36.

Mehtap, D., Karsak, E. E. and Melis, A. Karadayi, (2011). A Fuzzy MCDM Approach for Health-Care Waste Management. World Academy of Science, Engineering and Technology 73.

Nosheen, A., Shamil, N., Amin, F. and Khawaja, T. Mahmood, (2011). Hospital Waste Disposal: A Review Article. J. Pharm. Sci. & Res. Vol.3, No. 8, 2011, 1412-1419.

Pruss, A., Giroult, E. and Rushbrook, D. (1999) Safe management of waste from healthcare activities. Geneva: World Health Organization.

WHO, 2013. Safe management of waste from healthcare activities (second version) retrieved August 10th 2015 from <http://www.healthcare-waste.org/>