Assessment of Healthcare Waste Management practices in Primary Health Care Facilities in a Lassa Fever Endemic Local Government Area of Edo state, Nigeria.

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ABSTRACT

Background: *The safe management of healthcare waste remains a public health issue in many countries of the world.*

Objectives: *To assess healthcare waste management practices in primary health care facilities in a rural Lassa fever endemic community in Edo State, Nigeria.*

Materials and Methods*: A cross sectional descriptive study was carried out in 12 Primary healthcare centers in Esan West local government area of Edo State. Wastes generated over 7 days were weighed daily. A checklist was used to record current practice, and Key informant interviews with officers in charge of facilities assessed Managements' commitment to healthcare waste management. Statistical Package for the Social sciences (SPSS) version 15 was used for data analysis, and results presented as tables, with continuous variables summarized as means and standard deviations.*

Results: *Mean waste generation for all the facilities was 0.21/kg/bed/day. Waste re-use and segregation was minimal, storage was in open baskets, with safety boxes used for sharps, and final disposal was by burial or burning. Policies on healthcare waste management were unknown, and there was no budget for waste management.*

Conclusion: *Waste management remains a public health concern at the Primary Healthcare level in Edo State. Addressing this problem will necessarily start with gaining support from health managers at this level of healthcare delivery.*

Key words: *Healthcare waste, primary healthcare centres, waste management.*

INTRODUCTION

Healthcare waste refers to any waste generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining to or in the production or testing of biologicals[1].Such waste, when properly managed, generally pose no greater risks than that of properly treated municipal or industrial wastes[2-4]. Principal groups at risk are healthcare workers, patients, visitors to healthcare establishments, workers in support services including laundry, Waste handlers and transporters, and scavengers [5-7]. The World Health Organisation estimates that each year there are about 8 to 16 million new cases of Hepatitis B virus (HBV), 2.3 to 4.7 million cases of Hepatitis C virus (HCV) and 80,000 to 160,000 cases of human immune deficiency virus (HIV) infections due to unsafe injections and poor waste management systems[8,9]. Lassa fever , a viral haemorraghic disease endemic in West Africa, has joined the league of blood borne pathogens. Chemicals and pharmaceuticals wastes are generally genotoxic, corrosive, flammable and explosive and may cause intoxication, either by acute or chronic exposure, and injuries, including burns.

Environmental effects of waste piles include environmental pollution and the contamination of soil and underground water and unpleasant odour [10]. The treatment of waste can itself pose additional hazards. Inadequate incineration or open burning of healthcare waste may produce toxic air pollutants and distribute them over a wide area. Landfills can contaminate drinking water, if not properly constructed[11,12].

Waste management is reported to be suboptimal in most developing countries, including Nigeria[13].Findings from a study carried out among 6 major hospitals in Jos metropolis , Nigeria, showed that practice of waste management fell below what was prescribed by WHO and other regulatory authorities. Health workers were unaware of the existence of a hospital waste management policy[14]. Assessment of healthcare waste management practices in 5 health facilities in Port-Harcourt showed that waste was not segregated into colour coded bins for the different waste streams, nor were records kept of waste generation and disposal[15]. Another survey of healthcare waste management practices in 20 healthcare facilities in Lagos metropolis, and 47 registered primary and secondary health facilities in 3 senatorial zones in Anambra state, both in Nigeria, yielded similar pictures[16,17].

Healthcare establishments are obliged to abide by the agreement by Member States of United Nations to the

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Basel convention that states that it remains the responsibility of healthcare establishments to treat and dispose wastes generated by them in such a manner as to ensure that there would be no adverse health or environmental effects[18]. Management of healthcare waste is not confined to data compilation and technologies of waste treatment and disposal, but also includes attention to training, commitment, leadership and effective legislation[19].

Considerable gap exists in the implementation of healthcare waste management policies at the primary healthcare level, despite the fact that this level of healthcare carters for the health needs of the greater population of people residing in the rural parts of the country. The nature and quantity of healthcare waste generated as well as assessment of institutional practices with regards to sustainable methods of healthcare waste management including waste segregation and waste recycling are often neglected or at most, poorly examined despite the health risks posed by the improper handling of healthcare wastes[16,20].The need for such a survey is heightened considering the endemicity of Lassa fever in parts of Edo State.

This study therefore set out to quantify waste generation and evaluate waste management systems at the primary healthcare level in a Lassa fever endemic local government Area of Edo State.

MATERIALS AND METHODS

The study was carried out in Esan West Local government area (LGA) of Edo state, in the South-South region of Nigeria. The headquarters of the LGA is at Ekpoma. The LGA has an area of 502km^2 and population of 147,655 at the 2006 census. The LGA is divided into 10 political wards. The people are mainly of Esan tribe, and predominantly subsistence farmers. The community enjoys a blend of traditional and orthodox medicine, with the presence of traditional bone setters, traditional birth attendants and herbal healers. There are twenty three primary health centres within the LGA, all owned and supported by the Local Government. The heads of the facility oversee the smooth functioning of the centres, and report to the Primary Healthcare Coordinator or Medical Officer of Health for that LGA. The calibre of staff commonly found at the health centres includes community health extension workers, nurses, and auxiliary nurses. Services offered at these centres include: health education, immunization, family planning counselling, treatment of minor ailments and first aid, referrals, ante-natal, delivery and post-natal care services. There are also several private laboratories and patent medicine dealers, a government owned general hospital, and three health posts.

Twelve, representing approximately 50% of the 23 primary health centres (PHC) in the local government were selected through a process of simple random sampling.

Data was collected using quantitative and qualitative data collection methods and tools.

Waste quantification: In the selected facilities, an inventory of the waste generated in the Labour ward, In-patient wards (Male, Female and/or Paediatrics wards where available), out- patient clinic, injection and dressing / treatment rooms of the PHC, were collected consecutively over a period of seven days, weighed daily by trained assistants. Since the waste were not segregated, at each of the units, the entire quantity of waste generated over 24 hours was weighed using a weighing balance with capacity of 20 kilograms and intervals of 50 grams. The weight was recorded in the inventory form adapted from the guidance manual provided by the World Health Organisation [21]which has been previously used by an earlier study carried out in a tertiary hospital in the state [22].The quantity of the different categories of waste was deduced by estimation [23], while the type of waste was identified through direct observation, and categorized into A – Z series according to standard WHO definitions[11,21]. For in-patient units, total waste per bed per day at each facility was calculated by dividing the total waste generated per day by the total number of occupied beds. Calculation of average quantity of waste per bed per day generated in each unit was carried out by dividing the quantity of waste by the number of beds in the unit [21]. For out-patient units, total waste was divided by the total number of patients/ clients over the period .

Observational checklist: A checklist, modified from the WHO questionnaire on assessment of health facility on healthcare waste management[21],was used to determine waste management and compliance with WHO guidelines on healthcare waste management. The checklist, consisted of five waste management descriptors (General management strategy, Waste collection, Waste segregation, Waste recycling, Waste storage, and Offsite disposal) and 22 indicators of healthcare waste management. For each facility, current performance was judged against set criteria, suggested by Townsend and Cheesman [9], to determine sustainable level of practice. Facilities fell into any of five levels, with level 0 being worst performing, and level 4 those facilities operating in a way that displays all the characteristics normally associated with sustainable development.

Key informant interviews: Interviews were conducted with the Officer-in-charge of the facilities, using semi-structured interview guide; to provide an understanding of the healthcare waste management culture of the facility. Questions covered existence of a hospital waste management policy, Special budget for waste management in the facility, operational staff for management of waste, previous training of waste handling staff, presence of IEC materials and use of personal protective gears by waster handlers[8]

Data from the key informant interviews were collated as one , and presented in the light of the objectives. Data from the checklist were coded and analysed using Statistical Package for Social Sciences (SPSS) version 15(SPSS Inc, Chicago IL 60606-6412) software. Tables and charts were used to present results.Continuous data were summarized as means and standard deviations.

Ethical clearance was obtained from the Ethical committee of the Irrua Specialist Teaching Hospital, and permission for data collection was obtained from National Primary Healthcare board of the Local government Health Department. Verbal consents from the head of each health centre were also taken prior data collection. Data collectors were trained to use protective devises while handling healthcare wastes.

RESULTS

Twelve facilities were assessed in the survey. The average amount of health care waste generated from all the facilities over the 7 day period was 0.21kg/bed/day. Average amount generated from the out-patient unit and treatment rooms was 0.023 $\pm$ 0.001 kg/person/day, and 0.012 kg$\pm$ 0.001 /bed/day in the in-patient wards. The labour ward generated the most waste, 0.03 $\pm$ 0.002kg/person/day,and had the highest diversity of wastes, most of which are classified as categories B and C. Categorization of waste in the facilities showed that all 12 (100.0%) facilities generated sharps , infectious and general waste, 6(50.0%) generated pharmaceutical waste, 4 (33.3%) generated pathological waste . Neither radioactive, chemical nor genotoxic waste was generated in any facility. Classification of waste generated by unit/ward is presented in table 1**.**The type of waste generated in the primary healthcare centres is presented in table 2.

Table 1: Classification of waste generated from 12 PHCs

Unit of facility	Category of waste
Out- patient/ Treatment unit	
Used handglove	C1
Swab	C1
Needles/ syringes	B2
Waste paper	A1
Food debris	A1
Labour ward	
Placenta	B1/B5
Soiled cloths	C1
Tissue	C1
Empty bottles/ injections	B31
Drip set	B31
Needle / syringe	B2
Intravenous fluid giving set	C1
Sutures	C1
In-patient ward	
Swab	C1
Body fluids	B5
Needle / syringe	B2
Waste paper	A1
Food debris	A1

Table 2: Types of waste generated in the different primary health centres.

PHCs	Human waste	Sharp	Pharm	Blood and body fluid	Cytotoxic	Infectious	Recyclable	Radioactive
1	-	+	+	-	-	+	+	-
2	-	+	-	+	-	+	+	-
3	+	+	+	-	-	+	+	-
4	-	+	-	-	-	+	+	-
5	-	+	+	+	-	+	+	-
6	+	+	+	-	-	+	+	-
7	-	+	-	-	-	+	+	-
8	-	+	-	+	-	+	+	-
9	+	+	+	-	-	+	+	-
10	+	+	+	+	-	+	+	-
11	-	+	-	-	-	+	+	-
12	-	+	-	-	-	+	+	-

Pharm = Pharmaceutical
Bio = Biodegradable

Officers in charge of all facilities claimed to have at least one member of staff overseeing healthcare waste management. They included ward orderlies, who were responsible for the day to day cleaning of the wards and emptying of waste bins, and gardeners who cleaned the exterior and maintained the disposal site. Gardeners were not present in 7 (58.3%) facilities. Only 1 (8.33%) of the 12 respondents stated that a waste handler had ever been trained in the facility she is heading. Respondents were unanimous about the unavailability of the full complement of protective wears for the waste handlers. What was available were mainly rubber hand gloves for orderlies and boots for gardeners.

All respondents confirmed the unavailability of the national healthcare waste management Policy in their facilities, although heads of 4 (33.3%) out of the 12 facilities claimed to have heard of the policy, though in-depth knowledge was lacking. All the heads of facility reported that they had no special budget assigned to healthcare waste management. Whatever they had been able to acquire was at their own expense. Respondents in 5 (41.7%) facilities said instructive posters on waste management were on display in their health facilities. These were mainly on injection safety.

Waste collection was done into safety boxes for sharp waste and uncovered waste baskets, plastic buckets (predominantly of a capacity of 10 litres) and cartoons for all other waste. The same were used to transport the waste manually to the disposal site. Neither coloured bins nor coloured bin liners were in use in any facility. In all the facilities except one, sharp waste was collected separately from other waste types at the point of generation. The flow line of waste management from waste minimization through segregation, storage, handling, collection, and treatment were not properly and adequately practiced by any of the health centres. Waste re-cycling or re-use existed only in the form of re-use of empty plastic water bottles for storage of housekeeping chemicals, and of empty drug packaging as improvised appointment sheets. Drip sets were also re-used as tourniquets. Otherwise, there was no other form of recycling in practice.

Two (16.67%) facilities had provision for autoclaving of laboratory waste. Chemical disinfection of body fluid (urine/sputum) was practiced in 4 (33.33%) facilities, after which such waste were disposed of into latrines. Other free flowing liquid waste emanating from the laboratory or delivery rooms was disposed into the latrines without any further treatment (See table 3).

All the solid wastes generated within the facility were emptied at open dumpsites within the premises of 4 (33.3%) health centres (open dumping), where they

were burnt periodically. In the remaining 8 (66.7%) facilities, wastes were buried in dug out pits within the premises and covered with a layer of earth when they were filled up. One facility had a non-functional incinerator. Overall, the facilities were all classified as level 0 facilities (See table 4).

Table 3: Waste Processing and handling methods.

PHC	Use of receptacle (type)	Colour Coding of receptacles	Separate Collection of sharps and infectious material	segregation regulated	Presence of purpose built waste handling facility	Autoclaving of lab wastes	Encapsulation of sharp	Chemical disinfection of body fluid
1	Yes (basket)	No	No	No	Yes (Pit)	No	No	No
2	No	No	Yes	Yes	No	No	No	No
3	Yes (basket)	No	Yes	No	Yes (Pit)	No	No	No
4	Yes (waste bin safety box)	No	Yes	Yes	Yes (incinerator)	No	No	Yes
5	Yes (basket safety box)	No	Yes	No	Yes (Pit)	No	No	No
6	Yes (basket safety box)	No	Yes	No	Yes (Pit)	No	No	Yes
7	Yes (basket safety box)	No	Yes	No	Yes (Pit)	Yes	No	No
8	Yes (drums & basket)	No	Yes	Yes	Yes (Pit)	No	No	No
9	Yes (drums)	No	Yes	No	No	Yes	No	Yes
10	Yes (basket)	No	Yes	No	Yes (Pit)	No	No	Yes
11	Yes (basket safety box)	No	Yes	No	Yes (Pit)	No	No	No
12	Yes (safety box)	No	Yes	Yes	Yes (Pit)	No	No	No

Table 4: Guidelines for the assessment of level of sustainable waste management practice.

(Sustainable level of practice / Operating performance / Characteristic)

Level 0 **Operating in a totally unsustainable manner with reluctance to change.** No waste management strategy, only limited segregation of wastes, storage containers are unspecific with no color coding and waste likely to be dumped outside the hospital building. In addition waste is transported in open trucks, limited re-use of materials and no recycling at the facility; waste treatment is limited to the simplest technologies such as crude incineration while if off-site disposal exists it will be mainly to a dumpsite landfill with the attendant environmental hazards.

Level 1 **Generally operating in an unsustainable manner, although there is some evidence of awareness and willingness to change.** Although having no specific waste management strategy, will have separate collection of segregated wastes in enclosed vehicles, autoclave of infectious waste and use single cell incineration plant.

Level 2 **Operating in a manner with some aspects that are considered sustainable and others that are considered unsustainable.** Waste management policy in place, segregation of wastes and color coding, specified waste storage containers, waste transported with enclosed compaction vehicles and separate vehicles for hazardous waste, some recycling at facility (paper, cardboard etc), use of multi chamber incinerator plants and alternative modern technologies (such as microwave) to treat waste and disposal in level 2 landfill.

Level 3 **Generally operating in accordance with sustainable development, but some aspects not ideal Local waste management policy and strategy in place, full color coding, dangerous goods are stored in UN approved containers and packaging all waste in containers of approved standard and a dedicated waste handling facility.** Re-use and re-cycling of materials (example, print cartridges, oil), incineration of hazardous materials to EU Directive

	emission standards plus use of alternative technology and offsite disposal at a level 3 engineered landfill site
Level 4	**Operating in a way that displays all the characteristics normally associated with sustainable development Waste management policy, full time waste manager, full segregation of materials, full color coding, contracts with secondary raw materials industry, storage in UN approved containers, all wastes in containers or sacks to approved standard and a dedicated well secured waste facility.** Waste is transported in enclosed compaction vehicles, Basel convention applied to waste transport. Recycling of paper, glass, plastic, metal, construction waste, food waste, textiles etc. incineration of hazardous materials to EU Directive emission Standards plus use of alternative technology, hazardous waste to strictly controlled landfill sites and offsite disposal to level 4 engineered sanitary landfill.

Source: Adapted from Town end and Cheeseman [19]

DISCUSSION

The study showed that all units within the health facilities generated more than one category of waste. This is understandable as the primary health centres not only render curative services, but also preventive maternal and child health services. The non-generation of genototoxic and radioactive wastes is due to the non-provision of services requiring the use of these materials. Ward orderlies and gardeners identified as the waste handlers in these facilities, were found to be untrained and ill-equipped for the job , as has similarly been cited in a study carried out in Yemen[24].

Segregation was only done for sharp wastes. All other wastes were mixed together at points of collection and final disposal, as was similarly observed in other studies[14, 17]. Effective waste management activities must include segregation of all forms of waste from generation to final disposal[25].Segregation prevents non-infectious waste from mixing with infectious waste. Infectious wastes are to be stored in the designated colour-coded leak-proof containers for safe handling and can be disinfected / sterilized by the available facility in the hospital. Transportation of waste within the hospital is to be done using closed handcarts to avoid spillage of waste to a disinfection or treatment facility. After disinfection/sterilization the waste should be transported to a treatment facility, such as an incinerator or controlled landfill[26].Lack of segregation significantly increases the quantity of infectious medical waste mixing with non- infectious component, making the general non-infectious waste potentially infectious[27].

The use of waste baskets and plastic buckets for waste collection in this study has similarly been reported in other studies[3,28-30]. These perforated baskets are meant for use only in administrative areas. The availability of safety boxes in the present study , as was similarly documented in a study carried out in Ilorin, Nigeria[31], may be attributed to the immunization services rendered in most facilities. It is part of the bundling method strategies for immunization equipment logistics that make it mandatory for needle, syringe, injection safety box and other injection equipment to accompany vaccines to the health facilities[32]. But in the absence of appropriate final disposal, the hazard of needle-stick injury and transmission of blood borne infection still remains.

The lack of coloured liners is contrary to what is recommended by the WHO , to facilitate the segregation of healthcare waste at the source of generation , and to keep them separated from each other[33].

The daily average healthcare waste generated in the outpatient unit (0.02/kg/person/day), is lower than what was reported for primary healthcare facilities and health clinics in Saudi Arabia (0.08 $\pm$ 0.08kg/person/day) [34] , and in health centres in Ethiopia (0.035/kg/patient/day)[28]. The mean of healthcare waste in this study was similar to what was recorded in a study done in Tanzanian urban health centres, (0.02kg/patient/day) [35]. The greater quantity of waste generated by in-patients compared with out-patients has also been noted in a previous study in Nigeria[22]. The variation in mean values of waste generation could be attributed to the differences in resource inputs to heath facilities, season of the year the studies was undertaken, range of services offered in the facilities and social status of the patients.

The absence of knowledge on healthcare waste policy, though also reported in South East Asia[26], is contrary to what was observed in South Africa[36]. There is a critical need for management at all levels to provide institutional support and guidance aimed at ensuring that health workers follow a standard procedure in the management of healthcare waste at the primary healthcare level. Without a clear policy from the management, there is likely to be very little attempt at adequate waste management.

A lack of special budget for waste management has been highlighted in other studies[16,24]. This shows that healthcare waste management is not yet a priority issue in the health facilities, and may be a factor in the non- provision of standard waste bin, of desired size and make, such as bins with foot operated lid. To overcome this challenge, facilities may consider the use of inexpensive locally available containers which can be modified to make them suitable and then inserting coloured labels. This is can be used as a short term measure. A medium to long term measure will be the proper allocation of financial resources for the provision of appropriate storage bags and containers, construction of temporal storage facility. Training of operational staff and other health workers and the investment in appropriate technology for waste treatment and disposal should also be considered[7,32].Use of polyphenylene plastics was a problem identified in the study, and similarly reported in a study carried out in Pakistan[37].

A limitations of this study is that being cross sectional, it does not take into account changes in waste generation across the seasons, as being in a rural area, there may be seasonal changes in hospital attendance due to farm activities , and disease patterns.

CONCLUSION

Healthcare waste management at the Primary Health care level in Edo state is still rudimentary. Effective implementation of healthcare waste management practices must start with a commitment by health managers to support healthcare waste management by adequate funding and emphasis on awareness of hazards of healthcare waste among health workers, including the use of posters and seminars.

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