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Awareness Level of Workers in the Management of Medical Waste Generated from Hospitals in Bayelsa State

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ABSTRACT: *There is an increase awareness of the public on the dangers associated with the improper disposal of medical waste in this country predominantly waste contaminated with communicable disease agent. Given the general lack of knowledge and effective practice of medical waste documentation about the composition of bio-hazardous waste and the large amount generated, it becomes so difficult to evaluate strategies for waste reduction. The present work presents awareness level of workers in the management of medical waste generated from hospitals in Bayelsa State. The study aimed at assessing the awareness levels and knowledge on the documentation of medical waste among healthcare workers in the various healthcare institutions. The waste generated were weighed kg at source (various unit) for days, week monthly for a period of 3nonths at various unit in the health facilities. Other relevant data were obtained via well-structured questionnaire, and considering the Cochran formula, a sample size of 300 was obtained. Data were further analysed using simple percentage, frequency and charts. Result indicated that there was very poor awareness level of workers in the management of medical waste generated from hospitals in Bayelsa State, and that the level of knowledge on waste documentation as a practice of medical waste management was poor and supercilious in a twenty first century medical waste management process. Thus, it was recommended that the concern government agency should carry out sensitization, awareness, training and retraining of medical workers at the various healthcare institutions on effective medical waste management. Staff of the various hospitals should be properly trained on significance of documentation of waste generated in the various unit on the health facility and there should be provision of all medical waste management infrastructures to cushion the likely impact of these wastes on the on the workers and the general environment.*

KEYWORD: medical waste, medical waste management, healthcare institution, waste generation, waste documentation, sharp waste, pathological waste and genotoxic waste

INTRODUCTION

The hospital environment is one of the complex institutions that deal with different walks of life. Either the sick, well or sound, religion or none, political or apolitical etc., are often found in this environment. It accommodates people beyond patients and staff. Hospital environment is also called healthcare facility or medical facility [1]. However, the effective, efficient and sustainable management of the by-products from these various hospitals has become a public health issue in most developing countries. Medical waste therefore is any solid or liquid waste generated from medical facilities [2]. Thus, medical waste is a sort of hazardous waste [3] being generated by hospital, clinics, healthcare-centers and laboratories etc. It demands proper treated and disposal to avoid possible contamination [4].

Medical waste is composed of wide range of materials like needle and syringes, blood samples, cotton swabs, blood containers, radioactive materials, tissue and body parts, razors and scalpels, chemical solutions, histopathology collections, fecal samples, X-ray etc. The generation of these wastes is on the increase at the global level due to increase in population growth, industrialization, urbanization, modern transportation and agriculture, including the sophistication of medical equipment for diagnosis, treatment, prognosis, etc., [5, and 6]. The offshoot of these wastes could be hazardous (i.e., toxic, infectious, reactive, radioactive etc.) or it could be nonhazardous [7 and 6]. The hazardous components of medical waste constitute 15% of the total waste stream while the nonhazardous component entails 85% [8]. Furthermore, [9] noted that almost 85% of medical wastes are non-hazardous, whereas around 10% of the waste stream are infectious and 5% hazardous while the rest were non-infectious. This range varies according to different continents and countries. In the United States, 15% of healthcare waste is considered as infectious waste. In India, this range varies and falls between 15-35%, whereas in countries like Poland, approximately 20% of medical waste is considered as potentially hazardous or infectious. This variation depends on the overall amount of waste generated in that country [10]. However, the management of hazardous wastes generated from healthcare centers requires specific knowledge and regulations and must be administered by specialists within the field [11] Inappropriate management of these medical waste present danger to man and his environment as healthcare waste contains microorganism that can infect hospital patients, health workers and the general public [8].

In spite of the associated health risk of incongruous medical waste management, most health-care providers and medical waste handlers are not aware of these dangers and thus expose themselves inadvertently [7, 12 and 4]. Such attitude or ignorance exhibited by healthcare workers inhibits the public health significance of effective and efficient medical waste management. For example, the report of National Bureau of Statistics of 2012 has it that between 2007 and 2011, the incidence of hepatitis B infection in Nigeria rose from 5222 cases in 2007 to 7825 in 2011. The key predicator variable that helped the scourge in figure was lack of personal hygiene and purposeless administration/management of wastes. Most recently, worldwide discussion on medical wastes

management has been extended to incorporate a bigger natural motivation for healthcare institutions and a development towards greener hospitals [13].

According to [14], healthcare facilities must retain it sanitary and hygiene status at all levels of operation and at all times. To achieving this underscore the utilization of colour coding [7] and the effective sensitization and awareness campaign including training and re-training of health workers not only the waste handlers on medical waste management. Therefore, this study is aimed at evaluating the awareness levels of health workers in the management of medical waste generated from hospitals in Bayelsa State.

MAERIAL AND METHOD

Study Design

This study undertakes a descriptive research design. The approach involves the gathering of relevant information with respect to each healthcare facility as it affects waste generation rate, awareness and documentation [15 and 16].

Study Area

Geographically, the state is located between latitude $4^{0}15^{'}$ and $5^{0}23^{'}$ N, and longitude $5^{0}15'$ and $6^{0}45'$ E with a total land mass size of 9,415.8sq.km. The State has eight Local Government Areas, namely: Brass, Kokokuma/Okpokuma, Ekeremor, Nembe, Ogbia, Sagbama, Southern Ijaw and Yenegoa as its capital territory. The percentage distribution of the population among the five LGA ranges from 23.8% in Southern Ijaw, 14.2% in Ogbia, 11.1% in Ekeremor, 9.3% in Yenagoa and 6.0% in Kolokuma/Opukuma. Brass, Nembe and Sagbama has the rest 35.6%. The state has a riverine and estuarine like-setting and 78% of the communities are completely surrounded by water and creeks [17]. The total population of Bayelsa state was 1,704,515 (874,083 for male and 830,432 for female) according to [18]. It has limited dry land for settlements and agricultural purposes but it is characterized with extensive mangrove swamps, excessive rainfall, prolonged and disastrous flooding as well as coastal erosion [19]. The mean annual rainfall is estimated to be approximately 4900 mm and temperature variation from 20^{o}C to 31^{o} C. The hottest months are December to April. The state is almost entirely below sea level with a network of meandering creeks and mangrove swamps. The creeks and rivers connected in the South Pole drains into the Atlantic Ocean via the major rivers [20].

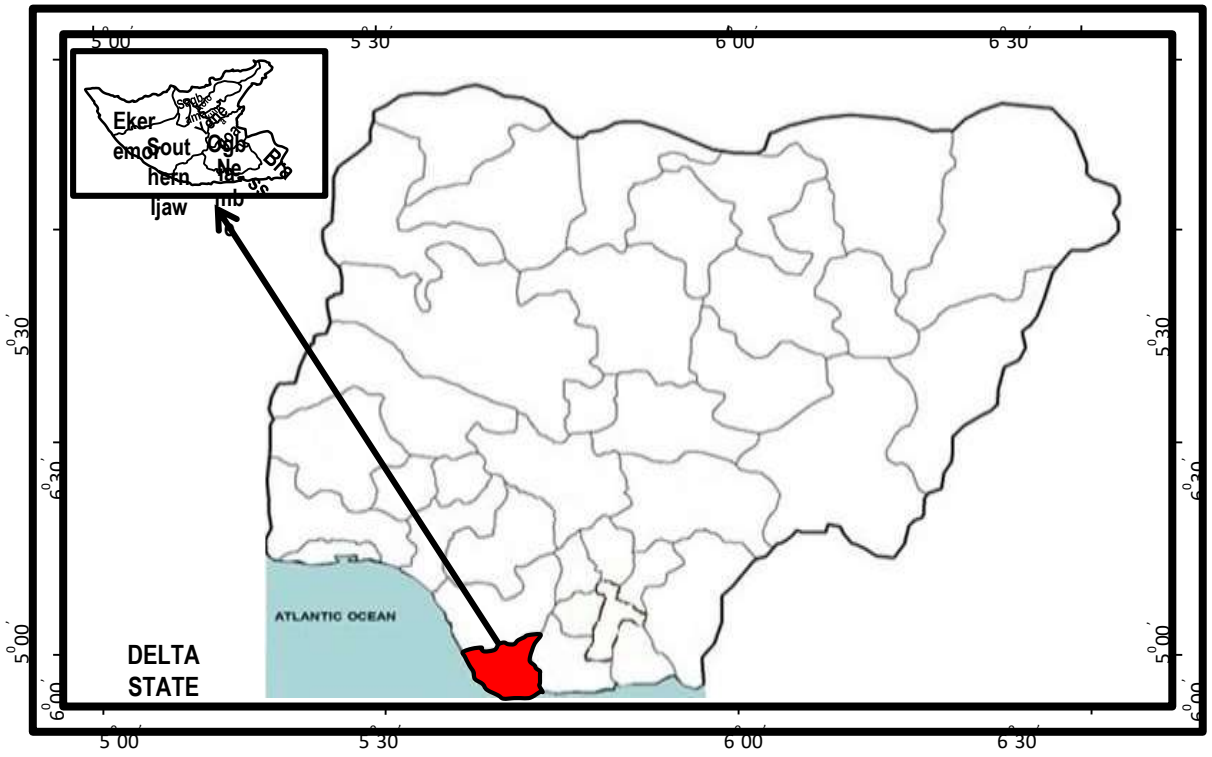

Figure 1: Map of Nigeria showing Bayelsa State
Source: Bayelsa State Ministry of Land, Urban Development and Housing, (2018)

Data Collection

Data were collected with the aid of a well-structured questionnaire, field measurement and field observation. The questionnaire was segmented into two parts. Part A deals with bio-data of the respondents while part B strictly emphasizes on the aim of the study. The field observations were made at each location, using WHO and ICRC checklist that focused on the collection, storage, transportation, treatment and disposal of hospital waste in consistent with WHO and ICRC standards.

Data Analysis

The quantities of hospital wastes collected from field measurements were presented in terms of kg/day for total amount of waste generated and percent (%) for the composition of wastes. Statistical excels and SPSS version 21 software, Analysis of Variance (ANOVA), Bivariate Analysis and Factor Analysis (FA) were used for the organization of data.

RESULT

Demographic Characteristic of Respondents

The results of the demographic characteristics of the respondents are presented in Table 1 with data on sex, age, marital status and level of education of the respondents that participated in the

Primary Healthcare facilities, Secondary Healthcare Facilities and Tertiary Healthcare facilities. However, these healthcare facilities were classified as thus, Primary Healthcare facilities as Small Hospital, Secondary Healthcare facilities as Medium Hospital and Tertiary Healthcare facility was classified as Large Hospital respectively6t. Gender composition of the facility's respondents sampled revealed that male 17(40%), 67(37%) and 103(41%) represents small, medium and large hospitals while the female 26(60%), 116(63%) and 150(59%) also represents small, medium and large hospitals respectively. This implies that across the three categories of healthcare facilities studied, the female gender were more than their male counterparts. The corresponding Age class of the respondents between 18-30years and 31-40years for small, medium and large hospitals were 8(17%) and 19(40%), 44(23%) and 19(40%), 85(44%) and 134(50%). More so, 41-50years and 51-60years had 12(26%) and 8(7%) for small, 54(28%) and 9(5%) for medium and 62(23%) and 12(4%) for large hospitals respectively. Furthermore, the marital status of the correspondents across the small, medium and large hospitals revealed that single had 10(22%), 54(28%) and 75(30%); married had 33(73%), 133(69%) and 168(66%) while Divorce had 1(2%), 1(1%) and 6(2%), and Widow had 1(2%), 3(2) and 4(2%) respectively. Finally, the opinion of respondents concerning their level of education attainment shows that SSCE, ND and Midwifery had 1(%), 6(18%) and 7(21%) for small hospitals; 23(15%), 16(10%) and 15(10%) for medium hospitals; 9(4%), 15(7%) and 17(8%) for large hospitals while HND/B.Sc. and Postgraduate had 17(54%) and 2(6%) for small hospital, 78(51%) and 21(14%) for medium hospital, 129(59%) and 47(22%) for large hospital correspondingly (Table 1).

Healthcare Facilities in the Bayelsa

There were variations in the number of health facilities in Bayelsa State. Small Hospital (Primary Healthcare Centres) was 172; Medium Hospitals (Secondary Health Facilities) had 58 while Large Hospital (Tertiary Healthcare Facilities) had 3. There were 22 private Medium Hospitals and none for Small and Large Hospitals respectively. These hospitals spread across the eight local government areas of the state (Table 2).

Percentage Categorization of Staff in the Healthcare Facilities

The percentage category of staff from the healthcare facilities are presented in Figure 4.1. The results showed that Nurses had 34%, Administrative staff 19%, Doctors/Physicians 17%, Laboratory Scientists 12%, Paramedics 8%, Pharmacists 4%, Cleaner 3% and Radiologists 2% for Large Hospital. Furthermore, in the Medium Hospital, Nurses had 34%, Administrative Staff 15%, Doctors/Physicians 11%, Laboratory Scientists 10%, and Pharmacists 9%, whereas Paramedics, Radiologists and Cleaner all had 7% each for. More so, the analysis as illustrated in Figure 4.1 vis-à-vis the category of staff from the Small Hospital were in the following order; Nurses 57%, Administrative Staff 17%, Pharmacists and Laboratory Scientists each had 11%, whereas Cleaner had 3%.

Table 1: Bio-demographic Data of the Respondents

Parameter	Category	Proportion of Respondents (%)	Parameter	Category
		Small	**Medium**	**Large**
Sex	Male	17(40)	67(37)	103(41)
	Female	26(60)	116(63)	150(59)
Age class	18-30	8(17)	44(23)	61(23)
	31-40	19(40)	85(44)	134(50)
	41-50	12(26)	54(28)	62(23)
	51-60	8(17)	9(5)	12(4)
Mar. St.	Single	10(22)	54(28)	75(30)
	Married	33(73)	133(69)	168(66)
	Divorce	1(2)	1(1)	6(2)
	Widow	1(2)	3(2)	4(2)
Education	SSCE	1(3)	23(15)	9(4)
	ND	6(18)	16(10)	15(7)
	Midwifery	7(21)	15(10)	17(8)
	HND/BSC	17(52)	78(51)	129(59)
	Postgraduate	2(6)	21(14)	47(22)

Mar. St. =Marital Status.
Source: Author's Field Survey, 2021.

Table 2: Bayelsa State Healthcare Facilities

LGA	Small Hospital		Medium Hospital		Large Hospital		Total
	Public	**Private**	**Public**	**Private**	**Public**	**Private**	
Brass	11	0	4	0	0	0	**15**
Ekeremor	17	0	5	0	0	0	**22**
Kolokuma/Opokuma	7	0	5	0	0	0	**12**
Nembe	19	0	3	0	0	0	**22**
Ogbia	24	0	4	0	1	0	**29**
Sagbama	24	0	3	0	0	0	**27**
Southern Ijaw	37	0	6	0	1	0	**44**
Yenogoa	32	0	6	22	1	0	**61**
	171	0	36	22	3	0	**232**
Total	**172**		**58**		**3**		

Source: Bayelsa State Ministry of Health, 2020

However, out of the 300 respondents from the various healthcare institutions under study, Small Hospital had the highest number of nurses (57%) that were sampled; whereas respondents from tertiary healthcare facilities had the highest number of administrative staff (19%) and medical

doctors/physicians (17%) that were involved in the study. The nexus for the high percentage of Nurses (57%) in the Small Hospital could be due to the concomitance rate of employment of indigenous health workers [mostly Senior Community Health Extension Workers (SCHEW) and the Junior Community Health Extension Workers (JCHEW) by the various Local Government Councils on one hand and the posting of Midwifes and Senior Staff Nurses by the State Ministry of Health, Federal Ministry of Health and their agencies including World Health Organization programmes and other Non-governmental agencies whose activities are tied to the various local government area to handle some specific vital units on the other hand may have contributed to this observed increases (Figure 1).

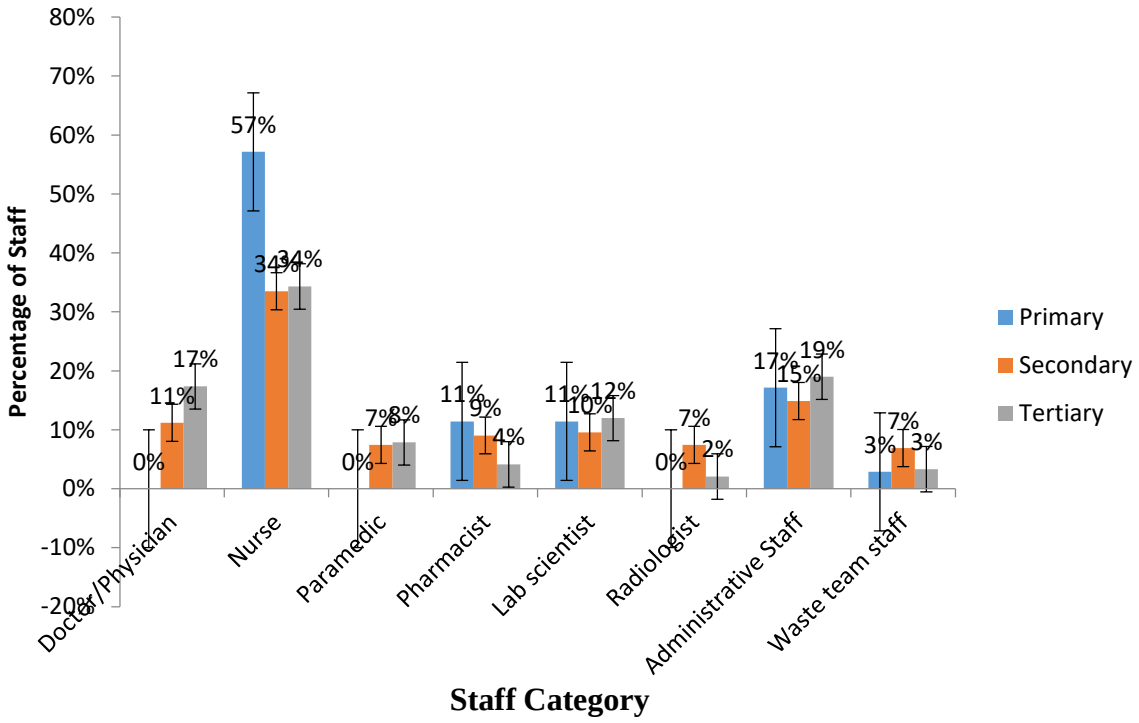

Figure 1: Percentage Category of Staff in the Healthcare Facilities

Percentage of Departmental Staff in the Healthcare Facilities

Figure 2 demonstrated the proportion of departmental staff in percentage across the various healthcare facilities. The results revealed that at the Small Hospital, General surgery, Emergency, Neurology and Orthopedic had 0%, 2%, 0% and 0% staff while Medium Hospital had 6%, 6%, 0% and 2% staff, and Large Hospital had 12%, 12% and 1% correspondingly. More so, Out Patient, HIV/AIDS, X-ray/Radiography, Pharmacy and Disinfection departments had a corresponding percentage staff as 72%, 8%, 0% and 5% for the Small Hospital; 32%, 4%, 11% and 8% for the Medium Hospital, 24%, 9%, 4% and 6% for the Large Hospital. Furthermore,

Laboratories, Kitchen and Dental departments had 11%, 0%, and 0% staff for the Small Hospital; 24%, 1% and 4% staff for the Medium Hospital while 18%, 2% and 7% staffers were for the Large Hospital respectively.

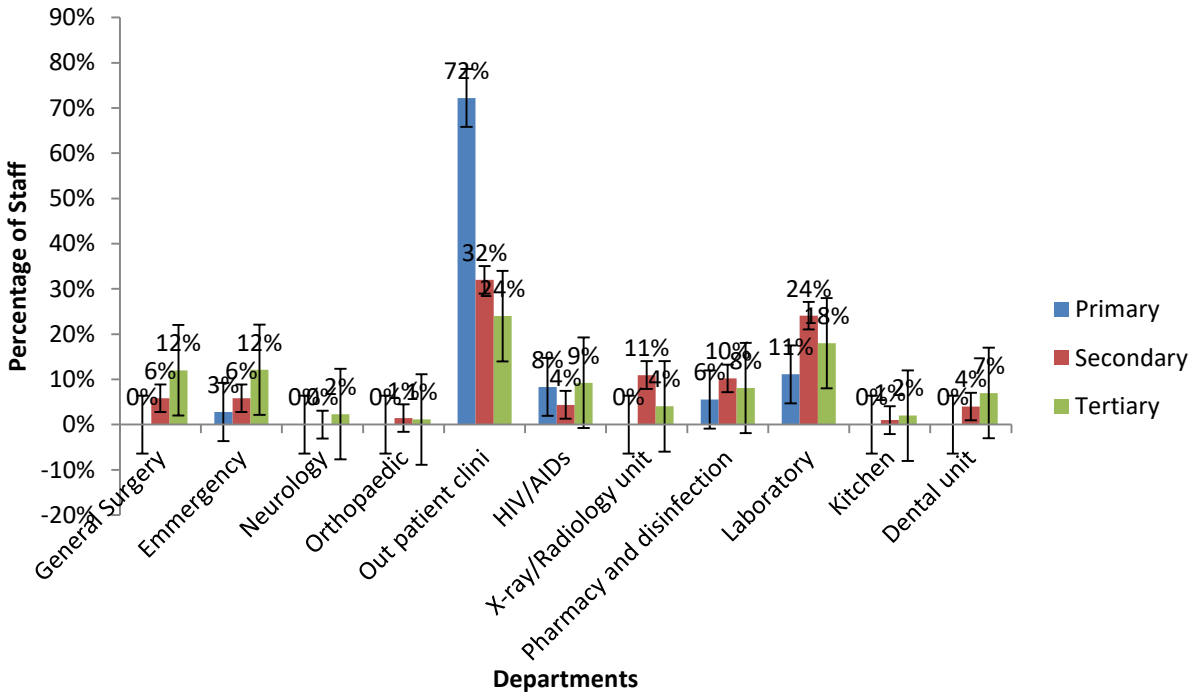

Figure 2: Percentage of Departmental Staff in the Healthcare Facilities

Status of Medical Waste Generation in the Various Health Institutions in Bayelsa

In the Small Hospital, three (3) health facilities vis-à-vis Agudama-Epie Primary Healthcare Centre (APHC), Basic Healthcare Centre Emeyal II (BHCE) and Ogobiri Healthcare Centre (OPHC) were utilized. The total waste generation capacity from these health facilities was 3522.65kg/Month. There were variations in levels of the waste generation capacity across the individual healthcare facilities in the Small Hospital. APHC varied from 7.50-18.70 (13.59±10.76) kg/day for infections waste and 6.30-30.84 (37.64±11.50) kg/day for non-infectious waste. The total waste generation capacity in APHC was 1434.79kg/Month; BHCF varied from 6.90-18.10 (9.95±8.91) kg/day for infectious waste and 4.8-17.50 (28.32±14.69) kg/day for non-infectious waste. The total waste generation capacity in BHCF was 1071.53kg/Month while OPHC varied from 2.10-7.20 (9.56±2.34) kg/day for infectious waste and 5.2-12.55 (26.74±16.29) kg/day for non-infectious waste, and having a total waste generation capacity of 1016.33kg/Month (Table 3).

In the Medium Hospital, Government General Hospital-Kolo (GGHK), Government General Hospital-Sagbama (GGHS) and Diete-Koki Memorial Hospital-Opolo (DKMHO) were used for the study. The total waste generation capacity for these three (3) health facilities was

8212.88kg/month. However, there were variations in levels of the sampled health facilities in the Medium Hospital. GGHK varied from 20.60-66.10 (40.88±15.41) kg/day for infectious waste and 6.30-30.84) kg/day for non-infectious waste, and having a total waste generation capacity of 2717.36kg/month; GGHS varied from 20.60-66.40 (38.58±9.13) kg/day for infectious waste and 34.99-55.58 (52.49±14.49) kg/day for non-infectious, with a total waste generation capacity of 2550.09kg/Month; DKMHO varies from 20.23-69.30 (43.78±18.77) kg/day for infectious waste and 23.94-74.57 (61.42±15.20) kg/day for non-infectious waste, with a total waste generation capacity of 2945.43kg/month respectively (Table 3).

For the Large Hospital, Federal Medical Centre-Yenagoa (FMCY), Federal Medical Centre-Otueke (FMCO) and the Niger Delta University Teaching Hospital-Okolobiri (NDUTH) were utilized for the study. The total waste generation capacity of these healthcare facilities was 19,479.05 kg/month. Furthermore, there were variations on the waste generation capacity of these healthcare facilities. FMCY varied from 33.9-124.30 (70.74±23.27) kg/day for the infectious waste and 41.58-134.45 (172.93±34.58) kg/day for the non-infectious waste, with a total generation rate of 6822.88 kg/month; FMCO varied from 26.60-80.30 (53.21±17.54) kg/day for infectious waste and 33.92-97.38 (74.47±26.61) kg/day for the non-infectious waste, with a total waste generation rate of 3575.47 kg/month whereas NDUTH varied from 54.90-150.90 (105.03±36.17) kg/day for the infections waste and 48.60-165.63 (219.28±62.14) kg/day for the non-infectious waste respectively, with a total waste generation capacity of 9080.70 kg/month (Table 3).

Table 3: Characteristics of Wastes Generated from the Healthcare Facilities

Category of healthcare	Name of H. Facility	$\bar{x}$±SD		Percentage		Total wastes		Num. of beds	AN OP
		Infectious	Non-infectious	IN	NIN	Kg	%		
Small Healthcare	APHC	13.59±10.76 (7.5-18.7)	37.64±11.50 (6.3-30.84)	26.53	73.47	1434.79	100	10	11
	BHCE	9.95±8.91 (6.9-18.1)	28.32±14.69 (4.8-17.50)	26.10	73.90	1071.53	100	6	8
	OPHC	9.56±2.34 (2.1-7.2)	26.74±16.29 (5.2-12.55)	26.34	73.66	1016.33	100	5	8
Medium Healthcare	GGHK	40.88±15.41 (20.6-66.1)	56.17±15.72 (14.36-71.34)	42.12	57.88	2717.36	100	97	19
	GGHS	38.58±9.13 (20.6-66.4)	52.49±14.48 (34.99-55.58)	42.36	57.64	2550.09	100	78	15
	DKMHO	43.78±18.77 (20.23-69.3)	61.42±15.20 (23.94-74.57)	41.61	58.39	2945.43	100	164	23
Large Healthcare	FMCY	70.74±23.27 (33.9-124.3)	172.93±34.58 (41.58-134.45)	29.03	70.97	6822.88	100	216	44
	FMCO	53.21±17.54 (26.6-80.3)	74.47±26.61 (33.92-97.38)	41.67	58.33	3575.47	100	112	36
	NDUTH	105.03±36.17 (54.9-150.9)	219.28±62.14 (48.6-165.63)	32.39	67.61	9080.70	100	280	68

APHC=Agudama-Epie Primary Health Centre, BHCE=Basic Healthcare Centre-Emeyal II, OPHC=Ogobiri Primary Healthcare Centre, GGHK=Government General Hospital Kolo, GGHS=Government General Hospital Sagbama, DKMHO=Diete-Koki

Memorial Hospital-Opolo, FMCY=Federal Medical Centre Yenagoa, FMCO=Federal Medical Centre Otuoke, NDUTH=Niger Delta University Teaching Hospital Okolobiri, H. Facility=Health Facility, IN=Infectious, NIN=Non-infectious, ANOP=Average number of patients, Num. =Number.

Consequently, at the Small Hospital in APHC, the average number of patients was 11 with a total of 10 beds creating a waste generation rate of 4.66 kg/patient/day while BHCE had an average of 8 patient with 6 beds making a waste generation rate of 4.78 kg/patient/day and OPHC had an average number of patients with 5 beds generating a waste of 4.54 kg/person/day (Appendix 2). More so, at the Medium Hospital, GGHK had an average number of 19 patients with 97 beds generating a waste capacity of 5.12 kg/patient/day; GGHS had an average of 15 patients with78 beds and a waste generation capacity of 6.07 kg/patient/day whereas DKMHO had an average of 23 patients with 164 beds making a waste capacity of 4.57 kg/patient/day (Appendix 2). Finally, at the Large Hospital, FMCY had an average number of 44 patients with 216 beds at a waste generation rate of 5.54 kg/patient/day while FMCO had an average number of 36 patients with112 beds generating 3.54 kg/patients/day and NDUTH had an average of 68 patients with 280 beds creating a waste capacity of 4.76 kg/patient/day (Table 4).

Table 4: Medical Waste Generation Rate at the Healthcare Facilities in Bayelsa State

Category of healthcare	Name of healthcare facility	Average quantity of generated wastes (kg/d)	Average number of patients	Number of beds	Generation rate (kg/patient/day)
Small healthcare	APHC	51.24	11	10	4.66
	BHCE	38.27	8	6	4.78
	OPHC	36.29	8	5	4.54
Medium healthcare	GGHK	97.05	19	97	5.12
	GGHS	91.07	15	78	6.07
	DKMHO	105.19	23	164	4.57
Large healthcare	FMCY	243.67	44	216	5.54
	FMCO	127.69	36	112	3.54
	NDUTH	324.31	68	280	4.76

Component and Characteristics of Medical Waste Generated

The components and characteristics of medical waste in the various hospitals exhibited is presented in Table 5. In the Small Hospital, pathological waste, pharmaceutical waste, genotoxic waste and chemical waste had 14.2%, 4.9%, 0.0% and 0.0% congruently while in the Medium Hospital, the corresponding percentages were 18.4%, 3.7%, 7.4%, 1.3% and 1.8%; and in the Large Hospital, the corresponding percentages were 23.7, 9.2, 12.8, 3.3% and 6.2%. Furthermore, in the Small Hospital, waste with high content of heavy metals, pressurized containers, radioactive waste and general waste had 0.0%, 0.0%, 0.0% and 79.3% respectively while at the Medium Hospital, the corresponding percentage values were 0.8%, 1.0%, 1.2% and 64.4%, and in the Large Hospital, values were 3.1%, 4.7%, 3.8% and 33.5% respectively (Table 5).

The general solid waste appeared to be the most frequent medical waste generated across the various Hospitals with Small Hospital having (79.3%), Medium Hospital (64.4%) and Large Hospital (33.5%). The observed percentage variability in composition as observed in this study for the general solid waste across the various hospitals could be related with the effective medical waste management practice in the Large Hospital as against the medium and Small Hospital (Table 5).

Table 5: Component/Characteristics of Medical Waste Generated in percentage (%) at the different Hospitals

Waste Description	Small (%) Hospital	Medium (%) Hospital	Large (%) Hospital
Sharps waste	14.2%	18.4%	23.7%
Pathological waste	1.6%	3.7%	9.2%
Pharmaceutical waste	4.9%	7.4%	12.8%
Genotoxic waste	0.0%	1.3%	3.3%
Chemical waste	0.0%	1.8%	6.2%
Waste with high content of heavy metals	0.0%	0.8%	3.1%
Pressurized containers	0.0%	1.0%	4.7%
Radioactive waste	0.0%	1.2%	3.8%
General solid waste	79.3%	64.4%	33.5%

Awareness of documentation of monthly waste generated in the Healthcare Institution

At the Small Hospital, the analysis on awareness of documentation of monthly waste generated revealed that, 74% of the healthcare workers accepted that they do not document monthly waste generated from the facilities. However, 26% of the workers consented that they have no knowledge on documentation of waste generated from the facilities (Figure 3). In the Medium Hospital, only 3% of the healthcare workers opined that medical waste generated from their facilities is documented on monthly basis. However, 50% of the workers accepted that they have no knowledge on whether wastes generated were documented. More so, 47% affirmed that medical wastes generated were not documented in the facilities (Figure 3). Finally, more than half of the respondents across the Large Hospital were of the opinion that they have no knowledge on the documentation of monthly generated waste in the facilities. Although, some of the respondents had a contrast view as 33% accepted that there was no form of documentation of waste whereas only 8% consented that waste generated from the facilities were documented (Figure 3).

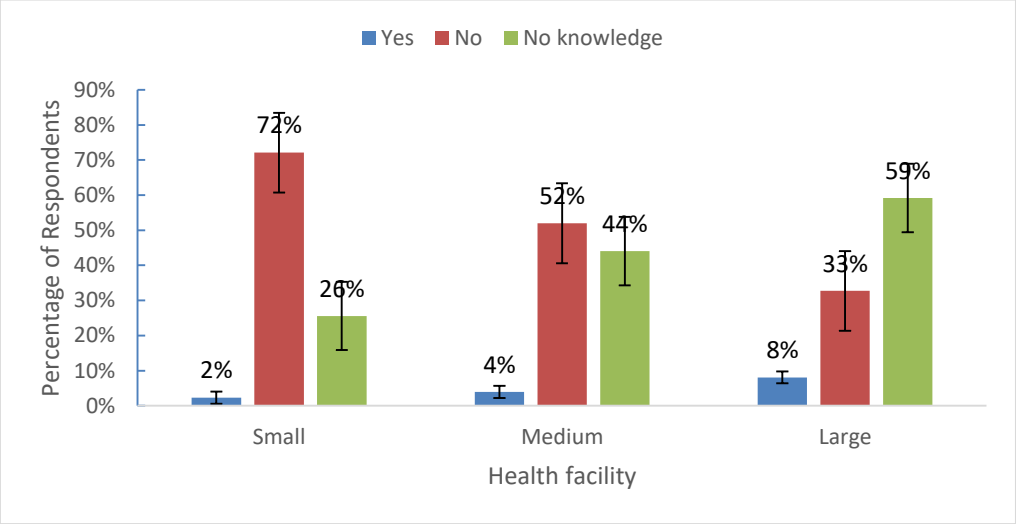

Figure: 3 Awareness of documentation of quantity of monthly medical waste generated in the health facilities

Levels of Awareness of Health Workers in Medical Waste Management

The appraisal on the levels of awareness of health workers in the management of medical waste generated in the various units of the healthcare facilities utilizes Figure 4 and 5 respectively. In the Small Hospital, none of the respondents accepted that waste generated from the wards and departments were documented while overwhelming majority (83%) of the respondents confirmed that there is no documented record of wastes generated from each ward, units and departments in the facilities, and 17% of them claimed not to have knowledge on any documented wastes generated records (Figure 4). At the Medium Hospital, only 2% accepted that wastes generated from the wards/units and department were recorded and documented, above half (54%) consented that there were no records of waste generated from the wards, units and department. However, 44% of the respondents claimed that they do not have knowledge on the subject matter in question (Figure 4). Furthermore, at the Large Hospital, 8% of the respondents consented that there are documented records of wastes generated from the wards/units and departments whereas 39% of the respondents varied from others as they acclaimed that there was no record of waste generated from the facility's wards/units and departments; and majority (53%) of the sampled respondents had no knowledge on the subject in question (Figure 4).

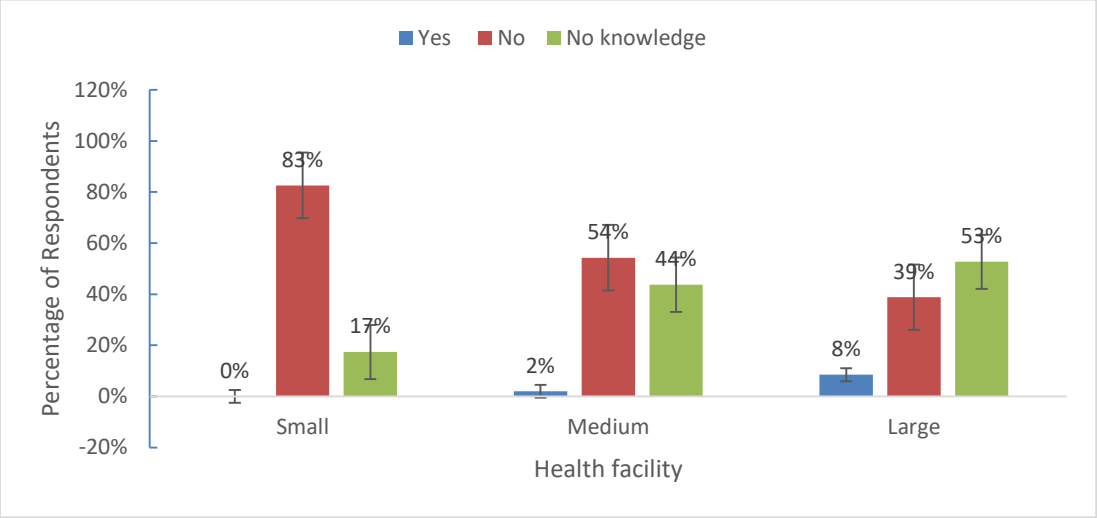

Figure 4: Awareness of record of quantity of waste generated from each ward/units/department in the health facilities

DISCUSSION

The demographic variables revealed that the female workers [Small Hospital 26(60%), Medium Hospital 116(63%) and Large Hospital 159(59%)] more when compared to their male [Small Hospital 17(40), Medium Hospital 67(27) and Large Hospital 103(41)] counterpart across the various hospitals. The significance of this is that, women could be more exposed to any likely dangers resulting from poor management of medical waste in the facilities and therefore should be protected. Most of the respondents have post-secondary school educational qualification which qualifies the authenticity of the responses to be highly valid. Again, there were 44 private sector hospitals (Medium Hospital) cutting across two major senatorial district (Southern-Ijaw and Yenegoa) which underscore the integration of all major players in the medical management process that ensured and maintained an effective study.

However, in the Small Hospital, the total amount of waste generated was 3522kg at a rate of 78.97 infectious wastes and 221.03 noninfectious waste while at the Medium Hospital, the total waste generated was 8212.88kg at a rate 126.09 infectious waste and176.91 noninfectious waste. Furthermore, at the Large Hospital, the total waste generation was 19471kg with 103.09 infections waste and 196.91 noninfectious wastes respectively. The average waste generation rate for the Small Hospital was 13.98 kg/patient/day; Medium Hospital had 15.76 kg/patient/day while Large Hospital had 13.84 kg/patient/day correspondingly. According to [4, 21 and 22], medical wastes are sort of hazardous wastes being generated in hospitals, clinics, healthcare-centers and laboratories etc. which demand proper treatment before final disposal of such waste should be encouraged. It was discovered that the average waste generation rate in kg/patient/day for the

Large Hospital was less than that of the Small and Medium Hospitals. This simply deciphered that only special cases needed by the Large Hospital attend the hospital hence the reduction in the volume of waste per kg/patient/day in this study.

The characteristics of medical waste generated in percentage revealed that in the Small Hospital, Sharps, pathological and pharmaceutical had, 14.2%, 1.6% and 4.9% with a corresponding 18.4%, 3.7% and 7.4% for Medium Hospital, and 23.7%, 9.2% and 12.8% for Large Hospital. More so, Genotoxic, Chemical, waste with high content of heavy metals, pressurized content and radioactive waste had 0.0% respectively whereas their corresponding values of 1.3%, 1.8%, 0.8%, 1.0% and 1.2% for Medium Hospital and 3.3%, 6.2%, 3.1%, 4.7%, and 3.8% as for the Large Hospital and General Solid Waste (GSW) had 79.3% (Small Hospital), 64.4% (Medium Hospital) and 33.5% (Large Hospital). It was indicated that the large Hospital had higher percentage values for all the characteristics of waste generated except that of general solid waste (GSW). The nexus for this high variability in the characteristics of waste generated at the Large Hospital could be attributed to the specific nature of the hospital (Specialist Centre), hence the special waste like the radioactive, pressurized, genotoxic heavy metal waste among others. This corroborate with the work of Wong et al., 1994 in Miami, United State. Out of these wastes stream, the proportion of hazardous waste (20.7%) falls within [8] categorization and composition of medical waste while the non-hazardous waste constituted 79.3% in the Small Hospital.

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The awareness level and documentation of medical waste generated in the various healthcare facilities was poor in this study and comparable to the study carried out by [23] in Boswana, [24] in Hindawi and [7] 2007 in Nigeria. However, it was revealed that in the Small Hospital, 72% of the respondents maintained not been aware of waste documentation while 26% asserted that they do not have any knowledge whatsoever in documenting the waste been generated. The Medium Hospital had similar situation with that of the Small Hospital whereas there was divergence of idea at the Large Hospital. Furthermore, it was observed that in the Large Hospital, very negligible percentage (8%) of the respondents averred that they are aware of waste documentation. Again, on the awareness of the amount of waste generated and recorded at the various ward as a way of waste management strategy unfolded that at the Small Hospital, the respondents had no knowledge hence are not aware of any waste recording at the ward level. Only 2% of the respondents at the Medium Hospital agreed been aware of waste recording while 8% only out of 100% in the Large Hospital also maintained been aware. The level of awareness in this study is not ideal for an effective and sustainable medical waste management practice.

SUMMARY OF FINDINGS

1. The degree of awareness and documentation of generated medical waste is generally very poor across the Small, Medium and Hospitals in Bayelsa State.
2. The poor awareness level observed in the various healthcare institutions in this study could be attributed to dearth of sensitization and awareness campaign environmental health education, including training and re-training of staff.

3. In addition, to medical waste management deficiency and policy implementation practices. waste management infrastructure,
4. Furthermore, the study revealed that the percentage of sharps waste generated at the Small Hospital was 14.2%, Medium Hospital 18.4% and Large Hospital 23.7% respectively.
5. The general solid waste generated across the various healthcare institutions revealed that Small Hospital had the highest value of 79.3%followed by Medium Hospital 64.4% and large Hospital 33.5%.

COMPETING INTEREST

The authors declared that there was no competing interest.

CONCLUSION

The average waste generation capacity in kilogramme per day (kg/day) from the Large Hospital out-ways that of the Medium and Small Hospitals respectively. Thus, there is an urgent need for medical waste managers at the various healthcare institutions to create more awareness on the need to document the amount of waste generated at the various units of the hospital in a bid to reducing the health risk associated with medical waste management.

RECOMMENDATION

1. The concern government agency should carry out sensitization, awareness, training and retraining of medical workers at the various healthcare institutions on effective medical waste management.
2. Staff of the various hospitals should be properly trained on significance of documentation of waste generated in the various unit on the health facility.
3. There should be provision of all medical waste management infrastructures to cushion the likely impact of these wastes on the environment.
4. Waste handlers should be incorporated in the training and re-training of staff to enhance proficiency in the entire waste management stream of the various health institutions.

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