Assessment Studies On Hospital Waste Management In Imo State

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Abstract

This study was carried out in three hospitals in Owerri, Imo State, Nigeria to establish the status of Hospital waste management between September- October, 2011. The three hospitals generated similar categories of medical waste, after evaluating their collection and disposal methods, assessing and comparing the volume and quantity of waste generated by segregation and sorting; General waste measured for 52.8%, Pathology 18.9%, Radioactive 1.9%, Chemical 1.5%, Infectious 5.8%, Sharps 5.85%, Pharmaceutical 5.7, Pressurized container 7.4%. The result further revealed that significant higher quantity of waste was generated in Federal Medical Centre 1075.1kg/week. Colour waste containers were used only in Federal Medical Centre for collection of waste and incineration was also used only in Federal Medical Centre while all the pathological waste was buried in pits. Municipal waste bin and open burning were used for other categories of waste in St. David and General Hospital. However, only 33.3% of the staff in Federal Medical Centre was aware of the WHO guidelines. 53.3% of the respondent was aware of health implications of waste. Finally the refresher course given to cleaners consists of not often from St. David, yearly from General Hospital and 2-3 times yearly in Federal Medical Centre. The studies have shown that none of the hospitals had a waste management team thus waste management practiced in these studied hospitals were not adequate and recommendation was offered for proper waste management.

Keywords: Hospitals, waste management

1. Introduction

Waste, generally are unwanted materials generated domestically at home, hospitals or industrially as by-products or degraded materials. Thus generated waste materials may be solid, gaseous or liquid in nature. It may also exist in the form of chemical, metal or organic waste, (Adewumi & Babatola, 2006).

According to Dehghani et al. (2008), Hospital wastes are defined as the discarded materials which arise during the diagnosis, treatment or immunization of human beings, animals or in research activities. The waste may include disposable syringes, swabs, bandages, body fluids, human excreta, among others. Dehghani et al. (2008) further observed that hospital waste if not properly managed can be a serious threat to human health due to their infectious attributes. For instance, it has been estimated that 25% of the total waste generated in a hospital are infected. Again the indiscriminate dumping of untreated hospital waste in Municipal bins increases the chances of survival and mutation of pathogenic microbial population in the municipal waste, which can lead to disease epidemics and increased incidence of communicable disease in the community.

The prevalence of infectious disease like tuberculosis, AIDS and others has also been traced to the inappropriate use, storage, treatment, transport and disposal of hospital waste (Sreejith, 2008). He also stated that the chances of vectors like cat, rat, mosquitoes, flies, birds, dogs and others getting infected or becoming carriers also spreads disease in the community. Hospital waste as stated by Sadeghi (2001) is a special waste which demands special attention by all especially stake holders in the field of Medicine and Environmental Protection Agencies in terms of generation, segregation and final disposal of these waste. Its proper management will help minimize the amount of waste that has the potential to cause disease.

The principles, methods, techniques and practices which constitute standard and acceptable hospital waste management are embedded in regulations and policies promulgated by agencies such as the World Health Organization, Medical Professional Organizations, United Nations, and Government Organization at the Federal, State, Local Government and even Community levels. This implies that those who are in the business of hospital waste generation and management are expected to be well acquitted with the existing hospital waste management regulation from such regulatory agencies, as it concerns them, (Nouri, 1990).

On the contrary, the scarcity of literature materials on existing hospital waste management regulations and lack of implementation is a clear pointer to the gap the knowledge of hospital waste management among the practitioners. The inadequate knowledge of waste management in the hospital would result in poor attitude of the practitioners towards waste management. The indiscriminate dumping of hospital waste among domestic, the absence of waste management facilities such as incinerators, autoclave, microwave,

hydroclave etc., poor implementation of waste management policies and regulations by Government and corporate bodies are clear indications of the nature of attention given to hospital waste by almost all and sundry (Ashrafi, 2005).

2. Aim and objectives

The aim of this study is to assess the status of hospital wastes management in the hospitals situated in Owerri through the following objectives:

- To determine the types of waste generated in three hospitals in Owerri
- To evaluate their collection and disposal methods
- To assess and compare the volume and quantity of waste generated in Federal, State and Private Hospitals.
- To assess their knowledge on WHO hospital waste management guidelines and the level of training given to hospital waste handlers.
- To make recommendations for effective hospital waste management in Owerri.

3. Materials and methods

3.1 Methods

The methodology is descriptive and consists of the use of survey, interview with authorities of the health care facilities and with personnel involved in the management of the wastes and distribution of questionnaire to the hospital waste handlers. A general survey of waste handling, segregation and disposal procedures practiced in the hospitals was performed to assess its compliance with the information on the questionnaire. The supporting staff of each ward, laboratory and department of the three hospitals was briefed on the nature of assistance and support that was needed in determining the quantity of waste during the study period. They were given stickers to place on the plastic containers to differentiate the containers in order to facilitate in tracing the generation site for data collection.

3.2 Study area

The study was carried out in Owerri, capital of Imo state. Imo state is bounded on the East by Abia state, on the North by Anambra state, on the West slightly by Delta state and on the South by Rivers state. Imo state has twenty seven local government areas. It is divided into three political zones namely: Owerri zone, Okigwe zone and Orlu zones. The study was done in the urban area

Two Government hospitals in Owerri Federal Medical Centre (FMC) and General Hospital Umuguma, and a private hospital St. David were selected for this study. Federal Medical Centre (FMC) is situated at Orlu road; Amakohia in Owerri North L.G.A. FMC has twenty two (22) Medical units and a mortuary. General Hospital Umuguma (GH) (Owerri Specialist Hospital) located at Housing estate off Port Harcourt road, Umuguma in Owerri West LGA. The hospital has 19 units and a mortuary. St. David (St.D) Private hospital is situated at 14 Mbari Street Ikenegbu layout Owerri, in the state capital. It has 12 Medical units.

3.3 Data collection

A 3-page questionnaire was used to collect data on the collection, segregation, treatment, transportation and final disposal of hospital waste management system. A total of 29 (twenty nine) questionnaire was distributed in the following order: to St. David (4), General Hospital (10) and Federal Medical Centre (15). Seventeen questionnaires out of the 29 distributed were retrieved and used for the analysis. Interview schedule and observation were also used to collect data for the study.

3.4 Data sampling

The collection of clinical waste samples, analysis and characterization were carried out in accordance to World Health Organization (WHO, 1999) recommendation. All the waste generated in three hospitals were segregated and weighed manually during a period of One week. Parallel to the interviews, the quantity and volume of the waste were determined and recorded in the date form for each hospital using the spring scale (100g) and percentage. Hand gloves and large forceps were used to segregate the waste into different categories. The waste were discarded in a plastic container and weighed according to their categories, following this procedure the wastes were transported to a special site for storage and final disposal. The segregating of this waste was a part of a continuing effort to measure and understand the waste generated in hospitals. The raw survey data was compiled and managed so as to enable the estimation of waste generation quantities and management practices.

3.5 Data analysis

The quantity of infectious and non-infectious waste as well as sharps were weighed and recorded on a suspension spring scale

(100g) with the assistance of a staff in each ward/department for a period of one week. The calculations on the quantity of waste were made using Percentage and Analysis of variance (ANOVA).

4. Results

Table.1. St. David Hospital Owerri characteristics

St. David Hospital Owerri					
Intensive care Unit	Male	Female	Total	% M	% F
Number of bed	10	10	20		
Number of inpatient/day	5	7	12	41.6	58.3
Number of outpatient/day	3	2	5	60.0	40
Casualty ward					
Number of bed	2				
Number of inpatient/day	2				
Number of outpatient/day	2				
Maternity					
Number of bed	20				
Number of inpatient/day	17				
Number of outpatient/day	8				
Children Ward					
Number of bed	18				
Number of inpatient/day	8				
Number of outpatient/day	3				
Total No. of inpatient/day	39				
Total No. of outpatient/day	18				

Source: Fieldwork

Percentage of waste generated

St. David 25%
Gen. Hosp. 34%
Fed. Med. Cen. 41%

- St. David
- Gen. Hosp.
- Fed. Med. Cen.
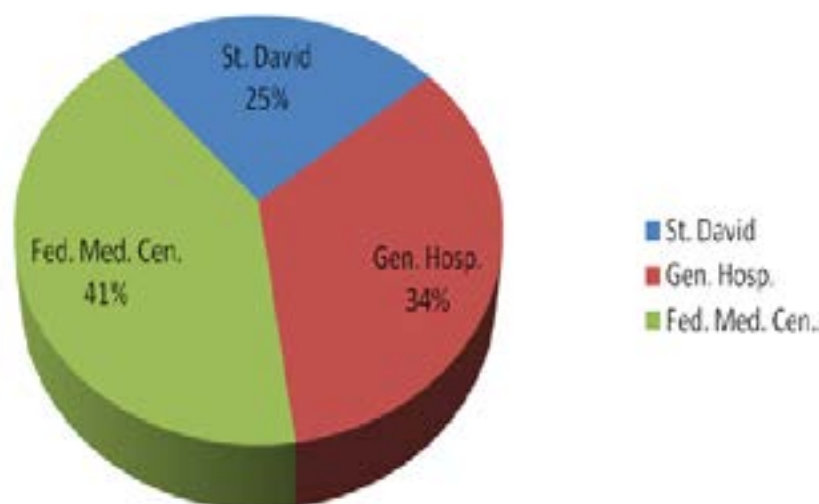
Table.2. General Hospital Umuguma Owerri characteristics

General Hospital Umuguma Owerri					
Intensive care Unit	Male	Female	Total	% M	% F
Number of bed	22	25	47		
Number of inpatient/day	16	20	36	44.4	55.6
Number of outpatient/day	5	8	13	38.5	61.5
Casualty ward					
Number of bed	10	13	23		
Number of inpatient/day	5	4	9	55.5	44.5
Number of outpatient/day	2	1	3	66.7	33.3
Maternity					
Number of bed	20				
Number of inpatient/day	18				
Number of outpatient/day	5				
Children Ward					
Number of bed	10				
Number of inpatient/day	5				
Number of outpatient/day	2				
Total No. of inpatient/day	68				
Total No. of outpatient/day	23				

Table.3. Federal Medical Centre Owerri characteristics

Federal Medical Centre Owerri					
Ward 1	Male	Female	Total	% M	% F
Number of bed	12	15	27		
Number of inpatient/day	10	14	24	41.6	58.3
Number of outpatient/day	4	2	6	66.7	33.3
Ward 2 (Orthopedic)					
Number of bed	10	15	25		
Number of inpatient/day	5	4	9	55.6	44.4
Number of outpatient/day	1	2	3	33.3	66.7
Ward 3 (Maternity)					
Number of bed	26				
Number of inpatient/day	18				
Number of outpatient/day	6				
Ward 4					
Number of bed	30				
Number of inpatient/day	18				
Number of outpatient/day	9				

Ward 5					
Number of bed	18				
Number of inpatient/day	10				
Number of outpatient/day	5				
Prenatal Ward					
Number of bed	21				
Number of inpatient/day	15				
Number of outpatient/day	8				
Ward 6	**Male**	**Female**	**Total**	**% M**	**% F**
Number of bed	9	11	20		
Number of inpatient/day	7	11	18	38.9	61.1
Number of outpatient/day	3	9	9	33.3	66.7
Ward 7					
Number of bed	10	15	25		
Number of inpatient/day	5	11	16	31.3	68.8
Number of outpatient/day	3	4	7	42.9	57.1

The result on hospital characteristics showed that Federal Medical Centre had the highest inpatients (189/day) and outpatient (72/day) followed by General hospital with inpatients of 44/day and outpatients of 14/day. St. David hospital had the least inpatient and outpatient of 39/day and 18/day respectively. Table. 5 shows that the hospitals sampled generated the same category of waste. The types of waste identified are General waste (house hold waste), Pathology, Radioactive, Chemical, Infectious, Sharps, Pharmaceutical and Pressurized container. The pathological wastes generated by the three sampled hospitals are disposed into a pit. In FMC, the other identified wastes are incinerated with incinerator while in St. David hospital they are disposed into a municipal bin which is removed by the government agency. In General hospital, the other identified categories of waste are incinerated in open burn.

The result on the volume and quantity of waste generated shows that St. Federal Medical Centre generated the highest quantity of waste, 1075.1kg/Wk, followed by General hospital, 870KG/Wk and St. David had the least value of 654.9kg/Wk. Furthermore, the result revealed that the general waste (house hold waste) constituted the highest volume of waste generated in the three hospitals St. David 54.0%, General hospital 56.1% and Federal Medicine Centre 49.4% while chemical waste constituted the least volume of waste in the sampled hospital. Therefore, it is accepted that, since F-value (0.3) is less than T-value (3.4) as calculated in Appendix I, the null hypothesis states that there is no significant difference between the volume and quantity of waste generated in the three hospitals as they represent Federal hospital (Federal Medical Centre), State hospital (General Hospital) and Private hospital (St. David).

The result shows that the waste handlers in St. David and General hospital are not aware of the WHO recommendation on Hospital waste management; hence it is not implemented while 33.3% of respondents from Federal Medical Centre were aware of the guideline. 100% of respondents from St. David, 60.0% from General Hospital and 53.3% from Federal Medical Centre were aware of health implication of Hospital waste. The result on level of training shows that training of staff are not often given in St Davids hospital , General hospital offered yearly training while Federal Medical Centre offered training 2-3 times yearly.

5. Discussion

From the result of characteristics and sample, it implies that St. David generate less waste as regards to the number of inpatients and outpatients 39/day and 18/day respectively *(table1)* while Federal Medical Centre has the highest number of inpatients and outpatient 189/day and 72/day respectively *(table3)*. Disposal methods (pit) for pathological waste practiced in the three sampled hospitals according to WHO (1999) should be covered with a 10 to 30cm layer of soil after each use which this hospitals violets. It also shows that St. David, General Hospitals and Federal Medical Centre use municipal bin, open burn and incineration respectively for general waste, radioactive, chemical, infectious, sharps, pharmaceutical and pressurized containers. The result on the volume and quantity of waste generated *(in table6)* shows that that St. Federal Medical Centre generated the highest quantity of waste (1075.1kg/Wk) in response to the number of inpatients they have and as the largest hospital. St. David had the least value of 654.9kg/Wk being a private

hospital and the smallest amongst the three sampled hospital. Furthermore, the result also revealed that the general waste (house hold waste) constituted the highest volume of waste generated in the three hospitals St. David 54.0%, General hospital 56.1% and Federal Medical Centre 49.4%. The inadequate training can result to outdated information on waste management and hence the knowledge depreciates. However, lack of waste management facilities, government assistance, waste management guidelines constitute the most serious hospital waste management practices.

Federal Medical Centre Owerri (continued)					
Ward 8					
Number of bed	10	11	21		
Number of inpatient/day	7	8	15	46.7	53.3
Number of outpatient/day	2	4	6	33.3	66.7
Ward 9					
Number of bed	10	10	20		
Number of inpatient/day	5	9	14	35.7	64.3
Number of outpatient/day	1	3	4	25	75
Ward 10					
Number of bed	10	13	23		
Number of inpatient/day	7	10	17	41.2	58.8
Number of outpatient/day	2	4	6	33.3	66.7
Ward 11					
Number of bed	10	12	22		
Number of inpatient/day	6	9	15	40	60
Number of outpatient/day	1	2	3	33.3	66.7
Total No. of inpatients/day	189				
Total No. of outpatients/day	72				

Table 4: Characteristics/Status Summary of the Sampled Hospital

Status	St. David	General Hospital	Fed. Med. Centre
Inpatients/day	39	44	189
Outpatients/day	18	14	72
No. of Unit	12	19	22
No. of Wards	4	6	11

Waste Categories	St. David Qty/Wk(kg)	%	General Hospital Qty/Wk(kg)	%	Fed. Med. Centre Qty/Wk(kg)	%	Total Qty/Wk(kg)	%
General waste	354	54.0	488	56.1	531	49.4	1373	52.8
Pathology	132	20.2	165	19.0	194	18.0	491	18.9
Radioactive	11	1.7	14	1.6	25	2.3	50	2.0
Chemical	8.9	1.3	14	1.6	17	1.6	39.9	1.5
Infectious	32	4.9	48	5.5	72	6.7	152	5.8
Sharps	40	6.1	50	5.7	62.1	5.8	152.1	5.9
Pharmaceutical	28	4.3	37	4.3	84	7.8	149	5.7
Pressurized container	49	7.5	54	6.2	90	8.4	193	7.4
Total	654.9	100	870	100	1075.1	100	2600	100

Table 5:   Types of waste, collection and Disposal method

Waste Categories	St. David	General Hospital	Fed. Med. Centre
General waste(House hold)	Municipal bin	Open burn	Incineration
Pathology	Pit	Pit	Pit
Radioactive	Municipal bin	Open burn	Incineration
Chemical	"	"	"
Infectious	"	"	"
Sharps	"	"	"
Pharmaceutical	"	"	"
Pressurized container	"	"	"
Collection method	2 colour coded plastic container was used	No colour code, plastic container was used	3 colour coded plastic container was used

Table 6. *The Volume and Quantity of waste generated on weekly basis Response on Knowledge of WHO and Level of Training*

	St. David	General Hospital	Fed. Med. Centre
Response	n=8	n=20	n=30
Awareness of WHO guidelines	0(0.00)	0(0.00)	10(33.3)
Knowledge of health implication of Hospital waste	8(100)	12(60.0)	12(60.0)
Refresher course	not often	yearly	2-3 times yearly

Lack of awareness, appropriate policy and laws, apathy and lack of facilities are responsible for improper management of hospital waste in Owerri. The process of collection, segregation and disposal of hospital waste is not performed according to WHO recommended standards and concerned people are exposed to the dangers of such waste. The field survey also shows that there is a poor coordination between the Environmental Protection Agency (EPA) and the Ministry of Health thus depreciating implementation of waste management in hospitals.

However, in order to achieve aesthetic application for the entire process of hospital waste management in Owerri, the collection of the infectious and non-infectious waste should start at the patients/visitors area so that less full trolleys moves along these areas. The infectious waste should not be transported through the patient area to avoid dropping on the premises as seen in Fig 2 of the pictures above. Furthermore, it is suggested that in a situation like this, periodic meeting should be conducted involving the administrative and maintenance staff who are directly or indirectly involved with waste management in order to share and discuss the technical or practical difficulties and provide suggestions on improvement of waste management practices specific to a particular hospital.

Most of the treatment facilities are not available in any of these hospitals, hence until now, the only method for treatment of these wastes is incineration. Hence, this practice releases toxic substances such as dioxin emission into the air, (Nurunnabi; 1997). At hospitals, incineration should be monitored to reduce potential risks to humans and the surrounding environment. The incinerator must have electrostatics precipitation, scrubbers and 30m high or more chimneys with a load capacity of 1000kg and 150kg/h incineration rates, temperature maintained at 800^0C over 12hours for cooling and empting the accumulated ash before a fresh load of hospital waste is inserted. The transformation and dematerialization process include transform of solid and liquid toxic waste into gaseous emissions and particulate matters. The acid gases (e.g. hydrochloride, nitrogen oxides and sulphur dioxides), which can cause chronic health effects. Ray, (2008) reports that burning of chlorine made materials e.g. PVC (Polyvinyl chloride) containers creates dioxins, a known animal carcinogen and considered as human carcinogen. Dioxins are a class of chemical contaminants that are formed during combustion process such as waste incineration. They are widely distributed throughout the environment in low concentration thus persistent and bio-accumulated. Dioxins can be commonly detected in air, soil, sediment and food; they are primarily transported through the air and are deposited on the surfaces of soil, building and pavement, water bodies and leaves of plant. Others are introduced to the environment through the air as trace products of combustion. Humans are primarily exposed to dioxins by eating food contaminated by these chemicals and hence develop skin disease marked by severe chloracine such as acne pimple and heart disease.

6. References

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