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Original Research Article

A case study of hospital contraceptive waste management practices in Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka, Anambra State

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ABSTRACT

Background: Effective management of hospital waste is a critical component of a hospital's infection control program and is central to occupational safety for healthcare workers. Thus, this study focused on the assessment of hospital contraceptive waste management practices at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) Awka, Anambra state, Nigeria.
Methods: A cross sectional analytical study was carried out among healthcare workers selected using multistage sampling technique in 6 categories of healthcare workers in COOUTH. Data was collected using a pre-tested semi-structured interviewer-administered questionnaire and a World Health Organization (WHO) checklist and analyzed using statistical package for the social sciences (SPSS) version 22. Associations and correlations between variables were tested at the bivariate level using Chi-square and t-test.
Results: A total of 86 healthcare workers were surveyed. The majority of the respondents were females, nurses with RN qualification. The mean knowledge score of the respondents was 94.8%. The attitude of healthcare workers towards segregation of hospital contraceptive waste at source point was 71% while the usage of gloves in handling hospital waste was 95.3%. The major factor affecting contraceptive waste management practices in the facility was the respondent's cultural beliefs. The lack of funds to finance standard waste disposal methods was noted to be a significant barrier to optimum waste management practices.
Conclusions: This study showed that despite the high level of knowledge of healthcare workers on hospital contraceptive waste management practice in COOUTH, the hospital contraceptive waste management practice is not functioning optimally in Anambra state. Hence, the need to reform the hospital waste management practice to achieve functional results.

Keywords: Hospital waste management, Waste generation, Waste disposal, Waste segregation, Incineration, Healthcare workers

INTRODUCTION

Hospital waste is "any waste which is generated in the diagnosis, treatment or immunization of human beings or animals or in research" in a hospital.[1] "Hospital waste is a special type of waste produced in small quantities carrying a high potential of infection and injury".[2] There are serious health effects from a public health stand point if hospital waste is not handled properly. According to the Health Professions Council of South Africa (HPCSA), healthcare waste may be defined as "any undesirable or superfluous by product, emission, residue, or remainder generated in

the course of health care by healthcare professionals, healthcare facilities, and other non-healthcare professionals, which is discarded, accumulated, and stored with the purpose of eventually discarding it or is stored with the purpose of recycling, reusing, or extracting a usable product from such matter".[3] According to the World Health Organization (WHO), medical waste and by-products cover a diverse range of materials, as the following list illustrates: infectious waste, pathological waste, sharps waste, chemical waste, pharmaceutical waste, cytotoxic waste, radioactive waste and nonhazardous or general waste.[4] The World Health Organization (WHO) estimates that each year there are about 8 to 16 million new cases of hepatitis B virus (HBV), 2.3–4.7 million cases of hepatitis C virus (HCV) and 80,000–160,000 cases of human immunodeficiency virus (HIV) due to unsafe injections disposal and mostly due to very poor waste management systems.[7] The inadequate waste management systems in the healthcare centers pose a severe threat to public health as well as to the environment. This concern has been raised in many studies.[8,9]

Contraceptive waste disposal procedure is different from commonly generated medical waste but quite similar to disposal of expired medicines or medical supplies.[42] The management of unusable contraceptives due to it being expired, poor quality, damaged or unrecognizable which consist of but not limited to, plastic from IUDs, packaging materials from contraceptives, condoms latex materials especially derivatives included in estrogen hormonal contraceptives which has an environmental effect on aquatic life needs to be considered to ensure environmentally appropriate methods are used during disposal.[36]

Studies have shown that, the emission of ethinyl estradiol from landfills is negligible but if sands are present below landfills, it can act as a strong absorbent and further reduce the chance of ground water contamination.[37] In 2007 it was reported that over 16.2 million of reproductive aged women 15-49 globally utilized copper bearing intra-uterine contraceptive devices (TCu380A and MLCu375). The latter are widely used and represent an effective means of long-term contraception.[38-40] Developing countries such as Nigeria are aiming for zero waste and to achieve this, they are pricing waste disposal to heavily favor recycling and discourage other forms of disposal – legal and otherwise aimed at benefits of safe, and implications of unsafe, disposal of waste.[41]

In Nigeria, a typical developing African nation, not many people are aware that medical waste contributes substantially to environmental pollution and hazards. This is reflected by lack of awareness and specific policy to address the menace of healthcare facility (HCF) waste, some of which is deemed hazardous.[5] Waste management refers to the processes involved from the point of generation to reuse or disposal of generated waste. Proper handling of biohazardous waste must meet minimum requirements for disposal which include – segregation from other waste, securely packaged, type of waste, labeling indicating source, and the nature of treatment required, transportation by appropriately trained personnel, treatment and elimination of the biohazard; and documentation and records.[6] In general, the establishment of standard operating procedures (SOPS) is regarded as an effective way to better ensure the proper handling, storage, and transportation of medical wastes. Considerable gaps exist with regards to assessment of hospital wastes management practices in Nigeria and several other countries in sub-Saharan Africa. Nature and quantity of healthcare wastes generated as well as institutional practices with regard to sustainable methods of hospital contraceptive waste management including segregation are often poorly examined. Level of awareness particularly of health workers regarding healthcare waste has not been adequately documented.

This study seeks to add to existing body of knowledge by assessing healthcare facilities' practices in hospital contraceptive waste management using Chukwuemeka Odumegwu Ojukwu University Teaching hospital (COOUTH) as a case study.

Objective

The aim of the study is to assess the hospital contraceptive waste management practices in Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH), Awka, Anambra State.

METHODS

Study location

This study was done at Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) in Awka, Nigeria; an Anambra State owned 150 bedded Hospital serving over 2 million populations from September 2021 to December 2022. COOUTH formally known as Amaku cottage hospital as it was originally called started functioning as a community hospital in 1956. It was established by the Awka community in honor and memory of her illustrious son, Dr. Phillip Nweke Amaku. The Community Hospital was handed over to the Government of Anambra state in 1980 and was renamed Amaku General Hospital Awka. In September 1991, with the creation of the new Anambra state, its name and status were changed to a specialist hospital. In 2000, Anambra State University came into existence with its main campus at Uli, following this, an idea of establishing a Medical School was muted so as to allow the University to train Medical Graduates. The Government of Anambra State under His Excellency, Mr. Peter Obi and the Ministry of Health under Prof. Amobi Ilika were already thinking in that line of developing a standard state of the art Teaching Hospital and a medical school. COOUTH provides a wide range of specialized medical, surgical, diagnostic, out-patient, in-patient, rehabilitative and support services.

Study design

This was an analytical cross-sectional study on hospital waste management practices among healthcare workers in Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka, Anambra state, Nigeria. In general, cross-sectional studies characterize the prevalence of one or multiple health outcomes in a specified population therefore numerous findings can be used to create an in-depth research study.[25]

Study population

The study population comprised healthcare workers in obstetrics/gynecology and family planning clinics of Chukwuemeka Odumegwu Ojukwu University Teaching Hospital (COOUTH) in Awka who are involved in hospital contraceptive waste management. This comprised of doctors, nurses, pharmacy technician, laboratory technician, health attendants (cleaners) and waste handlers who meet the inclusion criteria.

Inclusion and exclusion criteria for the study

The study focused on healthcare workers working in COOUTH in obstetrics and gynecology and family planning clinics who have worked for at least 6 months in the facility and voluntarily consented to participate in the research. Thus, all health workers comprising doctors, dentists, nurses, laboratory scientists, pharmacists, hospital attendants (cleaners) who have worked for a duration of at least 6 months were qualified to be included in the study. Furthermore, those who were critically unwell were not qualified for inclusion, even if they had worked in COOUTH Awka for at least 6 months. More so, health workers in COOUTH Awka who do not handle medical waste and on annual leave were excluded. Finally, those who declined participation in the study were excluded with no consequences for non-participation.

Sample size

The sample size was worked-out using the formula given.

$$nf = n/1 + n/N^{10}$$

Where N is the estimate of the population size=344, nf is the desired sample size when population is less than 10,000, and n is the desired sample size when population is greater than 10,000.

$$(n = Z^2pq/d^2d)^{10}$$

Where n is the minimum sample size; z is the standard normal deviate (1.96); p is prevalence (in this case, 93% was used, which is the proportion of healthcare workers who were able to identify correctly two hazards of healthcare waste in a study titled "healthcare waste management: what do the health workers in a Nigerian tertiary hospital know and practice").[11] Also, q is the proportion of people without factor under study (q=1-p), and d is the degree of precision (d=0.05).[10]

$$n = (1.96)^2(0.93)\ (1 - 0.93)/(0.05)^2$$

$$n = 100.0353$$

$$nf = 100.0353/1 + 100.0353/344$$

$$nf = 77$$

Using 90% as the anticipated response rate in this study, the minimum sample size was calculated as follows: 77/0.90=86.

Therefore, 86 respondents were invited to participate in this study.

Sampling technique

Multi-stage sampling technique which simplifies data collection when you have large, geographically spread samples was used to enroll respondents into this study.[24] There were 344 health care workers involved in hospital generated contraceptive waste management in COOUTH including 60 doctors, 74 pharmacists, 27 dentists, 87 nurses/midwives, 40 laboratory scientists and 56 hospital attendants/cleaners.

Stage 1

Proportionate allocation was used to determine the number of each of the categories of health workers involved in hospital waste management that participated in this study.

For doctors (n=60; total population=344), (60×86)/344=15.

For pharmacists (n=74; total population=344), (74×86)/344=18.

For dentists (n=27; total population=344), (27×86)/344=7.

For nurses/midwives (n=87; total population=344), (87×86)/344=22.

For lab scientists (n=40; total population=344), (40×86)/344=10.

For hospital attendants/cleaners (n=56; total population=344), (56×86)/344=14.

Stage 2

All consenting respondents from each of these categories who met the inclusion criteria were recruited randomly into the study until the sample size was met for each of the categories.

Table 1: Number of respondents to be studied in each category of healthcare workers.

Category of healthcare worker	Total number	Number of respondents to be studied
Doctors	60	15
Pharmacists	74	18
Dentists	27	7
Nurses/midwives	87	22
Medical laboratory scientists	40	10
Hospital attendants/ cleaners	56	14

Data collection

The instrument for data collection was a checklist and a predesigned self-administered questionnaire adopted from WHO recommended assessment tool[12] and adapted for this study. The checklist was used for the assessment of minimum standard of requirements/guidelines prescribed by the Anambra State Waste Management Board (ASWAMA), while the questionnaire contained four (4) sections on demography, knowledge, attitude and practice. Ten (10) research assistants were recruited and trained to help in the distribution of the questionnaires and checklists. Data was collected between January and April 2022.

Data analysis and management

Data was analyzed using IBM statistical package for social sciences (SPSS) statistics for Windows, version 20.0. Responses were coded and entered into the software. Before analysis, the entered data was checked for errors and made clean. Statistical tools like percentage frequency distribution, Chi-square test, Fishers exact and student t-test analysis were used to present the data, test the significance of the relationships between the dependent and independent variables, and to compare mean values of some variables respectively. Chi-square was used to determine the level of significance at $p \leq 0.05$. The analyzed data was represented in form of tables and charts.

Ethical consideration

This research work was done with permission from the Chukwuemeka Odumegwuemeka Ojukwu University Teaching Hospital Health Ethical Committee. Written informed consent was obtained from each respondent after explaining the aim of the study before commencement of interview and data collection. Respondents were assured that every information given would be treated with unconditional confidentiality. Confidentiality of the participants was maintained by ensuring handling of all data according to the ethical guidelines and records kept in locked cabinet. The principal researcher was the sole person who had access and no other persons was allowed to identify respondents with the information they gave. The benefit of this is that it had no harm or danger to any of the participants.

RESULTS

Between January and April 2022, a total of 86 questionnaires were administered to healthcare workers' focal points (hospital contraceptive waste management informants) in COOUTH Awka of Anambra state. Respondents were health care workers aged 19-54 years.

Socio-demographic characteristics of study population

The age of the studied population ranged from 19 to 54 years with majority aged between 25-34 years (40.6%) and a mean age determined as 36.2±6.8 years (Table 1). Majority of the respondents were females (69.8%) and nurses (27.9%) with Registered Nurse (RN) qualification (14%). It was found that only 1.2% of respondents obtained PhD as their highest educational qualification. Similarly, only 6.9% of the respondents had more than 15 years of experience as healthcare workers, with majority (50%) having 0-5 years of experience.

Knowledge of healthcare workers on hospital contraceptive waste management

Table 2 summarizes the knowledge of hospital contraceptive waste management among the respondents and showed majority of the respondents have good knowledge about hospital waste management practices as a greater number strongly agree with waste management as healthcare core standard (95.3%) and poor handling of waste pose a threat to the environment (83.6%). However, a great proportion of the respondents believed that less than 50% of wastes in healthcare are medical waste (95.3%) and equipment for proper waste management are not enough to address waste management practices (67.4%). The overall mean for all the respondents was 94.8±4.5.

In addition, Table 3 outlines the correlation between the in-service training of respondents and knowledge of hospital contraceptive waste management. There was significant difference between in-service training and the knowledge of the use of red pedal bins in collecting hospital waste ($p=0.047$). There was no significant difference between in-service training and other level of knowledge ($p>0.05$).

Furthermore, Table 4 sums up the association between the socio-demographic characteristics of respondents and knowledge of hospital contraceptive waste management. There is no statistically significant difference in the level of knowledge of hospital contraceptive waste management with respect to the socio-demographic characteristics of the respondents ($p>0.05$).

Table 1: Socio-demographic characteristics of the respondents.

Variables	Frequency (N), n=86	Percentage
Gender		
Male	22	25.6
Female	60	69.8
Missing	4	4.6
Total	86	100
Age (years)		
<25	12	14
25-34	35	40.6
35-44	30	34.9
45-54	5	5.8
Missing	4	4.7
Total	86	100
Mean age±SD	36.2±6.8	
Minimum, maximum	19 years, 54 years	
Occupation		
Doctor	15	17.4
Nurse	24	27.9
Lab scientist	10	11.6
Pharmacist	13	15.1
Attendant	13	15.1
*[1]Others	7	8.2
Missing	4	4.7
Total	86	100
Qualification		
FSLC	4	4.7
WAEC	13	15.1
BSc	16	18.5
RN	12	14
Masters	2	2.2
PhD	1	1.2
MBBS	14	16.3
*[2]Others	20	23.3
Missing	4	4.7
Total	86	100
Years of experience		
0-5	43	50
5-10	25	29.1
10-15	8	9.3
15+	6	6.9
Missing	4	4.7
Total	86	100

*[1]Others- pharmacy technician, MLS, Engineer, *[2]Others- OND, (B)Pharm, HND, (B)Eng., MD.

Table 2: Respondents 'knowledge of hospital contraceptive waste management (HCWM).

Variable	Frequency (N), n=86	Percentage
Different types of waste generated by healthcare		
*[1]Good	82	95.3
*[2]Undetermined	0	
*[3]Poor	0	
Missing	4	4.7
Waste management as healthcare core standard		
Good	82	95.3

Continued.

Variable	Frequency (N), n=86	Percentage
Undetermined	0	
Poor	0	
Missing	4	4.7
Municipal and clinical wastes are the same		
Good	0	
Undetermined	10	11.6
Poor	72	83.7
Missing	4	4.7
Any bio-products is not regarded as medical waste		
Good	0	
Undetermined	0	
Poor	82	95.3
Missing	4	4.7
Less than 50% of wastes in healthcare are medical waste		
Good	82	95.3
Undetermined	0	
Poor	0	
Missing	4	4.7
Red pedal bins collect all waste		
Good	14	16.2
Undetermined	5	5.8
Poor	63	73.3
Missing	4	4.7
Color-coded bins not part of waste management		
Good	0	
Undetermined	0	
Poor	82	95.3
Missing	4	4.7
Equipment not enough for hospital contraceptive waste management		
Good	18	20.9
Undetermined	6	7
Poor	58	67.4
Missing	4	4.7
Waste management does not need to be addressed		
Good	0	
Undetermined	0	
Poor	82	95.3
Missing	4	4.7
Handling waste poses a risk		
Good	82	95.3
Undetermined	0	
Poor	0	
Missing	4	4.7
Poor handling of waste a threat to the environment		
Good	72	83.6
Undetermined	4	4.7
Poor	6	7
Missing	4	4.7

*[1]Good-represents agree and strongly agree, *[2]undetermined-represents undecided, *[3]poor-represents disagree and strongly disagree.

Table 3: Correlation between in-service training and knowledge.

Knowledge	Had in-service training on waste management		Total	X^2	P value
	Yes N (%)	No N (%)			
Municipal waste/clinical wastes are the same					
Undetermined	5 (11.9)	5 (12.5)	10 (12.2)	4.934	0.559
Poor	37 (88.1)	35 (87.5)			
Red pedal bins can be used to collect all kinds of waste materials					
Good	5 (11.9)	9 (22.5)	14 (17.1)	5.019	0.047
Undetermined	0 (0.0)	5 (12.5)	5 (6.1)		
Poor	37 (88.1)	26 (65.0)	63 (76.8)		
Equipment for proper waste management are not enough to address waste management practices					
Good	9 (21.4)	9 (22.5)	18 (22.0)	3.894	0.635
Undetermined	2 (4.8)	4 (10.0)	6 (7.3)		
Poor	31 (73.8)	27 (67.5)	58 (70.7)		
Poor handling and disposal of waste poses threat to environmental health and cause ecosystem imbalance					
Good	36 (85.7)	36 (90.0)	72 (87.8)	1.618	0.732
Undetermined	2 (4.8)	2 (5.0)	4 (4.9)		
Poor	4 (9.5)	2 (5.0)	6 (7.4)		

Statistically significant ($p \leq 0.05$), X^2=Pearson Chi square, Fishers exact.

Table 4: Association between socio-demographic characteristics and knowledge of HCWM.

Variable	Knowledge of HCWM, n=86, N (%)			Test statistics	P value
	Good	Undetermined	Poor		
Gender					
Male	18 (22.0)	1 (1.2)	3 (3.7)	X^2=1.77	0.453
Female	54 (65.9)	3 (3.7)	3 (3.7)		
Age at last birthday					
Mean±SD	38.5±5.8	36.2±8.4	39.3±7.2	t-score=5.546	0.282
Occupation					
Doctor	12 (14.6)	1 (1.2)	2 (2.4)	X^2=12.085	0.211
Nurse	23 (28.0)	0 (0.0)	1 (1.2)		
Lab scientist	7 (8.5)	2 (2.4)	1 (1.2)		
Pharmacist	10 (12.2)	1 (1.2)	2 (2.4)		
Attendant	13 (15.9)	0 (0.0)	0 (0.0)		
Others	7 (8.5)	0 (0.0)	0 (0.0)		
Qualification					
FSLC	4 (4.9)	0 (0.0)	0 (0.0)	X^2=6.837	0.829
WAEC	13 (15.9)	0 (0.0)	0 (0.0)		
BSc	13 (15.9)	2 (2.4)	1 (1.2)		
RN	11 (13.4)	0 (0.0)	1 (1.2)		
Masters	2 (2.4)	0 (0.0)	0 (0.0)		
PHD	1 (1.2)	0 (0.0)	0 (0.0)		
MBBS	11 (13.4)	2 (2.4)	1 (1.2)		
Others	17 (20.7)	1 (1.2)	2 (2.4)		
Years of experience					
0-5	36 (43.9)	3 (3.7)	4 (4.9)	X^2=3.301	0.77
5-10	23 (28.0)	1 (1.2)	1 (1.2)		
10-15	8 (9.8)	0 (0.0)	0 (0.0)		
15+	5 (6.1)	0 (0.0)	1 (1.2)		

Statistically significant ($p \leq 0.05$), X^2=Pearson Chi square, t-test.

Attitude of healthcare workers toward hospital contraceptive waste management

In Table 5 which showed the attitude of respondents towards hospital contraceptive waste management, a large proportion of the respondents (71%) disagreed that segregation of waste at source increase the risk of injury to waste handlers. Another (80.2%) disagreed that containment of sharps does not help in safe management of hospital waste. 60% agreed that occupational safety of waste handlers is a must while (89.5%) agreed that use of color code for segregation is important. Only (95.3%) agreed simultaneously that HepB immunization is important to prevent hospital acquired infection and post exposure prophylaxis should be initiated as soon as possible. The overall mean for all the respondents is 89.4±5.2.

Table 5: Respondents' attitude toward hospital contraceptive waste management.

Variable	Frequency (N) n=86	Percentage
Segregation of waste at source		
*[1]Good	15	17.3
*[2]Undetermined	6	7
*[3]Poor	61	71
Missing	4	4.7
Containment of sharps		
Good	9	10.4
Undetermined	4	4.7
Poor	69	80.2
Missing	4	4.7
Occupational safety		
Good	52	60.5
Undetermined	19	22.1
Poor	11	12.7
Missing	4	4.7
Use of color codes for segregation		
Good	77	89.5
Undetermined	2	2.3
Poor	3	3.5
Missing	4	4.7
HepB immunization prevent transmission		
Good	82	95.3
Undetermined	0	0
Poor	0	0
Missing	4	4.7
Post exposure prophylaxis		
Good	82	95.3
Undetermined	0	0
Poor	0	0
Missing	4	4.7

*[1]Good-represents agree and strongly agree, *[2]undetermined-represents undecided, *[3]poor-represents disagree and strongly disagree.

Hospital contraceptive waste management practice

In Table 6 the practice of hospital contraceptive waste management among respondents was highlighted. A greater proportion (48.8%) of the respondents received in-service training on hospital contraceptive waste management thus, majority of the respondents (95.3%) wear gloves when handling hospital waste. Most of the respondents (66.3%) accepted that there is hospital waste (HW) regulations in their facility. Only (30.2%) do not adhere to the hospital waste code of conduct in their facility.

Table 6: Respondents 'practice of hospital contraceptive waste management (HCWM).

Variable	Frequency (N), n=86	Percentage
In-service training on hospital contraceptive waste management		
Yes	42	48.8
No	40	46.5
Missing	4	4.7
Segregation of hospital waste at point of generation		
Yes	58	67.4
No	24	27.9
Missing	4	4.7
Treatment of hospital waste on site of generation		
Yes	43	50
No	39	45.3
Missing	4	4.7
Kind of hospital waste treatment system used		
Chemical	51	59.3
Microwave	0	0
Autoclaving	3	3.4
Irradiation	1	1.2
Incineration	27	31.4
Missing	4	4.7
Transportation of hospital waste in health centre		
Yes	47	54.7
No	35	40.6
Missing	4	4.7
Sharps/vial containers sealed at 3/4th full		
Yes	69	80.2
No	13	15.1
Missing	4	4.7
Wearing of gloves when handling hospital waste		
Yes	82	95.3
No	0	0
Missing	4	4.7
Hospital waste regulations/code of conduct		
Yes	57	66.3
No	25	29
Missing	4	4.7
Strict adherence to hospital waste regulation		
Yes	56	65.1
No	26	30.2
Missing	4	4.7

Table 7 summarizes the correlation between in-service training and hospital contraceptive waste management practice among the respondents.

There is no statistically significant difference (p>0.05) between in-service training and hospital waste management practice among respondents.

Factors affecting hospital contraceptive waste management

On the factors affecting hospital waste management practice in COOUTH Awka, Anambra state highlighted in Table 8, Cultural beliefs were the main factor affecting hospital waste management as given by most of the respondents (41.9%) participating in the study. Majority of the respondents (57%) had the opinion that the number of patients admitted in the facility affects the quantity of hospital wastes. The cultural belief that likely affects waste handling was religious use (46.5%), ritual use (38.4%) and reincarnation (10.4%). Burying was the main method of disposal of human parts as stated by respondents (57%). The healthcare facility has a team for hospital waste management (74.4%).

Additionally, Table 9 shows the association between socio-demographic characteristic and hospital contraceptive waste management practice among the respondents using Chi square and t test as appropriate. The gender of the respondents was found to have achieved statistically significant association with hospital contraceptive waste management practice (p=0.033). The other variables were found not to be significantly associated with hospital waste management practice (p>0.05).

Table 7: Correlation between in-service training and hospital contraceptive waste management practice.

Practice	Had in-service training on waste management		Total	X^2	P value
	Yes, N (%)	No, N (%)			
Do you segregate waste at the point of generation of the waste?					
Yes	30 (71.4)	28 (70.0)	58 (70.7)	2.02	0.887
No	12 (28.6)	12 (30.0)	24 (29.3)		
Is medical waste treated on generation in your health centre?					
Yes	23 (54.8)	20 (50.0)	43 (52.4)	1.186	0.666
No	19 (45.2)	20 (50.0)	39 (47.6)		
If yes, what kind of medical waste treatment system do you use?					
Chemical	24 (57.1)	27 (67.5)	51 (62.2)	9.388	0.496
Autoclaving	2 (4.8)	1 (2.5)	3 (3.7)		
Irradiation	0 (0.0)	1 (2.5)	1 (1.2)		
Incineration	16 (38.1)	11 (27.5)	27 (32.9)		
Is waste transported out of your health centre?					
Yes	23 (54.8)	2457.3)	47 (57.3)	3.23	0.632
No	19 (45.2)	16 (40.0)	35 (42.7)		
Are sharps and vial containers sealed when 3/4th full in your health centre?					
Yes	33 (78.6)	36 (90.0)	69 (84.1)	8.006	0.157
No	9 (21.4)	4 (10.0)	13 (15.9)		
Are there any medical waste regulation or code of conduct in your health centre?					
Yes	28 (66.7)	29 (72.5)	57 (69.5)	4.329	0.566
No	14 (33.3)	11 (27.5)	25 (30.5)		
If yes, do you strictly adhere to the regulations?					
Yes	27 (64.3)	29 (72.5)	56 (68.3)	2.638	0.424
No	15 (35.7)	11 (27.5)	26 (31.7)		

Statistically significant (p≤0.05), X^2=Pearson Chi square.

Table 8: Respondents' factors affecting hospital contraceptive waste management (HCWM).

Variable	Frequency (N), n=86	Percentage
Factors that affect HCWM practice		
Quantity of waste	25	29
Cultural beliefs	36	41.9
Weather variations	6	7
Contents of the waste	15	17.4
Missing	4	4.7
Own opinion of what affects quantity of waste		

Continued.

Variable	Frequency (N), n=86	Percentage
Number of patients	49	57
Type of patients	30	34.9
Number of beds	3	3.4
Missing	4	4.7
Cultural belief that likely affect waste handling		
Reincarnation	9	10.4
Ritual use	33	38.4
Religious use	40	46.5
Missing	4	4.7
Method of disposal of human parts		
Burying	49	57
Burning	7	8.1
Disposal by patients along with other waste	26	30.2
Missing	4	4.7
HCWM team in the facility		
Yes	64	74.4
No	18	20.9
Missing	4	4.7

Table 9: Association between socio-demographic characteristics and HCWM practice.

Variable	HCWM practice n=86, N (%)		Test statistics (X^2)	P value
	Yes	No		
Gender				
Male	19 (23.2)	3 (3.7)	4.534	0.033
Female	37 (45.1)	23 (28.0)		
Age at last birthday				
Mean±SD	37.6±2.8	29±5.2	3.472	0.543
Occupation				
Doctor	8 (9.8)	7 (8.5)	14.678	0.769
Nurse	11 (13.4)	13 (15.9)		
Lab scientist	10 (12.2)	0 (0.0)		
Pharmacist	3 (3.7)	10 (12.2)		
Attendant	8 (9.8)	5 (6.1)		
Others	3 (3.7)	4 (4.9)		
Qualification				
FSLC	1 (1.2)	3 (3.7)	10.528	0.63
WAEC	8 (9.8)	5 (6.1)		
BSc	13 (15.9)	3 (3.7)		
RN	8 (9.8)	4 (4.9)		
Masters	1 (1.2)	1 (1.2)		
PhD	1 (1.2)	0 (0.0)		
MBBS	10 (12.2)	4 (4.9)		
Others	14 (17.1)	6 (7.3)		
Years of experience (years)				
0-5	34 (41.5)	9 (11.0)	4.906	0.907
5-10	24 (29.3)	1 (1.2)		
10-15	7 (8.5)	1 (1.2)		
15+	4 (4.9)	2 (2.4)		

*Statistically significant ($p \leq 0.05$), X^2=Chi square, t=t-test.

DISCUSSION

In this analytical cross-sectional study, selected healthcare workers were assessed on their knowledge, attitude and practice of hospital contraceptive waste management. The knowledge of the respondents on hospital contraceptive waste management was generally high (95.3%). This agrees with the findings of a study done in Nnamdi

Azikiwe University Teaching Hospital (NAUTH) Nnewi which reported that 99% of the respondent agreed that health care waste is hazardous.[11] This is also in keeping with the findings of a study done in Namibia which disclosed a high level of knowledge among healthcare workers especially among medical doctors.[15] However, this was in contrast to a study conducted in India in dental teaching institutions which showed a low level of knowledge.[16]

The high level of knowledge of hospital contraceptive waste management seen in this study would have been attributed to the in-service training some of the healthcare workers had undergone. However, this may not be so as majority of the healthcare workers who had good knowledge were yet to receive any form of in-service training. Hence, it was not surprising to see that there was no significant difference ($p>0.05$) between in-service training and knowledge of hospital contraceptive waste management among healthcare workers in COOUTH. Although, there was a significant difference between in-service training of healthcare workers and respondents that have the knowledge of the use of red pedal bins in hospital waste management ($p=0.047$). This was in contrast to a study by Dudi et al on the assessment of the knowledge, attitude and practice regarding biomedical waste management among paramedical healthcare staff in a tertiary facility in India.[17]

On probing further into the level of knowledge among healthcare workers based on their occupation, it was revealed that nurses and midwives (28%) had the highest level of knowledge. It was unexpected to discover that healthcare attendants (15.9%) had better knowledge than doctors (14%), pharmacists (12.2%), laboratory scientists (8.5%), and other healthcare workers (8.5%) except nurses. This finding is in contrast to that depicted by Adogu et al in which health attendants were seen to have the lowest level of knowledge when compared to other healthcare workers.[13]

Furthermore, into the level of knowledge among healthcare workers based on years of experience, it was brought to the fore that healthcare workers with at most 5 years of experience had the highest level of knowledge (43.9%). This finding agrees with that depicted by Muthoni et al in which staff in government hospital with 1-5 years of experience (84.62%) had the most knowledge towards medical waste management issues as compared to those in the private hospital with 5-10 years (83.72%).[18] Hence, the differences in the level of knowledge may be due to the fact that healthcare workers with at most 5 years of experience benefited from recent in-service training as a result of their recent employment status and as well adhering to the code of conduct of hospital waste management of the facility.

Apparently, the good knowledge of hospital contraceptive waste management by respondents did reflect in an equal level of practice. Although a great number of respondents exhibited good knowledge, the percentage of practice was not as high as that of the knowledge of hospital waste management. Surprisingly, though respondents who are laboratory scientists seemed to have low knowledge (8.5%) compared to other healthcare workers, it was found that they had a better practice (12.2%) than other healthcare workers in COOUTH. Generally, a relatively low level of practice was seen among all the respondents. This agrees with the findings of study by Elnour et al on the impacts of health education on knowledge and practice of hospital staff with regard to healthcare waste management at White Nile state main hospitals in Sudan which showed that more than half the nursing and sanitation staff had fair level of practice before the educational intervention program.[19]

Collection and segregation of waste is a major infection control strategy of hospital waste management. The practice of this strategy was exhibited by 67.4% of respondents in COOUTH. This finding was in contrast to a study by Umar and Yahaya in which poor practice was attributed to lack of labeling of waste bags/containers signifying biohazards to control exposure to infection.[14] Confirmatory findings by Awodele et al revealed that about 81.9 % of the respondents also indicated the need to segregate medical wastes. The responses however differed from hospital to hospital. 85.7% of the respondents' agreed that medical waste could be generated from diagnosis, immunization and treatment. About 74.3% of the respondents also knew that there are specific procedures for collection and handling of medical waste.[20] The use of personal protective equipment such as hand gloves in handling waste which is an important component of the universal precaution is a very important part of hospital waste management, hence it was gratifying to find that almost all the respondents (95.3%) complied with this practice despite all odds militating against this practice such as low economic status of the country. This was corroborated in a study by Azuike et al where 69.2% of healthcare workers in NAUTH, Nnewi affirmed the use of gloves in handling medical wastes.[21] Similar findings were seen in a study at Lagos state where majority of the respondents were found to use gloves in handling and disposing hospital wastes.[20] However there is still a need to periodically reinforce this practice of universal precaution among healthcare workers and to correct the small percentage of healthcare workers who didn't comply with this compulsory practice.

The standard treatment and disposal of hospital waste is one of the most important aspects of hospital waste management practice. In this study, incineration, sanitary landfills, open burning, and burying of waste in hospital ground were chosen as best methods of hospital waste disposal. However, incineration (65.7%) was the most chosen as best method of hospital waste disposal while buried on hospital ground (1.2%) was the least chosen. Similar findings were seen in a study by Awodele et al.[20] This was in contrast to the finding by a WHO report that proposed that these methods pose health risks indirectly through the release of pathogens and toxic pollutants into the environment. The disposal of sharps is also very

important as this is responsible for many cases of HIV, HBV, and HCV infections.[19] Furthermore, a person who experiences one needle stick injury from a needle used on an infected source patient has risks of 30%, 1.8% and 0.3% respectively of becoming infected with HBV, HCV, and HIV.[19] Thus, on assessing the proper disposal or sharps and vial, it was revealed that the respondents in COOUTH had good practice (80.2%). This was in line with a study by Justus et al in which many health workers affirmed that they seal sharps and vial containers when 3/4th full in their health centre.[23] Similar findings were also seen in studies by Adogu et al and Azuike et al.[21,22]

In a bid to ensure standard regulation of hospital waste disposal in line with ASWAMA, various hospital waste regulations or code of conduct were instituted in the healthcare Centre in Awka, however not all the healthcare workers adhered strictly to these codes of conduct. Hence, this might account for the sizeable number of healthcare workers who did not have good practice of hospital waste management. This was supported in a study by Mbarki where a low level of practice was attributed to poor compliance with the principles stated in the Moroccan medical waste legislation. Similar findings were seen in a study by Awodele.[20]

Another finding from this study is the way in which cultural beliefs affected hospital waste management practice as revealed by 41.9% of the respondents while religious use of hospital waste is considered by 46.5% of the respondents as the major cultural belief that affect hospital waste management. This may be connected to the fact that base on geographical location and ethnic divide, the eastern region of Nigeria has a very high regard for culture and religion which influence major part of their lives. It also explains why 30.2% of the respondents revealed that patients took their hospital waste along with them to dispose at home or for their cultural purpose. Attaching significance to the behavior of patients and caregivers with respect to hospital waste management will therefore also assist to create awareness and orientation among patients and caregivers in terms of hospital waste disposal.

The strength of this study lies in the fact that it assessed the effectiveness of hospital waste management practice and identification of factors affecting appropriate hospital waste disposal systems. It employed a specific method survey to provide necessary information on the knowledge, attitude and practice of hospital waste management among the respondents. The study is however limited in that it did not assess all the healthcare workers, patients and caregivers associated with hospital waste management practice. More research there needs to be conducted in order to encase this and facilitate more evidence for policy making.

Limitations

Hospital contraceptive waste management practices was self-reported. There might thus be the possibility of information bias as respondents might have given socially desirable responses. This, however was overcome by assuring them of the utmost confidentiality of the study and that the aim of the study was to improve the appropriateness of hospital contraceptive waste management practices and not necessarily for fault finding.

CONCLUSION

From our study findings, the mean knowledge of the respondents was 94.8% implying that healthcare workers in COOUTH, Awka had high levels of knowledge of hospital contraceptive waste management practice.

In summary, this study has shown that despite the high level of knowledge of healthcare workers on hospital contraceptive waste management practice and relatively good attitude towards hospital waste management in COOUTH Awka, the hospital contraceptive waste management practice is not functioning optimally in Anambra state. Hence, there is a need to reform the healthcare facilities and hospital community with regards to hospital waste management practice to achieve effective and functional results.

Based on the findings from this study, the researcher recommends that: Healthcare workers should be trained regularly on hospital waste management to facilitate the closure of the gap in standard modern methods of waste disposal, the government should elucidate and enact the hospital waste regulations/code of conduct and also ensure that healthcare workers adhere strictly to it, modern and standard incinerators operating at 850^{o}c-1100^{o}c with special gas-cleaning equipment to be provided in the healthcare center in COOUTH, financial aid should be made available to accelerate effective hospital waste management practices.

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