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Original Research Article

Solid Medical Waste Treatment Methods by Health Care Facilities in Abia State, Nigeria

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ABSTRACT

Medical wastes include sharps, pathological wastes, chemical wastes, infective wastes, pharmaceutical wastes and radioactive wastes. This study was carried out to determine the solid medical waste treatment methods by health care facilities in Lagos, Southwestern Nigeria. A harmonized checklist and a well-structured questionnaire were used to obtain data from 15 health care facilities and 552 workers. All the respondents gave an informed consent to be part of the study. Results of the study showed that for the treatment of sharps, shedding was indicated by 122 (22.10%) respondents; autoclaving, 200 (36.23%); incineration, 282 (51.09%); thermal inactivation, 28 (5.07%); chemical disinfection, 50 (9.06%); no treatment, 218 (39.49%). For pathological waste, shedding was indicated by 190 (34.42%) respondents; autoclaving, 12 (2.17%); incineration, 115 (20.83%); thermal inactivation, 135 (24.46%); chemical disinfection, 170 (30.80%); no treatment, 278 (50.36%). For treatment of radioactive waste, shedding was indicated by 10 (1.81%) respondents; autoclaving, 47 (8.51%); incineration, 35 (6.34%); thermal inactivation, 53 (9.60%); chemical disinfection, 193 (34.96%); no treatment, 214 (38.77%). For treatment of chemical waste, shedding was indicated by 93 (16.85%) respondents; autoclaving, 132 (23.91%); incineration, 27 (4.89%); thermal inactivation, 81 (14.67%); chemical disinfection, 194 (35.14%); no treatment, 106 (19.20%). For infectious waste, shedding was indicated by 72 (13.04%) respondents; autoclaving, 131 (23.73%); incineration, 42 (7.61%); thermal inactivation, 173 (31.34%); chemical disinfection, 245 (44.38%); no treatment, 34 (6.16%). For pharmaceutical waste, shedding was indicated by 111 (20.11%) respondents; autoclaving, 159 (28.80%); incineration, 142 (25.72%); thermal inactivation, 82 (14.86%); chemical disinfection, 100 (18.12%); no treatment, 101 (18.30%).

Keywords: Medical waste, Incineration, Autoclaving, Shedding, Chemical disinfection

INTRODUCTION

Wastes that are generated from healthcare facilities are termed as medical wastes, and such waste can cause considerable environmental pollution if not properly managed. The wastes represent a significant health risks for the hospital employees, patients and the society. Medical wastes are categorized as sharps, pathological wastes, chemical wastes, infective wastes, pharmaceutical wastes and radioactive wastes. [1] The hazardous and toxic parts of waste from healthcare establishments comprising infectious, medical and radioactive material as well as sharps that constitute a grave risks to mankind and the environment when allowed to be mixed with other municipal waste. [2] These wastes are usually in the form of solid and liquid wastes (wastewater). Both are

important sources of physical and natural environmental degradation and constitute health hazard. There are also radioactive wastes which result from contamination of substances by ionizing radiation from radionuclides. The soil associated or under the disposed wastes is one of the main reservoirs of microbial life, and contaminated water contains pathogenic microorganisms, which are causative agents of different types of disease. Poor waste management can jeopardize healthcare staff, employees who handle medical waste, patients and their families, and the neighboring communities. In addition, the inappropriate treatment or disposal of waste can lead to environmental contamination or pollution. [3]

Each class of medical waste require specific treatment, however, in order to be pragmatic, it is advisable to distinguish three major classes polarizing around 90 % of the biomedical waste production. [4] These major categories include waste sharps; infectious and cytotoxic wastes; and organic wastes (blood and body fluid wastes, human anatomical waste). Hazardous medical waste can be treated to reach a level of hazard that is considered as acceptable. Thus, after treatment, they follow the non-risk medical waste stream and are disposed of with the general solid waste. They can also be directly disposed of by incineration or in sanitary landfills. [5]

This option of on-site treatment is often the only one possible in the rural health care facilities of the primary sector but on-site treatment can be also carried out for health care waste generated in major health care facilities. On-site treatment facilities are particularly appropriate in areas where hospitals are situated far from each other and the road system is poor. [6] The advantages of providing each health-care establishment with an on-site treatment facility includes convenience and minimization of risks to public health and the environment by confinement of hazardous waste to the health-care premises. However, the treatment costs may be high if there are many hospitals: extra technical staff may be required to operate and maintain the facilities and it may be difficult for the relevant authorities to monitor the performance of many small facilities. This may result in poor compliance with operating standards, depending on the type of facilities, and increased environmental pollution. [7]

The health care waste generated in health care facilities can be treated off-site, when centralized regional facilities exist. Although off-site treatment increases dependency of the health care facilities on an external actor and requires a fine tuned transportation system, it provides the advantage that hospitals will not have to devote time and personnel to manage their own installations. Also efficient operation can be more easily ensured in one centralized facility than in several plants where skilled workers may not be readily available. There is greater cost-effectiveness for larger units, through economies of scale. [8] According to the United Nations Environment Programme, [9] treatment is near the bottom of the waste management hierarchy because the most desirable and preferred approaches involve preventing waste in the first place, reduction of waste, and reusing or recycling when safe to do so. After all approaches toward waste minimization have been used, the remaining waste requires treatment and safe disposal of residues. [9,10]

The purpose of treatment is to reduce the potential hazard from healthcare waste thereby protecting public health and the environment. There are four basic processes which could be used for the treatment of healthcare wastes; they are thermal, chemical, irradiative, biological, and mechanical, which could be used to supplement others. The traditional method of treatment has been incineration which transforms healthcare waste into ash. This however, transforms the waste into toxic air pollutants and in turn, constitutes hazard to human health and the environment. Land disposal may also result in leaching and

underground water pollution if improperly managed. [11] Thus, proper health care waste management practices should be strictly followed as part of comprehensive and systemic approach to hospital hygiene and infection prevention and control. It is important to mention that for most health care facilities, lack of resources tends to affect negatively the way health care waste is managed. In some cases, situations differ significantly from the public sector to the private sector. Therefore, this study aimed to assess the medical waste treatment practices in Abia State.

MATERIALS AND METHODS

This study was a descriptive cross-sectional study carried out in health care facilities of Abia State, Nigeria. A harmonized checklist and a well-structured questionnaire were used to obtain data from the health care facilities and their workers. All the respondents gave an informed consent to be part of the study.

RESULTS

A total 552 health workers from 15 health facilities across Abia State, Nigeria were used for this study. Table 1 showed the distribution of the methods used in the treatment of sharps before disposal. The table showed that shedding was indicated by 122 (22.10%) respondents; autoclaving, 200 (36.23%); incineration, 282 (51.09%); thermal inactivation, 28 (5.07%); chemical disinfection, 50 (9.06%); no treatment, 218 (39.49%). For pathological waste (Table 2), shedding was indicated by 190 (34.42%) respondents; autoclaving, 12 (2.17%); incineration, 115 (20.83%); thermal inactivation, 135 (24.46%); chemical disinfection, 170 (30.80%); no treatment, 278 (50.36%). Table 3 showed that for treatment of radioactive waste, shedding was indicated by 10 (1.81%) respondents; autoclaving, 47 (8.51%); incineration, 35 (6.34%); thermal inactivation, 53 (9.60%); chemical disinfection, 193 (34.96%); no treatment, 214 (38.77%).Distribution of methods used for treatment of chemical waste before disposal showed that shedding was indicated by 93 (16.85%) respondents; autoclaving, 132 (23.91%); incineration, 27 (4.89%); thermal inactivation, 81 (14.67%); chemical disinfection, 194 (35.14%); no treatment, 106 (19.20%). For infectious waste (Table 5), shedding was indicated by 72 (13.04%) respondents; autoclaving, 131 (23.73%); incineration, 42 (7.61%); thermal inactivation, 173 (31.34%); chemical disinfection, 245 (44.38%); no treatment, 34 (6.16%).Distribution of methods used for treatment of pharmaceutical waste before disposal showed that shedding was indicated by 111 (20.11%) respondents; autoclaving, 159 (28.80%); incineration, 142 (25.72%); thermal inactivation, 82 (14.86%); chemical disinfection, 100 (18.12%); no treatment, 101 (18.30%).

Table 1: Distribution of methods used for treatment of sharp before disposal

Method	n	%
Shedding	122	22.10
Autoclaving	200	36.23
Incineration	282	51.09
Thermal inactivation	28	5.07
Chemical disinfection	50	9.06
No treatment	218	39.49

Table 2: Distribution of methods used for treatment of pathological waste before disposal

Method	n	%
Shedding	190	34.42
Autoclaving	12	2.17
Incineration	115	20.83
Thermal inactivation	135	24.46
Chemical disinfection	170	30.80
No treatment	278	50.36

Table 3: Distribution of methods used for treatment of radioactive waste before disposal

Method	n	%
Shedding	10	1.81
Autoclaving	47	8.51
Incineration	35	6.34
Thermal inactivation	53	9.60
Chemical disinfection	193	34.96
No treatment	214	38.77

Table 4: Distribution of methods used for treatment of chemical waste before disposal

Method	n	%
Shedding	93	16.85
Autoclaving	132	23.91
Incineration	27	4.89
Thermal inactivation	81	14.67
Chemical disinfection	194	35.14
No treatment	106	19.20

Table 5: Distribution of methods used for treatment of infectious waste before disposal

Method	n	%
Shedding	72	13.04
Autoclaving	131	23.73
Incineration	42	7.61
Thermal inactivation	173	31.34
Chemical disinfection	245	44.38
No treatment	34	6.16

Table 6: Distribution of methods used for treatment of pharmaceutical waste before disposal

Method	n	%
Shedding	111	20.11
Autoclaving	159	28.80
Incineration	142	25.72
Thermal inactivation	82	14.86
Chemical disinfection	100	18.12
No treatment	101	18.30

DISCUSSION

Health care facilities in Nigeria generate hazardous wastes just like in any other country. These wastes must be treated properly in order to avoid hazardous exposure to human beings. Sharps such as needles, scalpels, lancets, razors, broken glass and wires must be not have any contact with people or else they can cause serious injuries. Table 1 showed that incineration was the most common method used in its treatment by the health care facilities. This method is recommended for treatment of pathological waste. [12] Before 1997, over 90% of all infectious medical waste was disposed of by incineration. [10] Other methods have been proved more effective depending on the kind of waste. Some kinds of chemical waste can be neutralized by applying reactive chemicals that render it inert. [13] This was practiced by some the health facilities studied as shown in table 4. Similar studies [5,14] have advocated for the use of chemical disinfection for the treatment of chemical waste. Other studies [15] have found autoclaving to be popular among the methods for disposing bio hazardous wastes. By autoclaving, steam sterilization renders the biological wastes non-infectious which then can be disposed of normally in solid waste landfills. Another way to render hazardous health care waste non-hazardous is to microwave it with high-powered equipment. As with autoclaving, this method opens up the waste to normal landfill disposal or incineration afterwards.

Medical waste treatment leads to a reduction in volume, weight and risk of infection and organic compound of the waste. There are no clear policies and plans in place for managing medical waste in the surveyed health facilities, as evidenced by the absence of manuals and guidelines. Indeed, it was gathered that there is no medical waste management policy/guideline at both the national and state levels. It is important for Standard Operating Procedures (SOP) be prepared for medical waste management in the hospitals as obtained in developed countries where definite rules and regulations exist at the national, regional and hospital levels. In the light of this, it is not only the policy/legislation, but also the inclusion of proper monitoring and enforcement strategy, which would further allow for proper health care waste management. This study also noticed several reasons for poor health care waste management in the hospitals but the most prevalent challenges highlighted during the interview section were lack of definite policies/legislation, lack of budget allocation, lack of rules and regulations, poor training of some hospital staff and lack of implementation/ enforcement. Several studies [16-18] in African countries have highlighted similar challenges in the health facilities especially in the rural areas. It is in the interest of health workers to ensure that health care waste is properly disposed as they are the ones who are mostly at risk of exposure to the hazardous wastes generated by the health facilities.

CONCLUSION

In conclusion, health care waste generated by the health care facilities studied did not dispose their wastes properly and many of the health workers did not take proper precautions to protect themselves. It is recommended that adequate guidelines and standard operating procedures be provided with the health care facilities so

that they can be properly guided with the proper waste treatment method according to the type of waste.

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