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Assessment of Medical Waste Management in Two Public Health Facilities within Akure Metropolis, Ondo State, Nigeria

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ABSTRACT

The study assessed the generation and management of medical wastes in public health care facilities within Akure metropolis, Ondo State, Nigeria. A cross-sectional survey was employed in distributing 220 pre-tested questionnaires among a target population of 2,200 respondents in examined hospitals through Stratified Random Sampling Techniques, out of which 140 respondents were from Ondo State Specialist Hospital Akure (OSSHA) while the remaining respondents were from Mother and Child Hospital Akure (MCHA). Medical wastes generated were measured in kg per day, kg per bed per day, and kg per patient per day, to know the quantity of medical wastes generated daily in each facility. Results obtained from the study through Pearson Chi Square test revealed that both facilities suffered similar appalling biomedical waste management practices right from the point of generation to final disposal and have not received considerable responsiveness from the management and regulatory bodies within the State. Moreover, 83.5% respondents from both health facilities pointed out that there is no medical waste record. Although, there was waste management team in the hospitals as identified by 79.5% respondents but almost half of them specified that no regular training course on medical waste management is on-hold. Furthermore, 79% respondents indicated that there is no mechanism in place to reduce the quantity of medical waste generation, while the segregation of medical waste at the point of generation is at low levels in both hospitals as only 54% respondents attested that segregation is done, but 15.5% were indifferent. However, through direct observation, segregation was applied only for sharp wastes, which was collected in punctured proof boxes. Insufficient supply of polythene bags for medical waste collection was recorded in both hospitals which resulted to overfilling of the bags and waste spillage. Consequently, the State Ministry of Health and the management of healthcare institutions should give more consideration towards policies for proper management of health care wastes in the State and Nigeria at large.

Keywords: *Health-care facilities, Medical waste, waste management, sampling techniques*

INTRODUCTION

A health-care facility is a service-oriented establishment saddled with the responsibility of providing medical care such as observational, diagnostic, therapeutic and rehabilitative services for persons suffering or suspected to be suffering from any kind of disease or injury. In the course of performing these activities, medical wastes are generated. Some of which are too hazardous to be treated negligently. These wastes in recent decades have abruptly increased due to the geometric increase in population growth, increase in the number of health care facilities, as well as the wide acceptance of the use of disposable medical products (Mohee, 2005). Medical wastes comprise of all waste materials generated by health-care facilities, such as hospitals, clinics, physician's offices, dental practices, blood banks, and veterinary hospitals/clinics, as well as at medical research facilities and laboratories (United States Environmental Protection Agency (USEPA), 2013). It includes a wide range of materials, such as diagnostic samples, soiled dressings, used needles and syringes, body parts, blood, radioactive materials, pharmaceuticals, medical devices and chemicals (Ananth *et al*., 2010). Majority of these materials are amongst the most infectious and potentially hazardous of emerging wastes across many communities in developing countries (Bdour et al., 2007) which according to the World Health Organisation (WHO, 2009), 75 – 80 % of it are general waste, which is analogous to domestic waste while the remaining 20 – 25

% is considered hazardous, as it may be infectious, toxic and/or radioactive. Moreover, studies by Askarian et al. (2004) revealed that if medical wastes is not properly treated and disposed, it poses mostly unrecoverable health risk to the public. Furthermore, improper medical waste management can alter the physicochemical and biological properties of air, water and soil which has negative effects on plants and animals. It also releases unpleasant smells to the environment, foster the growth and multiplication of insects, rodents, and worms (Amal *et al*., 2014) and may lead to transmission of diseases like typhoid, cholera, Human Immunodeficiency Virus (HIV), and hepatitis (B and C) (Abdulla *et al*., 2008).

Although some degree of attention is given on the cleanliness of patients' hospital wards, premises, laboratories, operation theatres, closets etc. and on the supply of safe drinking water in the two public hospitals within Akure metropolis but adequate emphasis is not given in most cases for the proper management of generated wastes and particularly segregation, interim storage and disposal of medical wastes. It was observed that segregation of medical waste at the point of generation was only observed for sharp objects while other solid medical wastes were most often dumped together as a result of insufficient supply of colour-coded bags. Moreover, interviews with health and environmental officers in the hospitals revealed that there is no waste treatment facility as the state waste management board is responsible for the treatment and disposal of medical wastes. Nonetheless, further enquiries made it clear that waste is collected at irregular interval and transported by an un-consigned vehicles to an open municipal dumping site for open burning. Handling of medical waste is a hazardous activity which requires a high standard of training. It then calls for specific training that depends on the nature of work in the hospital, the hazards and possibility of worker's exposure, and the responsibilities of individual workers (Manyele and Anicetus, 2006). However, it was observed that waste management team in both hospitals rarely undergo training programs on medical waste management. The management of hospital waste requires its removal and disposal from the health-care establishments as hygienically and economically as possible with the view to minimize the risk to public health and to the environment. This study encompasses an in-depth analysis of the present conditions of waste management systems of selected hospitals. It focuses on determination of the variations and similarities in the activities of medical waste management practices of two hospitals located within Akure metropolis. Using physical observation, administered questionnaire and interview questions, sectional data within each hospital were collated and analysed by employing statistical packages through cross tabulation inferential statistics. The results showed similarities in many areas, confirming that similar activities take place within the hospitals, and variations in other areas, thus confirming that many external and internal factors affect the medical waste management and other activities within the examined hospitals.

METHODOLOGY

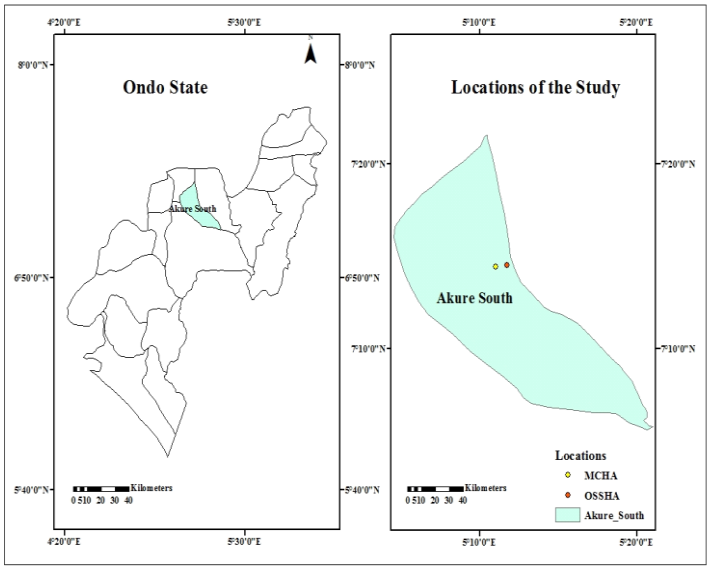
Study Area

The study on assessment of medical waste management system was conducted in two public health-care facilities located in Akure metropolis (Figure 1). These health centres include: Mother and Child Hospital, Akure (MCHA) and Ondo State Specialist Hospital Akure (OSSHA). The Ondo State Specialist Hospital Akure lies within latitude 7°14'31.8"N and longitude 5°11'44.4"E. It is the only Public Specialist Hospital in Akure South Local Government Area (ASLGA) of Ondo State with the highest percentage of medical services (a total number of 212 beds), while Mother and Child Hospital is the only Public Referral Hospital meant for infants and pregnant mothers in ASLGA with latitude 7°14'26.2"N and longitude 5°11'01.1"E. Hospital Akure, and Mother and Child Hospital Akure. They were selected because they render the highest medical services within Akure metropolis and across the State. Stratified random sampling technique through Probability Proportional to size was used for sample size determination.

Population of the Study

According to Creswell (2003), a study population comprises of the entire aggregation of cases that a researcher is interested in. The population size of this study consists of one thousand and nine hundred (1900) staff and three hundred (300) patients, out of which seven hundred (700) staff and one hundred (100) patients were from Mother and Child Hospital Akure while one thousand and two hundred

(1200) staff and two hundred (200) patients were from State Specialist Hospital Akure, Ondo State. The respondent population size comprises of medical staff such as doctors, nurses, laboratory scientists/technicians and pharmacists; the ancillary/sanitary staff such as cleaners, porters, waste handling operatives, environmental health officers and the patients.



A sample size of 220 respondents were selected through Probability Proportional to Size method (PPS) as indicated in figure 2. This method allows each and every stratum to be equally represented and the larger the strata, the more the samples to be taken. A total of 220 questionnaires were distributed to the health-care facilities. However, only 200 questionnaires were usable as they were completely answered while the uncompleted ones were excluded. Stratification ensured the production of improved estimations with less variation. Lists of health-care staff and their positions were obtained from the selected health-care facilities. A sample size of one hundred and ten (110) medical staff, eighty (80) ancillary staff and thirty (30) patients were decided upon for the two healthcare facilities (Polit and Beck, 2008). The overall target population was two thousand and two hundred (2200), which made up of one thousand one hundred (1100) medical staff, eight hundred (800) ancillary staff and three hundred (300) patients as shown on the stratified random sampling plan in figure 3.

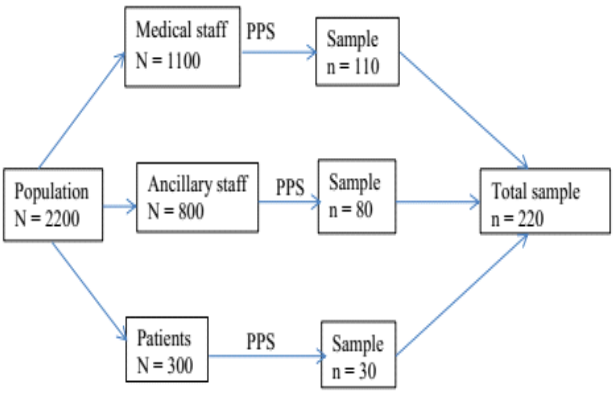


Figure2. *Stratified Random Sampling Plan*

Source: *Polit and Beck (2008)*

Data Collection and Research Instrument

Data were collected using both informal and formal survey. The informal survey was done through direct observation and semi-structured interviews while the formal survey was carried out via administering questionnaires.

Informal Survey

Direct Observation: Several visits were made to the two HCFs to carry out on the spot assessment involving physical examination of waste management system adopted. The observation was done using checklist tool as well as visual and photographic aids of objects and sites. Physical observation and the knowledge from reviewed literatures were used in the course of observation.

The observation helped to obtain unbiased information that corroborates the information obtained through semi-structured interview and formal survey. Semi-structure Interview: Interviews were conducted with some of the key officers in the facilities to gain a deeper knowledge of current practices in medical waste management. Some of the staff interviewed include: hospital management, health professionals, operational environmental health officers and sanitary staff. These set of people were able to give historical and up-to-date information on some of the challenges encountered in the course of managing medical wastes.

Formal Survey

Formal survey entails the use of a pre-tested self-administered questionnaire to obtain important information about medical waste management in the two sampled HCFs. Each item of the questionnaire was developed to address a specific objective of the study. Data collected include the inventory of patients visit to the hospital, availability of standard regulations that guide medical waste management practices, types of services rendered, composition and quantities of waste generated, waste minimization and recycling, waste collection, waste transportation, interim storage and handling of waste, segregation of waste, and treatment and disposal of waste.

Data Analysis

The raw data collected from the field were analysed using descriptive statistics such as frequency count, mean and percentages to affirm the level of waste generation in the study areas. IBM Statistical Package for Social Science (SPSS) version 20 through cross tabulation inferential statistics was used to analyse the level of medical waste management practices in the hospitals.

The results were presented in tables, histogram, pie-chart and graphs. Values obtained during waste analysis were used to design incinerator suitable for medical wastes produced in the sampled Health-care facilities.

RESULTS AND DISCUSSION

Demographic Characteristics of the Health Care Facilities (HCFs)

The compiled demographic characteristics of the sampled HCFs include profile of the organisations, response to Questionnaire and the distribution of study population according to age, gender, profession, job status and duration in service

Profile of the HCFs

The study examined two (2) HCFs within Akure metropolis, both of which are public hospitals. Table 1 gives a detailed profile of the hospitals. The hospitals are financed by the State Ministry of Health. 1 (50%) of the hospitals (Mother and Child Hospital) is principally meant for infants and pregnant mothers while the remaining 1 (50%) is a healthcare facility for all categories of patients.

Table1. *Profile of the HCFs*

Name of health facility		**MCHA**	**OSSHA**
Health care facilities details	Year of Establish	2010	1956
	Number of bed	102	212
	Average No of patient/day	80	200
	Average capacity of HCF	102	180
	Number of ward	13	60
	Number Theatre	1	2
	Number of Staff	345	1200
	Annual Budget	N/A	N/A
	Location	Oke-Aro	Hosp.Rd
	HCF characteristics	Referral	Specialist
	HCF type	Public	Public

Source: *Field survey, 2017*

Questionnaire Distribution Response in the HCFs

From table 2, it is evident that one hundred and forty (140) questionnaires were distributed to respondents in State Specialist Hospital for a period of one week while eighty (80) questionnaires were distributed in Mother and Child Hospital for one week, thus making a total of two hundred and twenty (220) questionnaires for two weeks. Ten (4.5%) questionnaires were not returned by the respondents while ten (4.5%) questionnaires were invalid on the ground that they were not properly completed. So, a total number of 200 questionnaires were correctly filled by the respondents, indicating a response rate of 91.0%. The reason for the massive response from both health care facilities is the quest of the staff and patients to get a lasting solution to waste management challenges confronting the institutions.

Table2. *Questionnaire distribution of the respondents in the HCFs*

Name of health facility		**MCHA**	**OSSHA**	**TOTAL**
Response to questionnaire	Distributed	80(100.0)	140(100.0)	220(100.0)
	Fill & returned	77(96.3)	133(95.0)	210(95.4)
	Invalid	4(5.0)	6(4.3)	10(4.6)
	Total valid	73(91.3)	127(90.7)	200(90.9)

Source: *Field survey, 2017*

Gender Distribution of Respondents

Distribution by gender indicated that Female employees and patients were the majority, recording 125 (62.5%) and constituting 72.6% from MCHA and 56.7% from OSSHA (Figures 3 and 4). This could be as a result of the services rendered mostly by MCHA, which is geared towards pregnant women and infants while their male counterparts from both facilities constituted 75 (37.5%) out of the total respondents.

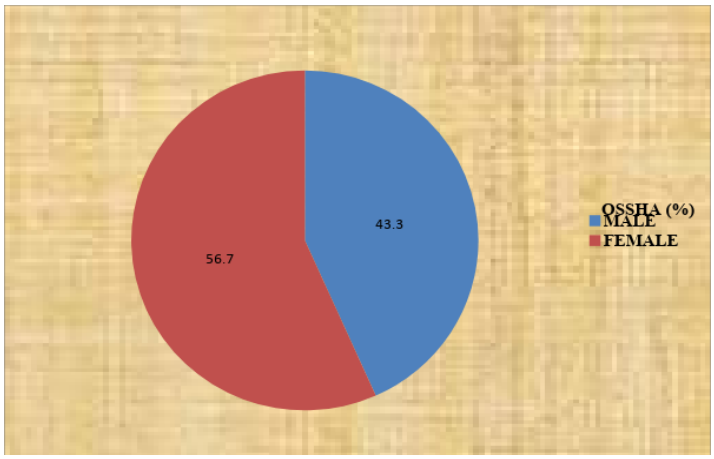


Figure3. *Gender distribution among respondents in OSSHA*

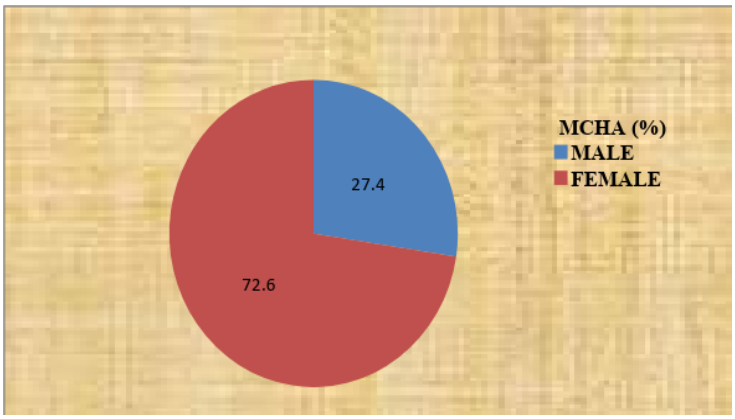


Figure4. *Gender distribution among respondents in MCHA*

Age Distribution of Respondents in the HCFs

In terms of age, the result revealed that 7.5% of the respondents were below the age of 20 while 23.5% were within the age limit of 21 to 30 years. As shown in figure 5, respondents within the age limit of 31 to 40 recorded the highest percentage of response from both facilities which amounted to 40.5% of the total percentage of response. This accounted for the huge response to questionnaire from both facilities. Moreover, 22.0% represents staff within the age bracket of 41 to 50 while 6.5% of the respondents were within the age limit of 51 to 60.

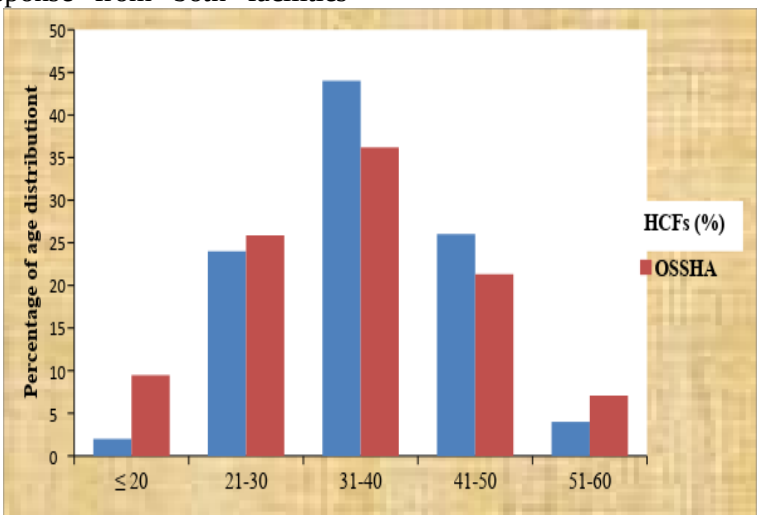


Figure5. *Age distribution among respondents in surveyed HCFs*

Source: *Field Survey (2017)*

Employment Status Distribution within the HCFs

Figure 6 shows that most of the respondents were medical staff, making up 51% followed by ancillary staff making up 36.5%, while 12.5% of the respondents represent the non-staff (patients) at the HCFs. The reason for large response from medical staff is to get a detailed assessment of the health facilities as they have basic knowledge on medical waste management.

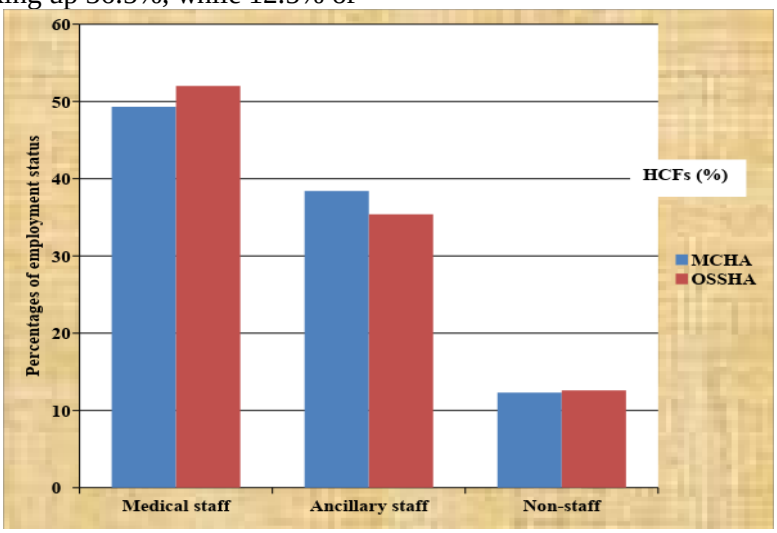


Figure6. *Employment status of respondents in surveyed HCFs*

Source: *Field survey (2017)*

Period of Working Experience at Surveyed Healthcare Facilities

With regards to the duration of work time in the Hospitals, figure 7 shows that 21.1% of the respondents have spent not less than five (5) years in the hospitals. Majority of the respondents representing 46.3% have spent 6 to 10 years with MCHA, making up 56.2% and OSSHA, 40.5% of the total respondents while 14.9% of the respondents have spent between 11 to 15 years in the hospital. 7.4% of the

respondent had working experience of 16 to 20 years while only 6.3% respondents from State Specialist Hospital had working experience above 25 years.

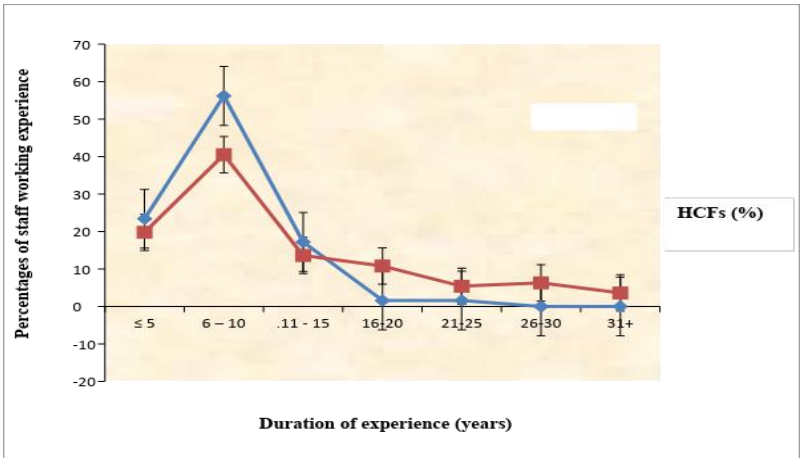


Figure7. *Work experience of staff within the HCFs*

Assessment of the Level of Knowledge on Medical Waste Management

Medical Waste Management Knowledge and Awareness

High percentage (60.5%) of respondents (121) from surveyed health-care facilities declared they have basic knowledge of medical waste management practices compared to 53 (26.5%) that had no knowledge about it. Only 13.0 % of the respondents were unable to decide on the subject. Moreover, table 3 shows the analytical results of testing the level of knowledge and awareness of respondents. The result indicated that though respondents from both hospitals have basic knowledge on medical waste management, the level of knowledge and awareness differs significantly ($p \leq 0.05$) as higher percentage (91.8%) of respondents (67) in MCHA have basic knowledge about medical waste management than OSSHA (54; 42.5%).

Table3.*Result analysis on medical waste management knowledge and awareness in HCFs*

Medical waste management awareness			**HOSPITALS**		**Total**
			MCHA	**OSSHA**	
Response	Don't Know	Count	1	25	26
		Expected Count	9.5	16.5	26.0
		% within HCFs	1.4	19.7	13.0
	No	Count	5	48	53
		Expected Count	19.3	33.7	53.0
		% within HCFs	6.8	37.8	26.5
	Yes	Count	67	54	121
		Expected Count	44.2	76.8	121.0
		% within HCFs	91.8	42.5	60.5
Total		Count	73	127	200
		Expected count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	47.306[a]	2	.000
Likelihood Ratio	54.556	2	.000
N of Valid Cases	200		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.49.

Medical Waste Management Team and Regular Training on Waste Management

Respondents up to 159 (79.5%) affirmed the presence of waste management team in surveyed facilities while only 22 (11.0%) of the respondents indicated that waste management team doesn't exist in the facilities. However, 9.5% of the respondents couldn't decide on the team's existence. Result analysis from Pearson chi-square test in table 4 indicated that there exists a significant difference between the Hospitals and medical waste management team

as p < .001 which implies that a considerably larger proportion of respondents (70) from MCHA (95.5%) affirmed the existence of waste management team compared with 89 (70.1%) from OSSHA.

Table4. *Result analysis on medical waste management team and regular training*

Waste management team			Hospital		Total
			MCHA	OSSHA	
Response	Don't Know	Count	2	17	19
		Expected Count	6.9	12.1	19.0
		% within HCFs	2.7	13.4	9.5
	No	Count	1	21	22
		Expected Count	8.0	14.0	22.0
		% within HCFs	1.4	16.5	11.0
	Yes	Count	70	89	159
		Expected Count	58.0	101.0	159.0
		% within HCFs	95.9	70.1	79.5
Total		Count	73	127	200
		Expected Count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.107[a]	2	.000
Likelihood Ratio	23.429	2	.000
N of Valid Cases	200		

- 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.94.

Personal Protective Equipment (PPE) and Outbreak of Waste Related Diseases

As shown in table 5, most of the respondents (130; 65%) said waste handlers in the facilities were equipped with safety/protective kit such as overall, hand glove, nose mask, protective shoes etc. while 47 (23.5%) of the respondents indicated that the workers might be exposed to health risk due to lack of protective kit. Analytical result from Pearson Chi-Square test showed that both facilities are equipped with personal protective equipment but there is significant relationship between the facilities and PPE as p-value is less than 5%. Higher ratio of respondents from MCHA (51; 69%) declared that PPE is used as safety kits in the facility compared to 79 (62.2%) respondents that gave similar statement in OSSHA. This explains the reason why 84.5% of the respondents confirmed that there has never been an outbreak of diseases caused by lack of protective equipment to handle medical wastes within the facilities.

Table5. *Result analysis on Personal Protective Equipment and outbreak of diseases in HCFs*

Personal Protective Equipment for waste handlers			Hospital		Total
			MCHA	OSSHA	
Response	Don't Know	Count	2	21	23
		Expected Count	8.4	14.6	23.0
		% within HCFs	2.7	16.5	11.5
	No	Count	20	27	47
		Expected Count	17.2	29.8	47.0
		% within HCFs	27.4	21.3	23.5
	Yes	Count	51	79	130
		Expected Count	47.5	82.6	130.0
		% within HCFs	69.9	62.2	65.0
Total		Count	73	127	200
		Expected Count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.833[a]	2	.012

Likelihood Ratio	10.657	2	.005
N of Valid Cases	200		
• 0 cells (.0%) have expected count less than 5. The minimum expected count is 8.40.			

Medical Waste Segregation

A total of 108 (54%) of the respondents indicated the implementation of waste segregation as one of the waste management techniques adopted in surveyed HCFs but from table 4, the practice is much more carried out in MCHA as attested to by 60 (82.2%) respondents than in OSSHA with 48 (37.8%) respondents (Table 6). Moreover, large percentage of respondents (75.5%) pointed out that punctured proof containers are used for sharps collection in the HCFs. On the contrary, 19% of the respondents revealed that no punctured proof containers were in use, while 5.5% were unaware of it. Pearson Chi-Square result by cross tabulation indicated a p-value less than 0.001. That is, there is a significant relationship between the variables (medical waste segregation and HCFs). This means that both facilities actually segregate wastes but the percentage of MCHA is more significant than OSSHA.

However, through direct observation and structured interviews with medical staff of the facilities, it was obvious that waste were not properly segregated as infectious waste is often time mixed with non-infectious. The study is consistent with the survey results obtained by Walker (1991) in Britain; Hussein (1997) in Egypt; and Abdulla *et al.* (2008) in Jordan, where inappropriate segregation of wastes typified management system.

Table6. *Result analysis on medical waste segregation and use of sharps boxes*

Medical wastes Segregation			Hospital		Total
			MCHA	OSSHA	
Response	Don't Know	Count	4	27	31
		Expected Count	11.3	19.7	31.0
		% within HCFs	5.5	21.3	15.5
	No	Count	9	52	61
		Expected Count	22.3	38.7	61.0
		% within HCFs	12.3	40.9	30.5
	Yes	Count	60	48	108
		Expected Count	39.4	68.6	108.0
		% within HCFs	82.2	37.8	54.0
Total		Count	73	127	200
		Expected Count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	36.813[a]	2	.000
Likelihood Ratio	39.224	2	.000
N of Valid Cases	200		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 11.32.			

in HCFs

Perception of Respondents on Medical Waste Collection Methods from Wards

As shown in table 7, 163 (81.5%) of the respondents from both health-care facilities indicated that medical wastes generated in the hospitals were collected from the wards at the end of each shift on a daily basis and transported by waste handlers to the temporary storage area in the hospitals. Only 13% declared they have no knowledge about waste collection.

5.5% respondents disclosed that medical waste collection is not done at the end of each shift. Analytical results from table 7 indicated that there exists a significant relationship between both facilities as p-value is 0.017. A considerably larger proportion of respondents (65) from MCHA (89.0%) are very sure that medical waste collection is done at the end of each shift compared with 98 (77.2%) in OSSHA.

Table7. *Perception of respondents on medical waste collection methods from wards*

Waste collection from hospital wards is at the end of each shift			Hospital		Total
			MCHA	OSSHA	
Response	Don't Know	Count	3	23	26
		Expected Count	9.5	16.5	26.0
		% within HCFs	4.1	18.1	13.0
	No	Count	5	6	11
		Expected Count	4.0	7.0	11.0
		% within HCFs	6.9	4.7	5.5
	Yes	Count	65	98	163
		Expected Count	59.5	103.5	163.0
		% within HCFs	89.0	77.2	81.5
Total		Count	73	127	200
		Expected Count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.172[a]	2	.017
Likelihood Ratio	9.503	2	.009
N of Valid Cases	200		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 4.02.

Interim Storage of Medical Waste

A considerable number of respondents (138; 74%) indicated that there is no standard storage room or site for medical waste within the facilities as against the 35 (13.7%) respondents that claimed the availability of such facility (Table 8). In addition, 143 (71.5%) of the respondents indicated that pre-treatment of medical waste was not carried out in any of the facilities. On the contrary, 19.5% of the respondents pointed out that medical waste were treated before interim storage. However, analytical test result shows that there is no significant relationship between the variables (Chi-Square = 1.335, df = 2, $p > 0.05$). It means that the percentage of respondents that could not decide on the subject matter from the facilities is not significantly different from each other.

Table8. *Result analysis on interim storage of medical result*

Standard temporary storage room/site for medical wastes			Hospital		Total
			MCHA	OSSHA	
Response	Don't know	Count	10	17	27
		Expected Count	10.0	17.0	27.0
		% within HCFs	12.3	14.2	12.3
	No	Count	54	84	138
		Expected Count	51.1	86.9	138.0
		% within HCFs	74.0	66.1	74.0
	Yes	Count	10	25	35
		Expected Count	13.0	22.1	35.0
		% within HCFs	13.7	19.7	13.7
Total		Count	74	126	200
		Expected Count	74.0	126.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.335[a]	2	.513
Likelihood Ratio	1.375	2	.503
N of Valid Cases	200		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.99.

Onsite and Offsite Transportation of Medical Waste

Internal (onsite) transportation of medical waste to temporary storage area is done manually by hands in the two facilities as indicated by 182 (91%) respondents in table 9. However, onsite transportation of medical waste by hands is much more practised in OSSHA than in MCHA, a practice considered to be inimical to human

health. Moreover, 150 (75%) of the respondents claimed that the hospitals use mobile machines for external (offsite) transportation as against the 10 (5%) respondents that stated the non-availability of such equipment while 20% were unable to decide whether such machine is in use or not. Nonetheless, result analysis indicated that there is significant relationship between the variables ($p < 0.001$). This means that larger percentages of respondents in MCHA are very sure of the use of enclosed vehicles for offsite transportation of medical waste compared to OSSHA.

Table9. *Result analysis on onsite and offsite transportation of medical waste in the HCFs*

Enclosed compaction vehicles for offsite transportation			**Hospital**		**Total**
			MCHA	**OSSHA**	
Response	Don't Know	Count	2	38	40
		Expected Count	14.6	25.4	40.0
		% within HCFs	2.7	29.9	20.0
	No	Count	4	6	10
		Expected Count	3.7	6.4	10.0
		% within HCFs	5.5	4.7	5.0
	Yes	Count	67	83	150
		Expected Count	54.8	95.3	150.0
		% within HCFs	91.8	65.4	75.0
Total		Count	73	127	200
		Expected Count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

a. 1 cell (16.7%) have expected count less than 5

Chi-Square Test	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.494[a]	2	.000
Likelihood Ratio	26.921	2	.000
N of Valid Cases	200		

The minimum expected count is 3.65

Medical Waste Treatment and Disposal Facilities within the Hospitals

Considerable percentage (78%) of the respondents (156) identified that no medical treatment equipment was in place as they could not identify one within the facilities while 35 (17.5%) were unable to decide on its existence (Table 10). However, 143 (71.5%) respondents acknowledged that waste disposal is done weekly by the state waste management agency. As regards burning and landfilling of medical waste, 181 (90.5%) of the respondents strongly said nothing of such is in existence within the facilities while 2% stated that burning and land filling is practised within the hospitals. However, Pearson Chi-Square test shows there is no significant relationship between medical waste treatment and disposal systems in the surveyed health institutions as p-value is 0.661 (Table 10).

It means that the percentage of respondents that indicated the availability, non-availability, as well as inability to decide on the presence of treatment and disposal facilities in surveyed health facilities are not significantly different from each other.

Table10. *Result analysis medical waste treatment and disposal facilities within the hospitals*

Waste treatment equipment in hospitals			**Hospital**		**Total**
			MCHA	**OSSHA**	
Response	Don't Know	Count	13	22	35
		Expected Count	12.8	22.2	35.0
		% within HCFs	17.8	17.3	17.5
	No	Count	58	98	156
		Expected Count	56.9	99.1	156.0
		% within HCFs	79.5	77.2	78.0
	Yes	Count	2	7	9
		Expected Count	3.3	5.7	9.0
		% within HCFs	2.7	5.5	4.3
Total		Count	73	127	200

	Expected Count	73.0	127.0	200.0
	% within HCFs	100.0	100.0	100.0
Chi-Square tests	Value	df	Asymp. Sig. (2-sided)	
Pearson Chi-Square	.829[a]	2	.661	
Likelihood Ratio	.892	2	.640	
N of Valid Cases	200			
• 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.29.				

Waste Management Agencies in the HCFs

The State Waste Management Agency was identified by 78% of the respondents as the body responsible for the treatment and disposal of the wastes generated in the hospital. On the contrary, 13% stated that no waste management is saddled with that responsibility. Both facilities pointed out that waste management agencies are responsible for the treatment and disposal of medical waste as indicated in table 11. Result analysis indicated a significant relationship between the variable as p-value is less than 0.005.

This means that the percentage of respondents that indicated that waste treatment and disposal is not done by external agent is higher in OSSHA than MCHA. However, the percentage of respondents that were unable to decide on same issue is higher in MCHA than OSSHA.

Table11. *Result analysis on Waste management agencies in the HCFs*

Waste treatment and final disposal done by state waste management			**Hospital**		**Total**
			MCHA	**OSSHA**	
Response	Don't Know	Count	12	6	18
		Expected Count	6.6	11.4	18.0
		% within HCFs	16.4	4.7	9.0
	No	Count	3	23	26
		Expected Count	9.5	16.5	26.0
		% within HCFs	4.1	18.1	13.0
	Yes	Count	58	98	156
		Expected Count	56.9	99.1	156.0
		% within HCFs	79.5	77.2	78.0
Total		Count	73	127	200
		Expected Count	73.0	127.0	200.0
		% within HCFs	100.0	100.0	100.0

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.088[a]	2	.001
Likelihood Ratio	15.095	2	.001
N of Valid Cases	200		
a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.57.			

CONCLUSION

After the assessment made regarding planning of biomedical waste management at the public HCFs within Akure metropolis and survey on the basis of responses of hospital staffs to the questionnaire verified by means of semi-structured interviews and personal observations for the evaluation of the know-how, outlook and practices of employees towards waste management, it has come out very clearly that understanding the need and importance of segregation needs to be imbibed in the minds of the health functionaries from Chief Medical Officer (CMO) level to the sanitary assistant, as the present study found that there was serious mismanagement of medical waste, which is typical of many hospitals in Nigeria. The medical waste management practices available in surveyed facilities fall below standard because they were marked with ill-practices; this has the potency of creating unsafe environment for health workers and the populace at large. Most often, general and infectious waste materials were mixed together during collection and this does not only increases the volume of infectious waste greatly but also increase the cost of its management. The survey, therefore, indicate the urgent need for relevant strategies to support and promote waste management practice in health settings.

Such a strategy should involve training of hospital employees, development of relevant guidelines, improving awareness of the hospital managers about significance of medical waste management, devising standard procedures for selecting, handling, storing, treating and disposing of hazardous materials, and effective collection of data regarding the amount and hazards of waste materials.

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