

Healthcare Waste Management Among Private Healthcare Facilities in Abuja Municipal Area Council, Nigeria

¹Oyelayo A. Adekiya*, ²Anokwu Joseph

¹Department of Geography and Environmental Management,
Faculty of Social Sciences,
University of Abuja,
Abuja.

²National Hospital
Abuja

Email: oyelayoadekiya@gmail.com

Abstract

A survey of healthcare waste management among private healthcare facilities was carried out in Abuja Municipal Area Council. The study assessed 52 private healthcare facilities with a total capacity of about 650 beds. Two types of questionnaires were administered during the survey. The first questionnaire on healthcare waste management practices was administered to the managerial staff of the selected private healthcare facilities. The second type of questionnaire, was given to 190 waste handlers, which dealt with problems involved with healthcare waste management. The measurement of quantities of healthcare waste was done using the load- count analysis. The study revealed that the medical waste generated in the healthcare facilities ranges from 0.17 to 0.83kg/bed/day. Only 10-18 % of the waste can be classified as hazardous and it comprised of used needles, swabs, pharmaceutical and pathological waste. About 77 % of healthcare facilities do not segregate waste before disposal. Majority (82%) of the healthcare facilities do not pre-treat waste before disposal. Open dumping account for 32 % of disposal option of healthcare waste in most facilities. About 83 % of the waste handlers were not trained properly on how to manage healthcare waste. Only 40 % of the waste workers use the personal protective equipment, which mostly compromises of overall, facemask and hand glove. Based on the findings, the study recommend that all healthcare facilities should segregate their wastes using the colour coding system by WHO. Pre-treatment of hazardous wastes should be done either by the Abuja Environmental Protection Board at a cost or by the private health facilities before disposal. Open dumping of mixed municipal and healthcare waste should be discouraged. Private healthcare facilities are to provide Personal Protective Equipment for their waste workers and to mandate the workers to use the equipment.

Keywords: Disposal, Hazardous waste, Management, Public, Segregation

*Author for Correspondence

INTRODUCTION

World Health Organization (WHO 2015) defines healthcare waste as the total waste stream from a healthcare or research facilities that produces both potential risk waste and non-risk waste. Healthcare waste is also defined as any solid waste generated in the diagnosis, treatment or immunization of human beings or animals related to research, production or testing of biological samples from all types of healthcare institutions including hospitals, dental clinics or veterinary and medical laboratories (Parks 2009). Of all the total amount of waste generated by healthcare activities, about 85% is general and non-hazardous. The remaining 15% is considered hazardous material that may be infectious, toxic or radioactive (WHO 2018). The hazardous waste generated include a broad range of used needles, syringes, and soiled dressing, body parts, diagnostic samples, blood, chemical pharmaceutical, medical devices and radioactive materials (Khan *et al.*, 2019).

Healthcare waste management is an important way of creating a barrier between waste handlers and the waste itself, by strictly adhering to the laid down procedures from the point of generation, collection, segregation, storage, pre-treatment, transportation, incineration and final disposal at dumpsite or landfill, (Bassey *et al.*, 2006). Healthcare waste management is important because it protects the environment from infectious agents which may end up re-infecting humans or animals. Healthcare waste management also prevents environmental pollution, through untreated medical waste buried in, or drained into the ground (Kwikiriza *et al.*, 2019).

Poor management of healthcare waste have environmental and health impacts on the community, such as there lease of chemical and biological hazards, including drug resistant microorganisms, into the environment, (WHO 2020). It also exposes the patients, healthcare workers, waste handlers and the communities to infections and injuries. (Oli *et al.*, 2016; Hayleeyesus *et al.*, 2016). Inadequate healthcare waste management can cause environmental pollution (air, water and soil), growth and multiplication of vectors like insects, rodents and worms and may lead to the transmission of dangerous diseases like typhoid, cholera, hepatitis and acquired immune deficiency syndrome through injuries from syringes and needles contaminated with humans' pathogens (Zafar 2019). Unsafe disposal of injection needles in 2010 were responsible for 33,800 new human immunodeficiency virus infection, 1.7 million hepatitis B infection and 315,000 hepatitis C infection (Pepin *et al.*, 2014).

Many developed countries have articulated technology and data management systems along with adequate rules and policies for waste management, these countries enforce strict guidelines regarding healthcare waste management (Marinkovic *et al.*, 2008; Iqbal *et al.*, 2017), However in developing countries, healthcare waste management is poorly done due to constrained resources (Caniato *et al.*, 2015; Mustafa *et al.*, 2017). Healthcare sector is growing at a very rapid rate in Nigeria, this in turn has led to increase in quantity of healthcare waste generated. In Nigeria, healthcare waste is collected and disposed in conjunction with normal domestic/household waste (Ebisike 2010). This can result to an increase in risk to the health of the people and the communities at large. Blood borne diseases like HIV and viral hepatitis B can be acquired through mismanagement of hazardous hospital waste (Kwikiriza *et al.*, 2019).

Abuja, the Federal Capital of Nigeria is experiencing increase in population year after year as people from different parts of Nigeria visit the seat of Government in search of green pasture. According to the National population Commission (2006) the population of Federal Capital Territory was 1,406,239 in 2006, this has been projected to 3,564,100 in 2016 (City

population 2020). The influx of people into the city has led to increase in the provision of healthcare facilities. As the number of healthcare facility increases, the volume and quantity of healthcare waste produce also increases. Some of these healthcare facilities are cited within the residential areas. According to Niyaongabo (2018), medical waste disposal in many developing countries still have many problems. Development of an effective waste management practice is crucial to the prevention of the potential exposure of healthcare service worker, patients and the public to infection, toxic chemicals as well as protection to the environment (Windfeld and Brook 2015). The aim of this paper is to evaluate the current healthcare waste management practices in private healthcare facilities in Abuja Municipal Area Council, with a view of raising awareness to the government and the public on the risk associated withimproper management of healthcare waste.

STUDY AREA

The Federal Capital Territory (FCT) was created in1976, it is 1,100kilometres away from Lagos. It is located in the heartland of the country, It lies between latitude $8^{\circ} 25''$ and $9^{\circ} 21''$ north of the equator and longitude $6^{\circ} 45''$ and $7^{\circ} 3''$ east of the Greenwich meridian. Its areaof land coverage is 8,000km². The Federal Capital Territory is divided into six area councils namely: Abaji,Kwali, Kuje, Bwari, Gwagwalada and Abuja Municipal Area Council (AMAC). The AMAC which is the study area, has an estimated land of 1,769km². According to the National Population Commission the projected population of AMAC is 1,967,500 (City population 2020). There are 2 tertiary healthcare facilities, 6 secondary healthcare facilities, 42 primary healthcare facilities and 131 private healthcare facilities in the study area. (Health and Human Services Department 2018).

MATERIALS AND METHODS

A cross- sectional survey research was employed for this study. Forty percent (52) of the 131 registered private hospitals within Abuja Municipal Area Council were selected at random using the lucky dip method. Fifty-two healthcare facilities having between 10-15 beds were selected. Four waste handlers/collectors were picked from each of the fifty-two sampled private healthcare facilities. Two types of questionnaires were administered during the survey. The first type was given to each of the managerial staff of the fifty-two (52) selected private healthcare facilities. This questionnaire dealt with healthcare waste management practices within each sampled healthcare facility. The second type of questionnaire, given to the waste handlers/collectors dealt with socio-economic characteristics of waste handlers and problems involved in healthcare waste handling, collection and disposal. A total numbers of two hundred and eight (208) questionnaires were given out, however one hundred and ninety (190) were returned.

The measurement of quantities of healthcare waste generated by the sampled healthcare facilities per day was done, using the load- count analysis. In this method the number of individual load and the corresponding waste characteristics (type of waste, estimate volume) from sampled healthcare facilities were noted and recorded in kilograms, using the weighing scale. This was done on a daily basis for 7 consecutive days, running from Monday to Sunday. The field surveys and practical measurement of healthcare waste generated in the sampled healthcare facilities lasted for a period of two months (March and April 2019). The data were analyzed using the frequency table, line graph and bar charts.

RESULTS

The results of this study are presented in two sections. The first section deals with the waste management practice in the selected healthcare facilities. The second section deals with socio-economic characteristics of waste handlers, problems involved in healthcare waste management, and occupational hazards among waste handlers.

Waste management practices in the selected healthcare facilities

The study revealed that the largest quantity of waste (2,857kg/day) was generated on Tuesday, while the lowest (1,045kg/day) was generated on Sunday. This is due to the fact that on weekends the hospital always have low turn up of patients and visitors. The average waste generation rate per bed per day was from 1.60 to 4.39 kg/bed/day (table 1). The medical waste generated in the sampled healthcare facilities ranged from 0.17 to 0.83kg/bed/day (table 2). In figure 1, the composition of waste generated in private healthcare facilities shows that 82 % of the waste were domestic and non-hazardous and only between 10-18 % could be classified as hazardous healthcare waste which comprised of used needles, syringes, soiled dressing, pharmaceutical and pathological waste. Different containers were used in the healthcare facilities to store waste before disposal. Plastic containers without lids accounted for 40 % (table 3 and fig.2, other storage containers used were cartons, metal bins with lids and plastic containers with lids. Table 3 showed that, 77 % of healthcare facilities do not practice segregation of wastes before disposal. Domestic waste are usually mixed with medical or hazardous domestic waste in the same storage container (fig.2). In most healthcare facilities, segregation of waste was only done during the data collection period, when the researchers needed to quantify the domestic/non-hazardous waste and the hazardous waste. About 82 % of the healthcare facilities do not pre-treat waste before disposal, only 17 % pre-treated the healthcare waste before its final disposal and the pre-treatment measures used are mainly chemical disinfection. (i.e with chlorine).

Open dumping within the neighbourhood account for 32 % of disposal option of healthcare waste in most facilities, 28 % of the healthcare facilities used the private waste collectors, 21 % practiced onsite burning of waste within their premises and 17 % employed the services of Abuja Environmental Protection Board for waste evacuation and disposal.

Table 1: Average waste generated per bed/day

Days of the week	Daily waste generated (Kg)	Kg/bed/day of waste
Monday	2611	4.01
Tuesday	2875	4.39
Wednesday	2397	3.67
Thursday	2403	3.69
Friday	2007	3.08
Saturday	1487	2.28
Sunday	1045	1.60

Table 2: Average medical waste generated per bed/day

Days of the week	Daily medical waste generated	Kg/bed/waste
Monday	451.7	0.69
Tuesday	539.9	0.83
Wednesday	402.6	0.61
Thursday	360.4	0.55
Friday	280.9	0.43
Saturday	172.4	0.26
Sunday	110.7	0.17

Healthcare Waste Management Among Private Healthcare Facilities in Abuja Municipal Area Council, Nigeria.

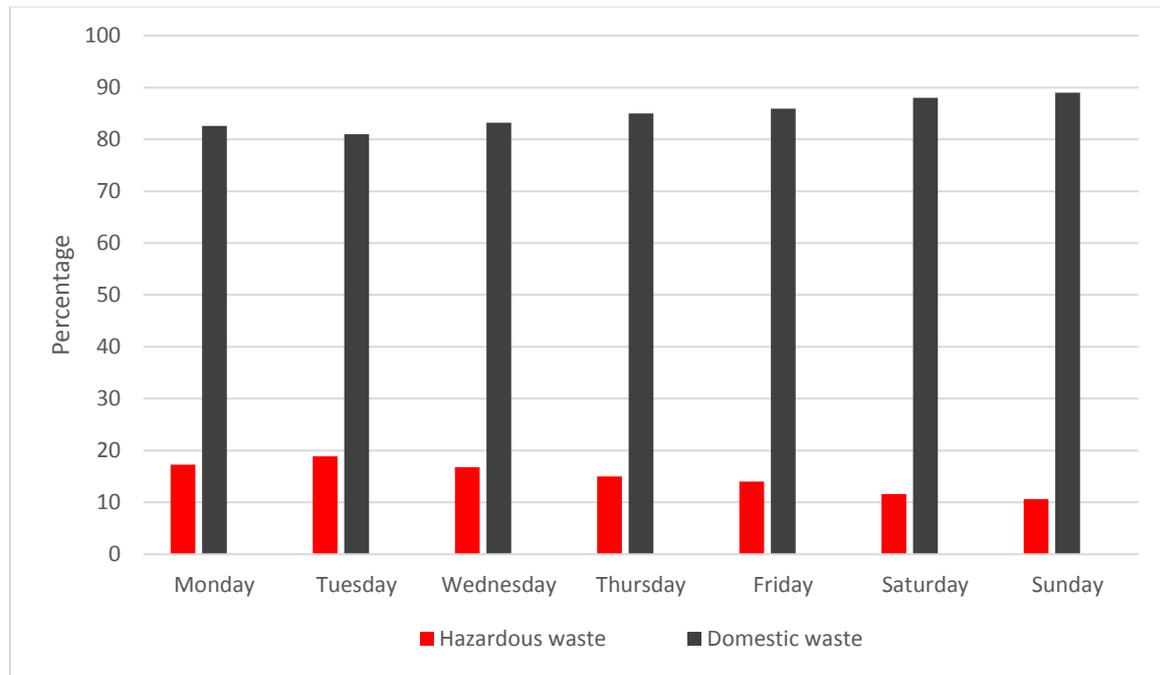


Fig. 1 Composition of Healthcare waste in sampled Healthcare Facilities

Table 3: Waste management practices in the selected healthcare facilities

Types of Waste Containers	Number	Frequency (%)
Plastic bins with lid	9	17.3
Plastic bins without lid	21	40.3
Metal bin with lid	12	23
Cartons	10	19.2
Total	52	100
Segregation of wastes	Number	Frequency (%)
Yes	12	23
No	40	77
Total	52	100
Pre-Treatment Measures	Number	Frequency (%)
Yes	9	17.3
No	43	82.6
Total	52	100
Disposal Options	Number	Frequency (%)
Open dumping within the Neighbourhood	17	32.6
Onsite burning	11	21.1
Evacuation by private collectors	15	28.8
Evacuation by Abuja Environmental Protection Board	9	17.3
Total	52	100



Fig. 2 Container and types of waste in a sampled Healthcare Facility

Socio-economic characteristics and occupational hazards among waste handlers

In table 4, it revealed that 52 % of the waste handlers were between the ages of 25 to 44 years. Female waste handlers account for 64 %, while the male waste handlers are 36 %. More than half (52 %) of the waste handlers have secondary school certificate. This table also shows that 65 % of the waste handlers have worked for between 1 to 4 years, 22% of the waste handlers have worked from 5 to 10 years, while only 13% respondents have worked up to 11years and above. The researchers learnt from the field work, that, the waste handlers in the private healthcare facilities do not stay too long on the job due to the high risk involved in the work and secondly because of poor wages. The researchers further learnt that the highest monthly salary received by the waste handlers was between fifteen to twenty thousand (N15, 000 -20,000) naira only.

From table 5 and 6, about 83 % of the waste handlers were not trained properly on how to manage healthcare waste and 60 % do not use any form of personal protective equipment. Only 40 % of the waste workers use the personal protective equipment, which are comprised of overalls, facemask and hand gloves. In figure 3, about 32% of the waste handlers have not been exposed to an occupational hazard or accident. The different hazard and accident other waste handlers have been exposed to include minor cuts (33%), body rash (16%), burns (10 %), needle prick (5 %) and falls (4 %).

Healthcare Waste Management Among Private Healthcare Facilities in Abuja Municipal Area Council, Nigeria.

Table 4: Socio-economic Characteristics of Waste Handlers

Age (in years)	Number	Frequency (%)
18-24	53	27.8
25-44	100	52.6
45 and above	37	19.4
Sex	Number	Frequency (%)
Male	68	35.7
Female	122	64.2
Educational Qualification	Number	Frequency (%)
First School Certificate	67	35.7
Secondary School Certificate	98	51.5
Diploma Certificate	25	13.1
Number of years of working in the healthcare facility	Number	Frequency (%)
1-4	123	64.7
5-10	41	21.5
11 years and above	26	13.6

Table 5: Training of Waste Handlers on Healthcare Wastes

Training of Waste Handlers	Number	Frequency (%)
Yes	32	16.8
No	158	83.1
Total	190	100

Table 6: Wearing of Personal Protective Equipment (PPE) by Waste Handlers.

Wearing of Personal Protective Equipment	Number	Frequency (%)
Yes	77	40.5
No	113	59.4
Total	190	100

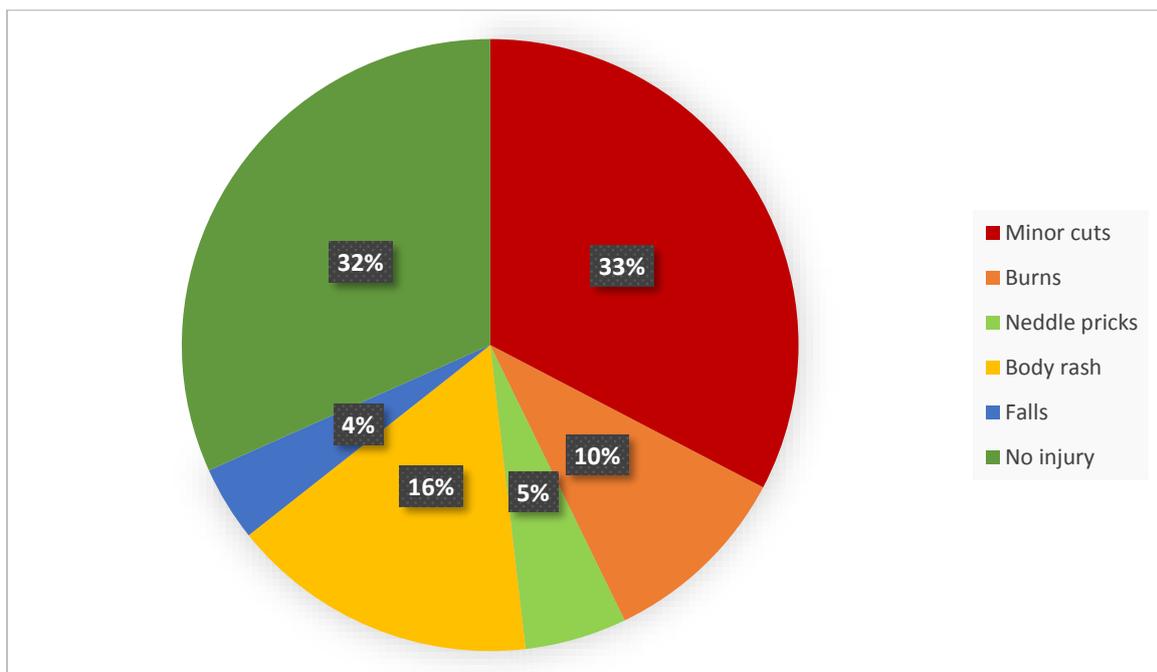


Fig. 3 Types of Hazard among waste handlers

DISCUSSION

The composition of healthcare waste generated from private healthcare facilities showed the waste comprised of both non-hazardous (made up of office papers, food waste, food containers, toiletries etc.) and hazardous waste, this corroborates with the WHO (2018). According to Mustafa *et al* (2017) the hazardous healthcare waste may comprise of infectious, toxic genotoxic and radioactive items, such waste pose environmental and occupational health risk. Medical waste generated from the study are similar to generation rate in Lagos (Nigeria) 0.57 kg/bed/day, Sudan 0.85 kg/bed/day, India 0.19 to-0.51 kg/bed/day, China 0.68 kg/bed/day, Turkey 0.63 kg/bed/day, Ethiopia 0.20 to 0.03kg/bed/day and Egypt 0.85 kg/bed/day, (Mustafa *et al.*, 2107;Hayleeyesus *et al.*,2016).

Segregation of infectious waste at the source of generation is a key for achieving a sound medical waste management (Longe and Williams 2006). In the study most, of the healthcare facilities do not practice colour coding segregation of waste, this was also noted in Zaria (Joshua *el al.*, 2014) and Lagos (Longe 2011). The poor segregation and handling of waste increases the risk of infection to staff, patients and visitors (Akume *et al* 2016). A small number of healthcare facilities carry out pre-treatment measures of healthcare waste before its final disposal. The pre-treatment measures used are mainly chemical disinfection. WHO (2018) noted that treatment of healthcare waste with chemical disinfectants can result to release of chemical substances into the environment, if those substances are not properly handled, stored or disposed of in the respective environment. Alternatives pre-treatment measures for healthcare waste recommended by WHO (2018) are autoclaving, microwaving and steam treatment before disposal.

Open dumping of healthcare waste, within the neighbourhood is still a disposal option for some health care facilities, Open dumping of healthcare waste creates serious health risk to municipal workers, the public and the environment (Olatunbosun *et al.*, 2014). Mixing healthcare waste with municipality waste in the open dump sites make the entire waste to be infectious. It is difficult to obtain a benefit from general waste through processes such as reuse, recycling and recovery when wastes are contaminated with infectious agents (Lavee 2007, Hassan *et al.*, 2018). Burning and incineration of medical and municipal waste have been linked to the release of heavy metals like mercury and toxic dioxin in the environment (Chintis *et al.*, 2004).

Majority of the waste handlers were not trained properly on how to manage healthcare waste. Lack or inadequate training, low awareness, financial constraints etc. are barriers which led to improper healthcare waste management (Hassan *et al.*, 2018). According to Khan *et al.* (2019) training sessions for private healthcare facilities staff can help significantly in educating waste handlers to understand the seriousness of their jobs. Most of the waste handlers do not use any form of personal protective equipment, To minimize risk, provisions of healthcare waste infrastructure is of great importance, handling of healthcare waste require the use of PPE such heavy duty gloves to prevent cuts, pricks and heat, face mask to control dust, smoke and powdered chemicals, boots and apron (Pruss *et al.*, 1999;Kagonji and Manyele 2016,).Poor management of healthcare waste exposes the patients, healthcare workers, waste handlers and the communities to infections and injuries (Oli *et al.*, 2016; Niyongabo *et al.*, 2019). The WHO (2020) also noted that health workers including healthcare waste workers are exposed to a variety of health and safety hazards. These include biological hazards (TB, hepatitis, HIV/AIDS, SARS), chemical hazards (ethylene oxide), physical hazards (noise, radiation, slips trips and falls), ergonomic hazards (heavy lifting), psychosocial diseases, fire and explosion hazard and electrical hazards.

CONCLUSION

The study showed that there is poor healthcare waste management in private healthcare facilities in Abuja Municipal Area Council (AMAC). There is poor storage of healthcare waste, most of the private healthcare facilities do not practice segregation of waste using the colour coding system by WHO and only a little percentage of the facilities pre-treat hazardous healthcare waste before disposal. Open dumping of waste within the neighbourhood is still used for disposal of healthcare waste. The study also showed that there is poor training of waste worker on handling of waste and there is poor usage of the PPE. The healthcare waste handlers are highly exposed to health hazards, infection and physical injuries that are associated with improper management of healthcare waste. This current practice among the private healthcare facilities shows that neither the government or other regulatory agencies is closely monitoring the management of healthcare waste to ensure adherence to recommended standards.

RECOMMENDATION

Based on the findings, the study, recommend that the Federal Ministries of Environment (FME), Health (FMOH) and Abuja Municipal Area Council should put in place a legislation that will regulate healthcare waste generation and management in Abuja Municipal Area Council. Existing policies/laws on healthcare waste generation and management should be enforced and implemented. All healthcare facilities should practice segregation of wastes, in which hazardous waste must be separated from domestic waste using the colour coding system by WHO. Proper storage bins with lids should be encouraged for collection and storage of healthcare wastes. Pre-treatment of hazardous wastes should be done either by the Abuja Environmental Protection Board at a cost or the private health facilities before disposal. Open dumping of mixed municipal and healthcare wastes should be discouraged, as it poses health risk to municipal waste workers, scavengers and the public at large. All workers should be trained on techniques of handling healthcare waste. Private healthcare facilities are to provide PPE for their waste workers and to mandate the workers to use the equipment. If healthcare waste is not handled properly, there will be a great, significant level of deterioration in the health and living environment, which may grossly result in high loss of productivity and reduce economic output.

REFERENCES

- Akume, M. and Kiiwanuka, S. N. (2016). Healthcare waste segregation behavior among health workers in Uganda: An application of the theory of planned behavior. *J Environ Public Health*.8132306. Doi:10.1155/2016/8132306.
- Bassey, B.E., Benka-Coker, M. O., & Aluyi, H. S. A. (2006). Characterization and management of solid medical waste in the Federal Capital Territory Abuja Nigeria. *Afr Health Sci.*, 6(1): 58-63.
- Caniato, M., Tudor, T., & Vaccari, M. (2015). International governance structures for healthcare waste management: A systematic review of scientific literatures. *J Environ. Manage*,153:93-107.
- Chintis, V.,Chintis, S., Vaidya, K., Ravikant, S., Patil, S., &Chintis, D. S. (2004). Bacterial population changes in hospital effluent treatment plant in central India. *Water Research Journal*, vol. 38, (2): 441-447.

- Ebisike, O.A. (2010). Health Care Waste Management, Principles, Regulation and Policy: A presentation to Registered Environmental Health Officers by the Registrar Environmental Health Officers Registration Council of Nigeria, Abuja FCT.
- Hassan, A.A., Tudor, T., & Vaccari, M. (2018). Healthcare Waste Management: A case study from Sudan, *Environments*, 5 (8), 89.
- Hayleeyesus, S. F. & Wondemagegn, C. (2016). Healthcare Waste Generation and Management in Public Health care Facilities in Adama, Ethiopia. *J. Health Pollut.* 10: 64-73.
- Iqbal, S. T. Z, & Razzaq, S. (2017). Novel Healthcare Solution for Smart Hospital: A Qualitative Review. *Biomed Lett*, 3: 99-106.
- Joshua, A.T., Mohammed, S., Makama, J. G., Joshua, W.I., Audu, O., & Nmadu, A. G. (2014). Hospital waste management as a potential hazard in selected primary health care centers in Zaria, Nigeria. *Niger J Technol*, 33(2): 215-221.
- Kagoni, I., & Manyele, S. (2016). Analysis of health workers perception on medical waste management in Tanzanian Hospitals. *Engineering*, 8: 445-459.
- Khan, B. A., Khan, A. A., Ahmed, H., Shaikh, S. S, Peng, Z., & Cheng, L. (2019). A Study on small clinics waste management practice rules, staff knowledge and motivating factor in a rapidly urbanizing area. *Int J. Environ Res. Public Health* 16, 4044.
- Kwikiriza, S., Stewart, A. G., Mutahunga, B., Dobson, A. E., & Wilkinson, E. (2019). A Whole Systems Approach to Hospital Waste Management in Rural Uganda. *Front Public Health*. Doi: 10.3389/fpubh.2019.00136.
- Lavee, D. (2007). Is municipal solid waste recycling economically efficient? *Environ. Manage.*, 40: 926-943.
- Longe, E.O. (2011). Health care waste management status in Lagos state, Nigeria: A case study from selected facilities in Ikorodu and Lagos metropolis. *Waste Manag Res.* 0(0): 1-10.
- Longe, E. O. & Williams, A.A. (2006). A preliminary study of medical waste management in Lagos Metropolis, Nigeria. *Iran J Environ Health Sci. Eng.*, vol. 3(2):133-139.
- Marinkovic, N., Vitale K., Hoicer N. J., Dzakula A., & Pavic, T. (2008). Management of hazardous medical waste in Croatia. *Waste Management*, 28:1049-1056.
- Mustafa, Ali., Weenpig, Wangi., Nawaz, Chaudhry., & Young, Geng. (2017). Hospital waste management in developing countries: A mini review, *Waste Management and Research*, 35: (6) 1-12.
- Niyongabo, E., Jang, Y., Kang, D. & Sung, K. (2019). Current treatment and disposal practices for medical waste in Bujumbura, Burundi. *Environmental Engineering Research* 24:211- 219. Doi: 10.4491/eer.2018.095.
- Olatunbosun, B.E., Uguru-Okorie, D. C., & Ekpo, D. (2014). A comparison of medical waste generated in selected private and public hospital in Abeokuta Metropolis, Nigeria. *International Journal of Scientific and Engineering Research*, vol.5 Issue 7, July 2014, 1441, ISSN: 2229-5518.
- Oli, N.O., Ekejindu, C.C., Adje, D.U., Ezeobi I., Ejiofor O. S., Ibeh C., & Ubajaka C. F. (2016). Healthcare waste management in selected government and private hospitals in southeast Nigeria, *Asian Pac J Trop Biomed*, 6, (1): 84-89.
- Parks K., (2009). A textbook on Preventive and Social Medicine, 20th Edition, Published by M/S Bnarisdas, Bhanot, Jabalpur, India.
- Pepin J, Abou Chakra, C. N., Pepin, E., Nault, V., & Valiquette, L. (2014). Evolution of the global burden of viral infections 2000-2010 *PLoS ONE*, 2014, 9, e99677.
- Pruss, A., Girout. E., & Rushbrook, P., (1999). Safe Management of waste from Healthcare Activities. World Health Organization, Geneva, 1999.

- Windfeld, S.E. & Brook L.M. (2015). Medical waste management- A review. *J. Environ Manage.* **163**: 98-108.
- World Health Organization (2015). *Medical-waste-challenges-faced-around-the-world.* Factsheet No.253, November, 2015.
- World Health Organization (2018). *Health care waste.* Fact sheet, Feb.2018.
- World Health Organization (2020). *Health workers, occupational health.* Fact sheet.Feb.2020.
- Zafar ,Salman. (2019). *Medical waste management in Developing countries, Bio Energy,* Consult, Sept 30, 2019.