

Full Length Research Paper

Healthcare waste management practices and risk perception of healthcare workers in private healthcare facilities in an urban community in Nigeria

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Medical waste, despite the relatively small amounts in which it is generated, is a major concern for healthcare professionals and the government mainly because it poses risks to humans and the environment. Previous studies have shown that there is poor management of medical waste in developing nations, and Nigeria is not an exception. Some have surveyed the associated risks but few have studied the risk perceptions among healthcare professionals, particularly in this environment. This study therefore aimed at assessing the waste management practices among healthcare professionals at privately owned health facilities in Ife Central LGA. The study was a cross sectional study that assessed 24 private health facilities in Ife Central Local Government Area of Osun state, Nigeria using self-administered questionnaires, observational checklist and weighing of wastes. Risk perception of respondents was graded on a scale of 1 – 10 as low risk (1-4), average risk (5-6) and high risk (7-10). The facilities assessed generated a median waste of 500 g/day. 62.5% of them separated the waste, while 25% colour coded; however, none correctly matched the colours with the appropriate category of waste. 79.2% stored their waste in dustbins, and 75% of them burned while 20.8% buried the waste as a means of disposal. 45.8% had sharps boxes, 29.2% disinfected sharps before disposal; disposal was mostly by burning (41.7%). Over 90% of respondents were aware of health risks associated with health care waste management, with HIV (71%) and HBV (67%) being the most reported. Over a third (38%) of the respondents considered themselves to be at average risk with regards to health care wastes. Generation of medical waste is low in Private health facilities. However, open burning remains the way of disposal for such wastes and the health care professionals do not consider themselves at high risk from these wastes.

Key words: Health care waste, management, private facilities, hospital, medical.

INTRODUCTION

Waste is an inextricable product of life that is generated from a variety of sources including homes, offices, industries, healthcare facilities amongst others. Medical waste is considered as waste which is generated in the

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diagnosis, treatment or immunization of human beings or animals, in research pertaining thereto, or in the production and/or testing of biological entities (WHO, 2015; USEPA, 2013). Medical waste can be categorized into two broad categories: general (non-hazardous) and hazardous (infectious and highly infectious) waste (Brichard, 2002). General waste generated in healthcare facilities is similar to household waste and do not pose any risk of injury or infections under conditions in which they are generated, if separated at source. Hazardous waste is one whose health outcome is related to undesired physical, chemical and biological health damages in the course of its handling, processing and management (Park, 2009; Johannessen et al., 2000).

Medical waste should be of major concern to healthcare workers and government at all levels because it can be both infectious and hazardous (Wahab and Adesanya, 2011). Doctors, nurses, midwives, technicians, sweepers, clients, hospital visitors and patients are at high risk of exposure if poorly managed (Bendjoudi et al., 2009; Alagoz and Kocasoy, 2008). It poses threats to the environment beyond where generated and thus, requires specific treatment and management prior to its final disposal (Johannessen et al., 2000; Klangsin and Harding, 1998). Although, medical waste represents a relatively small portion of the total waste generated in a community, its careful handling and treatment as well as sanitary management is prioritized worldwide (Cheng et al., 2009) since 10-25% of it is regarded as hazardous and creates a variety of health risks (Pruss et al., 1999). Notable among the health risks posed by medical mishandling are infections by Human Immunodeficiency Virus (HIV) and Hepatitis B and C viruses. Other potential consequences associated with HCWs include infections by antibiotic resistant bacteria, punctures, abrasions and cuts from sharps as well as exposure to chemical irritants (Wahab and Adesanya, 2011).

The World Health Organization estimates that each year there are about 8-16 million new cases of Hepatitis B virus (HBV), 2.3-4.7 million cases of Hepatitis C virus (HCV), and 80,000 to 160,000 cases of HIV due to unsafe injections and mostly due to very poor HCW management systems (WHO, 2015; Townend and Cheeseman, 2005). There should be safe handling of HCW from production to the point of disposal. Unlike domestic waste, medical waste cannot be disposed of through regular channels because of its infectious characteristics. There has to be a HCW management protocol and facilities to be used by its handlers to avoid infection and cross contaminations. The quantity of HCW is increasing which should be handled and managed sanitarily; it should therefore necessitates development, adoption and use of standard HCW management protocol to avoid wide and varied consequences on public health beyond where they are generated.

Medical waste is expected to be separated at source through colour coding of bins or bin-liners; this should be followed by treatment and disinfection highly infectious

waste, prior to sanitary disposal of the hazardous components by incineration while the general waste should be disposed with municipal waste management stream. However, there are concerns that medical waste is being disposed with domestic waste (Awodele et al., 2016; Al Emad, 2011). This can have grave consequences. There has been an initiative recently to increase knowledge on the hazardous nature of medical waste among healthcare workers, but there seems to be a dearth of knowledge on how generated medical waste can be disposed.

What happens beyond the storage of the waste? There seems to be poor implementation of the National Healthcare Waste Management Plan, poor documentation of the quantity of medical waste generated, and how the waste generated is disposed. Studies have shown that there is poor management of medical waste in developing nations (Hassan et al., 2008). Some have surveyed the associated risks but few have considered the risk perceptions among healthcare professionals (Ferreira and Teixeira, 2010). In Nigeria, several studies (Abah and Ohimain, 2011; Stanley et al., 2011; Fadipe et al., 2011) have looked at different dimensions of health care waste management in Nigeria, especially in public settings. This study therefore aim to assess the quantity and categories of waste generated by private facilities, their waste management practices, determine the level of implementation of waste management policies if they exist and assess the risk perception of health care personnel towards medical wastes.

MATERIALS AND METHODS

The study was conducted in the ancient town of Ile-Ife in Ife Central Local Government Area of Osun State, Nigeria. The population of the town was estimated to be 167,254 and majority of the residents are farmers, traders and civil servants. The town has 20 registered private hospitals/clinics and several public primary health centers, 2 secondary health facilities and 1 tertiary hospital. The study design was descriptive cross-sectional in nature and all the private healthcare facilities within the study area were assessed.

The study utilized mix-methods in data collection using quantitative and qualitative instruments. The study adapted and used the UNEP/WHO (2004) questionnaires for assessing health care waste, comprising of open and closed ended questions in three sections. The first section of the questionnaire assessed facility attributes, while the second section assessed their medical waste management practices. The third section assessed the level of risk perception of the respondent on a Likert scale from 1 to 10 and risk was graded as low risk (1-4), average risk (5-6) and high risk (7-10). A pre-test of the questionnaire was carried out in Modakeke, an adjoining community, using ten health facilities to assess the relevance of the questions asked and for content validity. Data was obtained using the pretested, self-administered semi-structured questionnaire which was administered to the in-charge/ owner of the facility after obtaining informed consent. Qualitative assessment was also carried out by direct observation using a facility assessment checklist regarding waste generation, storage, collection, recycling and disposal.

The HCFs were given waste disposal bags to store their waste from 8 am till 7.59 am the following day. Waste generated from

Table 1. Characteristics of facilities assessed.

| Variable | Frequency (N=24) | Percentage |
|--|------------------|------------|
| Type of facility | | |
| Hospital | 9 | 37.5 |
| Clinic | 11 | 45.8 |
| Maternity Centre | 2 | 8.3 |
| Medical Laboratory | 2 | 8.3 |
| Services offered (multiple answers allowed) | | |
| Medical | 15 | 62.5 |
| Obstetrics and Gynaecology | 12 | 50.0 |
| Surgical | 13 | 54.2 |
| Paediatric | 13 | 54.2 |
| Emergency | 13 | 54.2 |
| Radiology | 3 | 12.5 |
| Laboratory | 3 | 12.5 |
| Have existing waste management policy | 15 | 62.5 |
| Have waste management plan in facility | 19 | 79.2 |
| Have designated waste management officer | 12 | 50.0 |
| Health care waste manager trained | 7 | 29.2 |

each health facility was weighed at 8am every day for 1 week, using a SECA® weighing scale and measured in gram. Univariate (tables and charts where appropriate) and Bivariate (Kruskal-Wallis) analyses were done using Statistical Product for Service Solution (IBM-SPSS) version 17. The level of significance was set at <0.05. Ethical clearance was sought and obtained from the ethics committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife. Written informed consent was obtained from head of facilities before administration of questionnaires and collection/weighing of wastes.

RESULTS

Table 1 presented the characteristics of the private HCFs studied. Most of the facilities assessed (46%) operated as clinics while 38% operated as hospitals. Over 60% offered medical services while over half offered specialty services such as Obstetrics and Gynaecology, Surgery, and Paediatrics. Over 60% of the facilities had waste management policies with 80% having a waste management plan; while 50% had a designated waste management officer and only about 30% have had any training. The facilities assessed had a median weight of generated waste of 500 g/day ranging between 100-2000 g/day. Dressings were the type of waste most generated, accounting for 87.5% of facilities followed by sharps (83.3%) and domestic waste (79.2%). Majority of the facilities (62.5%) claimed they segregated waste at source with only 25.0% reporting that they colour coded sorted wastes. However, none were able to identify the colour codes for the different categories of waste generated. Dustbin was the most commonly used method of collecting waste (79.2%) followed by plastic bags

(42.0%). Enclosed open burning was the most frequent method of waste disposal (75%) followed by burying (20.8%), while 17.0% dump it alongside communal waste (Table 2).

In addition, Table 3 showed that less than half (45.8%) of the facilities assessed had sharps boxes and few (29.2%) disinfected sharps (majorly by boiling (42.9%) before disposal which most (41.7%) did by burning. Table 4 shows that 91.7% of individual respondents were aware of health risks associated with handling medical waste mostly of HIV (70.8%) and HBV (66.7%) infections. 87.5% of them felt they were at risk and most (75%) use personal protective equipment commonly gloves as means of protection from these risks. Over a third of the respondents (38.1%) felt they were at average risk while 28.6% felt they were at high risk and a third (33.3%) felt they were at low risk, as shown in Figure 1. Although there was no significant association between professions and perceive risk, over half of the doctors interviewed (55.6%) have low risk perception compared to none of the nurses and 50% of other health workers (Table 5).

DISCUSSION

This study assessed healthcare waste management practices of private hospitals and observed that only 62% had a copy of the waste management policy and 79% had a facility health care waste management (HCWM) plan which should serve as a roadmap for waste management. These figures are much higher than those reported in other studies (Ngwuluka et al., 2009; Joseph

Table 2. Characteristics of waste generated in the facilities.

| Variable | Frequency (N=24) | Percentage |
|---|-------------------------|-------------------|
| Median weight of waste generated daily (g) | 500 | |
| Range of waste generated daily (g) | 100 – 2000 | |
| Type of waste generated (multiple options chosen) | | |
| Domestic waste | 19 | 79.2 |
| Sharps | 20 | 83.3 |
| Blood | 15 | 62.5 |
| Dressings | 21 | 87.5 |
| Others (injection bottle, intravenous fluids) | 4 | 16.7 |
| Waste segregation at source | | |
| Yes | 15 | 62.5 |
| Waste colour coded | | |
| Yes | 6 | 25 |
| Correctly matched waste with appropriate colour | 0 | 0 |
| Means of waste storage (multiple options chosen) | | |
| Trash bins | 19 | 79.2 |
| Plastic containers | 10 | 41.7 |
| Nylon bags | 8 | 33.3 |
| Others | 1 | 4.2 |
| Method of waste disposal (multiple options chosen) | | |
| Communal bin | 4 | 16.7 |
| Burning | 18 | 75.0 |
| Incineration | 4 | 16.7 |
| Burying | 5 | 20.8 |
| Landfill | 2 | 8.3 |

and Krishnan, 2004). Despite the availability of HCWM plan, only half of the private facilities had a designated staff and only a quarter had received training on HCWM which is much higher than 7% as reported by Oli et al. (2016) in Nigeria, but lower than reports from other studies (Ferreira and Teixeira, 2010; Joseph and Krishnan, 2004). The amount of waste generated in this current study range from 0.1kg to 2.0 kg per health facility with the median waste generated been 0.5kg which is similar to that found by Fadipe et al. (2011) in Osun state that found the range to be 1.0kg to 2.8kg and 1.0kg as the average. This suggests that waste generation is low in private hospitals in this environment which might be indicative of low client load.

Waste segregation at source is a veritable step in proper waste management. Though, two-thirds (65%) reported segregating waste at source which is much higher than 12% reported by Oli et al. (2016). Also, a quarter (25%) of the facilities assessed reported colour coding wastes; although the veracity of this claim could not be ascertained as none could correctly identify the colour codes for different medical wastes. This is contrary to the findings from a study by Ngwuluka et al. (2009) in

Jos that reported that some health facilities correctly matched the colours and Awodele et al. (2016) in Lagos where more than half could correctly identify the colour codes.

Waste generated in health facilities need to be stored hygienically to prevent contamination and spread of nosocomial infections; however in this study, 80% store in regular trash bins which is similar to findings from other studies (Fadipe et al., 2011; Ngwulakwu et al., 2009) and buttresses the fact that colour coding of waste is poorly practiced. A sixth of facilities still dispose their waste along with communal wastes though far lower than reports from Fadipe et al. (2011) and this poses a significant threat to the community where scavenging is still very rife due to poverty. This might be a pathway for hospital infections to get into the community. Only half of the facilities assessed had safety boxes, which is a key component of waste segregation and a vital prevention mechanism for sharp associated accidents. This is much lower than 75% of facilities reported by Awodele et al. (2016).

Majority (60%) of the respondent felt they were at risk which is consistent with the findings of Ferreira and

Table 3. Disposal of sharps in the facilities.

| Variable | Frequency (N=24) | Percentage |
|---|------------------|------------|
| Presence of sharp boxes | 11 | 45.8 |
| Disinfect sharps before disposal | 7 | 29.2 |
| Method of disinfection (N=7) (multiple options chosen) | | |
| Autoclave | 1 | 14.3 |
| Boiling | 3 | 42.9 |
| Chemical | 2 | 28.6 |
| Others | 4 | 57.2 |
| Method of sharp disposal (multiple options chosen) | | |
| Burning | 10 | 41.7 |
| Burying | 7 | 29.2 |
| Incineration | 3 | 12.5 |
| Open dumping | 1 | 4.2 |
| Communal bin | 3 | 12.5 |
| Others | 2 | 8.3 |

Table 4. Awareness of risks associated with handling health care wastes among respondents.

| Variable | Frequency (N=24) | Percentage |
|--|------------------|------------|
| Awareness of health risk associated with HCWM | | |
| Yes | 22 | 91.7 |
| No | 2 | 8.3 |
| Health risks (multiple options chosen) | | |
| Hepatitis B | 16 | 66.7 |
| Hepatitis C | 11 | 45.8 |
| HIV | 17 | 70.8 |
| Tetanus | 13 | 54.2 |
| Chemical irritation | 14 | 58.3 |
| Physical injury | 13 | 54.2 |
| Feel at risk from handling medical waste | 21 | 87.5 |
| Method of self-protection from risks | | |
| Use Personal Protective Equipment | 18 | 75 |
| Use Disinfection or Proper Disposal Methods | 1 | 4.2 |
| Being careful | 4 | 16.7 |

Teixeira (2010) in Portugal and nurses felt more at risk than doctors. However, despite the perceived risk, only a few took precautions to protect themselves which is consistent with the findings reported by Awodele et al. (2016) in Lagos. This disconnection between perceived risk and protection of self may be attributed to ignorance or lack of personal protective equipment. Most people felt they were at risk of acquiring Human Immunodeficiency syndrome, hepatitis B virus infection, and chemical irritation; while only a few felt they are at risk of hepatitis C virus infection, Tetanus and physical injury.

Conclusion

Waste generated in private health facilities is small compared to other health facilities, and despite the availability of HCWM plans, implementation is still poor. Most people are aware of the risks associated with handling medical waste; however, risk perception is still low. Health Care Workers should be trained on waste management to address waste segregation, colour coding, protection from hazards and increase their risk perception.

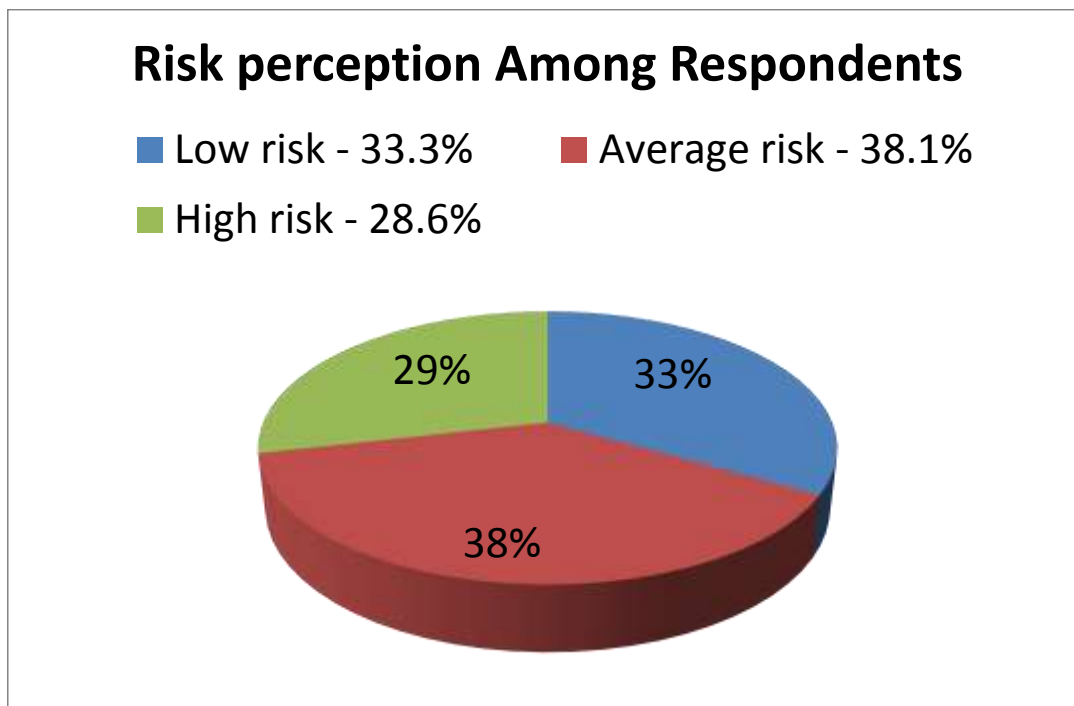


Figure 1. The risk perception among respondents.

Table 5. Association between profession and level of perceived risk.

| Person Interviewed (N=18) | Level of perceived risk | | | |
|------------------------------|-------------------------|---------------------------|------------------------|------------------------|
| | Low risk (Percentage) | Average risk (Percentage) | High risk (Percentage) | |
| Doctor (N=9) | 5 (55.6) | 3 (33.3) | 1 (11.1) | K-W = 5.76 p = 0.06 |
| Nurse (N=7) | 0 (0) | 3 (42.9) | 4 (57.1) | |
| Others (N=2) | 1 (50) | 0 (0) | 1 (50) | |
| Total | 6 (33.3) | 6 (33.3) | 6 (33.3) | |

K-W: Kruskal-Wallis Statistic.

Limitations

The researcher was unable to characterize the waste generated after weighing because of the inherent risk inseparation of these wastes. They were also unable to undertake a proper risk assessment and had to rely on self-reported risk perception, which is subjective and may be prone to social desirability bias.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

REFERENCES

Abah SO, Ohimain EI (2011). Healthcare Waste Management in Nigeria: a case study *Journal of Public Health and Epidemiology*

3(3):99-110.

Alagoz AZ, Kocasoy G (2008). Determination of the best appropriate management methods for the healthcare waste in Istanbul. *Waste Management* 28:1227-1235

Al-Emad AA (2011). Assessment of medical waste management in the main hospitals in Yemen. *East Mediterranean Health Journal* 17(10):730-737.

Awodele O, Adewoye AA, Oparah AC (2016). Assessment of medical waste management in seven hospitals in Lagos, Nigeria *BMC Public Health* 16:269.

Bendjoudi Z, Taleb F, Abdelmalek F, Addou A (2009). Healthcare waste management in Algeria and Mostaganem department. *Waste Management* 29:1383-1387.

Brichard K (2002). Out of sight, out of mind...the medical waste problem. *Lancet* 359:56.

Cheng YW, Sung FC, Yang Y, Lo YH, Chung YT, Li KC (2009). Medical waste production at hospitals and associated factors. *Waste Management* 29:440-444.

Fadipe OO, Oladepo KT, Jeje JO, Ogedengbe MO (2011). Characterization and analysis of medical solid waste in Osun State, Nigeria. *African Journal of Environmental Science and Technology* 5(12):1027-1038.

- Ferreira V, Teixeira MR (2010). Healthcare waste management practices and risk perceptions: findings from hospitals in the Algarve region, Portugal *Waste Management* 30(12):2657-2663.
- Hassan MM, Ahmed SA, Rahman KA, Biswas TK (2008). Pattern of Medical Waste Management; existing scenario in Dhaka City Bangladesh. *BMC Public Health* 8:36
- Johannessen LM, Dijkman M, Bartone C, Hanrahan D, Boyer MG, Chandra C (2000). *Health Care Waste Management Guidance Note*. Washington DC: World Bank publication pp. 2-7.
- Joseph J, Krishnan ACG (2004). Hospital waste management in the union territory of Pondicherry - an exploration. Govt. of Pondicherry Institution, Pondicherry 605006.
- Klangsin P, Harding A (1998). Medical Waste Treatment and Disposal Methods used by Hospitals in Oregon, Washington and Idaho. *Journal of the Air and Waste Management Association* 48:516-526.
- Ngwuluka N, Ochekepe N, Odumosu P, John SA (2009). Waste Management in health care establishment within Jos metropolis, Nigeria. *African Journal of Environmental Science and Technology* 3(12):459-465.
- Oli AN, Ekejindu CC, Adje DU, Ezeobi I, Ejiofor OS, Ibeh CC, Ubajaka CF (2016). Health care waste management in selected Government and Private hospitals in South East Nigeria. *Asian Pacific Journal of Tropical Biomedicine* 6(1):84-89.
- Park K (2009). Hospital Waste Management. In: *Park's Textbook of Preventive and Social Medicine*. 20th ed. Jabalpur M/s Banarsidas Bhanot. pp. 694-699.
- Pruss A, Cirouit E, Rushbrook P (1999). *Safe Management of wastes from health-care activities*. Geneva: World Health Organization available from http://www.who.int/water_sanitation_health/medicalwaste/guide1.pdf accessed 12/2/18.
- Stanley HO, Okpara KE, Chukwujekwu DC, Agbozu IE, Nyenke CU (2011). Hospital waste Management in Port Harcourt Metropolis. *American Journal of Scientific and Industrial Research* 2(5):769-773.
- Townend WK, Cheeseman CR (2005). Guidelines for the evaluation and assessment of the sustainable use of resources and of wastes management at healthcare facilities. *Waste Management Resources* 23:398-408.
- UNEP/WHO (2004). *National Health care waste management plans in sub Saharan African Countries Guidance manual annexe 6* available from http://www.who.int/water_sanitation_health/medicalwaste/en/guidancemanualann6.pdf accessed on 10/8/17
- US Environmental Protection Agency (USEPA) (2013). *Medical Waste* available from <http://www.epa.gov/osw/nonhaz/industrial/medical/index.htm> accessed on 12/2/2018
- Wahab AB, Adesanya DA (2011). Medical Waste Generation in Hospitals and Associated Factors in Ibadan Metropolis, Nigeria. *Research Journal of Applied Sciences, Engineering and Technology* 3(8):746-751.
- World Health Organization (2015). *Fact Sheet No 253*. Available from <http://www.who.int/mediacentre/factsheets/fs253/en> accessed on 5/11/ 2017.