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Knowledge, attitude, and factors influencing health care (HCW) waste management among nurses in selected hospitals in Abeokuta, Ogun State

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Abstract
Healthcare wastes (HCWs) are one of the most hazardous wastes globally; second to only radiation waste. In developing countries especially in Africa, healthcare waste has not received the much needed attention that it deserves. This is because of the inadequate resources in these countries resulting into low priority for HCW management. The objectives of the study assess nurses' knowledge about, find out nurses' attitude towards HCW management and identify the factors influencing HCW management among nurses in selected hospitals in Abeokuta, Ogun State. A cross-sectional non experimental descriptive survey design and convenient sampling technique was employed. Self developed instrument with 32 items was distributed among 129 eventually 120 correctly retrieved among nurses who are directly involved in generation and disposal of healthcare waste in the State hospital ijaiye and Oba Ademola II hospital, Ake Abeokuta. Data collected were analyzed using Statistical package of social science (SPSS) version 2.0 and presented with percentage and frequency tables. All the three (3) research questions were answered based on the findings of the study which can be deduced that revealed that majority (75.0%) of the respondents have high knowledge on HCW management while only few (25.0%) of them have low knowledge on it. Majorities (88.3%) of the respondents have positive attitude toward health care waste management while only few (11.7%) of them have negative attitude toward it. About factors influencing HCW management among respondents almost all (99.2%) of the factors have high impact and influence on health care waste management while only few (0.8%) of the factors is of low impact on HCW among respondents. According to the findings it is therefore recommended that Nurses should further improve their knowledge as regards the various forms of colour coding waste segregation beyond what is utilized in their health institution, healthcare waste inspectors must be introduced into the health sector for close monitoring of improper healthcare waste management. Conclusively, Nurses still need to brush up their understanding about certain aspect like location or sites to correctly carry out treatment and disposal of HCW and the extensive colour coding segregation system of HCW not just three colour.

Keywords: Knowledge, healthcare waste, attitude, nurses, factors influencing

Introduction

Healthcare wastes (HCWs) are one of the most hazardous wastes globally; second to only radiation waste (Wafula, Musiime, & Oporia, 2019) [20] similarly to Shinee, Gombojav, Nishimura, Hamajima, and Itoas (2008) [16] study which states thatHCW has been a growing concern across the world for some years. According to Oyekale and Oyekale (2017) [15], adequate management of health care waste (HCW) is a prerequisite for efficient delivery of healthcare services. In developing countries like Nigeria, HCW poses a serious threat due to its potential for causing environmental and public health hazards. A lack of awareness among health professional especially nurses who are at the core of health facilities and most times the end users/handlers of health care materials/by-product generating into waste as well as the general population regarding improper handling of HCW increase the potential risk of environmental and public health hazards. Rapid growth of healthcare facilities (HCFs) in urban areas accentuates the problem to a large extent (World Health Organization, [WHO], 2018) [21].

Health Care Waste (HCW) is defined as all types of waste generated from health care environments, whether it is infectious or noninfectious in nature, chemicals, and hazardous as well as nonhazardous materials (Jang, Lee, Yoon, & Kim, 2006) [8].

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Also the Medical Waste Tracking Act defines it as waste generated during medical research, testing, diagnosis, immunization, or treatment of either human beings or animals. Some examples are culture dishes, glassware, bandages, gloves, discarded sharps like needles or scalpels, swabs, and tissue (Medpro, 2018) [10]. WHO, (2018) [21] also opined that the total amount of waste generated by health-care activities about 85% is general non-hazardous waste comparable to domestic waste while the remaining 15% is considered hazardous material that may be infectious, chemical or radioactive.

Shivalli and Sanklapur, (2014) [17] posited that the nurse's role in healthcare waste management is crucial. Similarly in light to this, Australian Commission on Safety and Quality in Healthcare, (2017) [1] states that Nurses' responsibilities in healthcare quality extend beyond the provision of safe care that is aligned with best evidence and clinical standards, to participation in broader organizational and system quality and safety structures. Healthcare workers (nurses) can avoid most medical waste problems by adhering to a few key best practices. Employees should know the laws, then classify and separate all waste by type into the correct, color-coded waste containers. Waste should be labeled depending on its category, and the right documentation should accompany all containers during transit (Medpro, 2018) [10].

Inadequate knowledge among the health care workers especially nurses are struggle in the management of HCWs and previous research pointed out that HCW management may be affected by lack of formal training, lack of knowledge on HCW management, limited interest from hospital administration which could be factors acting as barriers hence attitude towards HCWs can be negative (Wafula, Musiime, & Oporia, 2019) [20].

Statement of problem
A retrospective study conducted under Avian Influenza Control and Human Pandemic Preparedness and Response Project; Medical Waste Management Plan (2007) [2] under the Federal Republic of Nigeria states that Improper handling of medical waste can create harmful effects and reduce the overall benefits of health-care. Generally, lack of awareness about the health hazards, poor management practice, insufficient financial and human resources and poor control of waste disposal are the most common problems connected with medical waste management in developing countries. Most developing countries do not have appropriate regulations to cover medical waste and where these regulations exist they are not effectively enforced. A major issue is the lack of clarity on whose responsibility is it to handle and dispose medical waste. According to the 'polluter pays' principle, this responsibility lies with the waste producer i.e. the health-care provider (hospitals, maternity homes etc). Nursing personnel play a critical role in healthcare waste segregation in the hospitals. Their knowledge and attitudes regarding healthcare waste management are vital for the prevention of healthcare waste related hazards (Shivalli & Sanklapur, 2014) [17].

The by-product of health care activities which generates HCW when poorly managed exposes health-care workers, waste handlers and the community at large to infections, toxic effects and injuries including damage of the ecosystem. In waste management, HCWs hold higher priority due to their hazardous nature which can affect human health and also pollute the environment. In working environments that have improper health care waste management practices, such waste exposes Healthcare workers and patients to infections like HIV/AIDS, hepatitis B & C and due to blood borne pathogens (Babirye, Vuzi, & Mutekanga, 2020) [3].

Anectodally, it has been observed in a number of hospitals in Nigeria, Abeokuta inclusive that the manner in which health care wastes are managed even by nurses who are supposedly the heartbeat of a health institution does not usually conform with the standard waste management policy especially the coding system of healthcare waste segregation this is evidential because syringes, needles, used dressings and some blood waste materials are sometimes seen openly among general hospital and in community wastes along the strategic corridors, spots designated for non-infectious waste disposal and sometimes on the streets nearby hospitals respectively. This is in line with W.H.O report, (2018) [21] which states that every year an estimated 16 billion injections are administered worldwide, but not all of the needles and syringes are properly disposed of afterwards. Upon this background the research study is set out to ascertain the knowledge, attitude and factors influencing effective health waste management amongst nurses in selected hospital in Abeokuta, Ogun State.

Objective of the study
The General Objective of the study is to;
Ascertain the knowledge, attitude and identify factors influencing HCW management amongst nurses in selected hospitals in Abeokuta, Ogun State.
The specific objective is to;
1. Assess nurses' knowledge about HCW management in selected hospitalsin Abeokuta, Ogun State.
2. Find out nurses' attitude towards HCW management in selected hospitals in Abeokuta, Ogun State.
3. Identify the factors influencing HCW management among nurses in selected hospitals in Abeokuta, Ogun State.

Research questions
1) How knowledgeable are nurses about HCW management in selected hospitals in Abeokuta, Ogun State?
2) What are nurses' attitudes towards HCW management in selected hospitals in Abeokuta, Ogun State?
3) What are the factors influencing HCW management among nurses in selected hospitals in Abeokuta, Ogun State?

Hypothesis
H01: There is no significant association between years of clinical practice and Respondents' Knowledge about HCW Management.

H02: There is no significant relationship between Respondents' Knowledge about HCW Management and the Factor Influencing HCW Management among Nurses.

H03: There is no significant relationship between Respondents' Attitude towards HCW Management and the Factor Influencing HCW Management among Nurses.

Significance of the study

The research will be relevant in helping to ascertain the magnitude of facts possessed by nurses, establish their notion regarding HCW management as well as figure out the possible agents that may serve as obstacles to HCW disposal and then identify the achievable ways out from the identified obstacles so that nurses can maintain and sustain HCW management process and as such the findings from the work will be important to determine if seminars/workshops should be regularly organized to update nurses on current HCW management pattern as this can get them equipped and in turn hazards from improper waste disposal will be curbed.

It will also help stakeholders of health institutions identify those hindrances to effective health care waste management and take necessary actions and at large information gathered from this research can be of importance to Minister of health/health policy makers in taking necessary actions against improper management of waste generated from health institutions and thereby the populace health as well as health care providers themselves will not be at risk of generated health care waste.

Lastly, the study will proffer additional insight from field findings and several literatures consulted to the existing pool of knowledge regarding effective healthcare waste management.

Scope of the study

Based on the very short span of time in the conduction of the study as well as the nature of the type of respondents which are registered nurses, type of health institutions (government hospitals), proximity/accessibility of location to the researcher, the study will be delineated to two selected hospitals in Abeokuta, Ogun State; State Hospital, Ijaiye and Oba Ademola II Maternity Hospital, Ijemo.

The study is to investigating Knowledge, Attitude and Factors influencing effective health waste management amongst Nurses of the above named health institutions.

Definition of terms

Knowledge: Explicit facts or in-depth information about effective health care waste management amongst nurses.

Attitude: Nurses predisposition, behavior or notion towards health care waste management.

Factors: The agents or elements determining nurses act of proper health waste management.

Nurses: Health care personnel who have been trained, deemed qualified to practice as a Professional of patient/client care and other health activities by a recognized and approved professional body.

Management: The act of nurses to effectively control or deal with health care waste.

Health Workers: Referring to Doctors, Health attendant, Pharmacist, Radiologist, Environmental health workers especially Nurses etc. working in health care setting.

Effective: A thorough manner in disposal/management of health care waste by nurses.

Methodology

This section describes the methodological approaches to the study in order to provide the right framework and perspective for interpreting the findings and conclusion of the research. It covers aspects of research designs, the study setting, target population, sampling size/technique, instrument used for data collection, method of data collection, method of data analysis, validity and reliability of the instrument, method of data collection/analysis and ethical considerations.

Research Design

A descriptive cross sectional non-experimental survey design was adopted to ascertain the knowledge, attitude and factors influencing effective health care waste management among nurses.

Research setting

The research study was conducted in two selected hospitals; State hospital Ijaiye, and Oba Ademola II Maternity hospital, Ijemo all in Abeokuta, Ogun State.

State Hospital, Ijaiye.

State Hospital, Ijaiye, Abeokuta represent a secondary health care facility where a good number of nurses work. The hospital is located in Abeokuta (urban) and operates on three (3) shifts system (i.e. morning, evening, and night). This hospital was established in 1914 at Wasimi, Ake, and later moved in to the present site at Sokenu, Ijaiye, Abeokuta after the World War II.

The Hospital currently has Eight (8) wards for Medical-Surgical, Orthopaedic and Gynaecological/Obstetric Services others are; Out-patient Unit, Children Emergency Unit, Accident and Emergency Room(s), Theatre, Chest Clinic, Eye Clinic, Family planning Clinic, Pharmacy Department, Physiotherapy/Prosthetics Units, Heart to Heart and Oncological Centre unit, Catering department, Account department, Study-day unit, Radiological unit and Administrative unit(s). The hospital provides inpatient, outpatient, a 24hours emergency service and primary health care facilities to patients and clients.

The present Chief Medical Director is Dr.Oladeinde and H.O.D Nursing is Chief Nursing Officer (CNO) Mosuro. The total number of Nurses working currently in the hospital according to their divisions and cadre are total of One Hundred and twenty-four (124);

Oba Ademola II maternity hospital, Ijemo.

The Hospital was previously known as Egba Maternity and child welfare centre it is presently located at Ake, Erunwon Abeokuta and was established in 1929 by Scottish lady, a Midwife-Miss Jane Me Cotter. The centre was used then to care for mothers who delivered at home and their newborn. Later in 1933 the founder commenced a training; Domicillary Midwifery till her demise in 1955. After her death, the Maternity was re-named after the reigning king-Oba Ademola II. The present Maternity Hospital was built between 1961 and 1962 on the advice of Chief Dr. M.K. Majekodunmi under the auspices of Egba Economic Council. It was registered as Oba Ademola II Maternity Hospital and was provisionally approved by the Midwives Board of Nigeria as training School for Grade1 Midwives in 1966 on the condition that preliminary training (PTS) would take place in Sacred Heart Hospital, Abeokuta. Still in 1966,

Mrs G.A. Gomez took up the Local Government appointment and commenced the training of Midwives for untiring and result oriented efforts with the assistance of an elderly experienced midwife. In 1976, the hospital was taken over from Local Government by State Government after the creation of Ogun State. It is the only Maternity Hospital in the State.

The wards are; Ante-natal, Labour, Post-natal, Gynae wards while the clinics consists of; Ante-natal, Family planning and Immunization clinics among other supporting units in the hospital. It also runs a 24hours services with shifting system.

The Maternity hospital presently headed by Dr. Ismail (C.M.D) and Mrs Bamgbose (C.N.O). The total number of Nurses working currently in the hospital according to their divisions and cadre are total of Forty-two (42).

Target population
The study involved registered nurses working on the wards of State Hospital, Ijaiye and Oba Ademola II Maternity Hospital, Ijemo, Abeokuta, Ogun State.

Sampling size determination
The selection of a subset of respondents from within the total population to estimate the characteristics of whole population was determined using Taro Yamane Fromula;

$$n = N/(1+N(e)^2)$$

Where;
N= signifies the sample size
N= signifies the population under study nu
E= signifies the margin error (it could be 0.10, 0.05, or 0.01) for this research 0.05 will be used since the study is a descriptive and not experimental design.
Number of respondents' population at State hospital Ijaiye and Oba Ademola II maternity hospital are 124 and 42 respectively, (from Records department of each hospital). This equals 166 population respondents in total.
Therefore;
N= 166, e= 0.05
$n= 166/(1+ 166(0.05)^2)$
n= 166/(1+ 166(0.0025)
=166/(1+ 0.415)
= 166/1.415
n=117.314 ~ 117 respondents sample size.

Due to attrition error rate, 10% was added to the sample size.
10% of 117 = 11.7 ~ 12

117+12 =129 respondents sample size
To calculate the sample size for each institution this statistical formula will be used;
n/N * X

Where; n = Population of each institution;
N = Sum of population of all institution
X = Sample size of the all institution

For State Hospital Ijaiye
=124/166× 129
= 0.7469×129
= 96.36144 ~ 96 sample size of respondents

For Oba Ademola II Maternity Hospital
= 42/166×129
= 0.2530× 129
= 32.6385 ~ 33 sample size of respondents
96+ 33 from each institution = 129 respondents sample size.

Therefore, respondents recruited for the study will be 129.
At the end of the field distribution 120 instruments were successfully retrieved with proper answering which is still workable as the actual numbers of 117 respondents was still achieved.

Sampling technique
A purposive non-probability sampling technique was employed as respondents were not seen collectively since they operate shifting duty and had a very busy work schedule.

Instrument for data collection
The instrument for this study was a self-structured questionnaire. It consisted of an introductory/informed consent note and four sections:
Section A: Socio-Demographic data of respondents;
Section B: Nurses' knowledge about HCW management in selected hospitals in Abeokuta, Ogun State;
Section C: Nurses' attitude towards HCW management in selected hospitals in Abeokuta, Ogun State; and
Section D: Factors influencing HCW management among nurses in selected hospitals in Abeokuta, Ogun State.

Validity of instrument
The drafted questionnaire was thoroughly checked, corrected and approved by the researcher's supervisor and research analyst to ensure face, and content validity before distribution to respondents.

Reliability of instrument
This was determined by conducting a pretest of 10% (13 instruments) from the estimated sample size that was distributed in a setting (Sacred Heart Hospital, Lantoro, Abeokuta) different from actual settings for the study but consists of respondents with same characteristics using split half method whereby the odd number test items of instrument will be separated from even number test items. The reliability of the instrument test items was calculated using spearman's correlation coefficient of 0.8 score which is within the normal score of 0.7 and above) this implied that test items in the instrument did consistently test what it ought to test i.e. reliable.

Method of data collection
After permission had been sought respondents were re-introduced verbally in simple clear English language about the study, informed consent was gained then instruments were administered based on voluntary participation of respondents. The exercise spanned through 4weeks for the distribution and retrieval of the instruments due to the number of settings involved and the very busy and shifting schedule of the respondents.

Method of data analysis
Statistical Package for Social Sciences (SPSS version 20) was used to analyze collected coded data, also Chi-square

and Pearson Product Moment Correlation (PMC) was used to test association and relationship respectively of variables stated in hypotheses against a probability(P)-Value of $\leq$ 0.05(this is so because the research study is not dealing with experimental clinical trial where the P-value is 0.01) if result is $\leq$ 0.05 P-value it means there is a significant relationship (then stated hypotheses H_0 will be rejected) but if the result is $\geq$ 0.05 p-value it means there is no significant relationship(then the stated hypotheses H_0 will fail to be rejected) .The results was organized, summarized and interpreted using frequency tables.

Ethical consideration

The ethical committees of the selected institutions were duly informed and approval letter issued/gained before the conduct of the research. Respondents were duly informed of their rights which include freedom to participate without coercion, the purpose of the study, maintenance of complete confidentiality. Also anonymity of the respondents were maintained, assurance of beneficence while avoiding maleficence and non-falsification of data was ensured. Plagiarism was avoided as various authors of literature used had been and were duly referenced. The study was submitted after it has met the required percentage for turn-it-in application check to the Babcock University Health Research Ethical Committee (BUHREC) in line with the school protocols with requested copies for further standardization.

Results
Data Analysis and Presentation

This chapter deals with presentation and analysis of data. Primary data obtained through the questionnaire were analyzed using frequency counts and percentages for the respondents' bio-data, Chi-square, Pearson Product Moment Correlation (PPMC) to test the hypothesis at 0.05 level of significance. 129 instruments were distributed to the respondents with 120 correctly retrieved.

Socio-demographic characteristics of the respondent

Table 1: Socio-demographic Characteristics of the Nurses (N=120)

Variables	Frequency	Percentage (%)
Sex		
Male	5	4.2
Female	115	95.8
Years of Clinical Practice		
1-5 years	26	21.7
6-10 years	16	13.3
11-15 years	26	21.7
16-20 years	19	15.8
21-25 years	7	5.8
Educational Qualification		
RN	12	10.0
RN/RM	44	36.7
RN/ROPHN	55	45.8
BNSc	3	2.5
MSc (Nursing)	6	5
Designation		
NO II	15	12.5
NO I	25	20.8
PNO	30	25.0
SNO	10	8.3
ACNO	17	14.2
CNO	22	18.3
ADNS	1	0.8
Wards/Units		
Medical	14	11.7
Surgical	16	13.3
Emergency	17	14.2
Paediatric	5	4.2
Theatre	10	8.3
Labour	25	20.8
Others	33	27.5

Source: Field Survey 2021

Others: Family Planning, Antenatal Care (ANC), Administrative, GOPD, ENT, Eye Clinic, Chest clinic, ART Dept., VCT.

Tables 4.1 revealed that majority (95.8%) of the nurses are female. Also, it was observed that vase majority (21.7%) of the nurses fell within the year bracket 1 – 5 years of clinical practice, 11 – 15 years, and above 25 years (each). Educational qualification of the nurses in the table showed that highest proportional (45.8%) of the respondents had obtained BNSc. degree. More so, the designation of the nurses revealed that majority (25.0%) are PNO;

Respondents' Knowledge on HCW Management

Table 2: Respondents' Knowledge on HCW Management

Statements	Yes, F (%)	No, F (%)	Not sure F (%)
HCW is defined as all types of waste generated from health care environments, whether it is infectious or non-infectious in nature, chemicals, and hazardous as well as non-hazardous materials	118(98.3)	1 (0.8)	1 (0.8)
HCW management must be consistent and stringent from the point of generation to the point of final disposal	116(96.7)	3 (2.5)	1 (0.8)
Incineration and land fill method of HCW disposal should be done on-site	84 (70.0)	23(19.2)	13 (10.8)
The puncture resistant needles safety containers should be at most 3/4th filled before it disposal	108(90.0)	6 (5.0)	6 (5.0)
There are only three forms of colour coding segregation system	85 (70.8)	20(16.7)	15 (12.5)
Waste segregation is an effective procedure for reducing risks associated with HCW and minimizing waste disposal costs	110(91.7)	5 (4.2)	5 (4.2)
Autoclaving and chemical treatment should be done off-site	69 (57.5)	32(26.7)	19 (15.8)

Source: Field Survey 2021

F – Frequency; % - percentage

Result from Table 4.2 showed the knowledge of Health Care Waste management among practicing nurses. Majority (98.3%) of the respondents indicated yes with the statement that "HCW is defined as all types of waste generated from health care environments, whether it is infectious or non-infectious in nature, chemicals, and hazardous as well as non-hazardous materials". Meanwhile, 70.8% nurses indicated Yes, with the statement that "There are only three forms of colour coding segregation system". Table also showed that 57.5% nurses indicated yes that "Autoclaving and chemical treatment should be done off-site".

Categorization of Nurses' knowledge on HCW Management

Table 3: Categorization of Respondents' Knowledge on HCW Management

Variable	Categorization status	Score range	Frequency	Percentage (%)
Level of respondents Knowledge on HCW management	Low	7-13	30	25.0
	High	14-21	90	75.0

Source: Field Survey 2021

Table 4.3 revealed that majority (75.0%) of the respondents have high knowledge on HCW management while only few (25.0%) of them have low knowledge on it.

Respondents' Attitude towards HCW Management

Table 4: Respondents' Attitude towards HCW Management

Variables	Strongly Agree F (%)	Agree F (%)	Undecided F (%)	Disagree F (%)	Strongly Disagree F (%)	SD	Mean	Rank
Waste should be segregated at the source of generation	65(54.2)	49(40.8)	2(1.7)	4 (3.3)	-	0.697	4.46	1st
Nurses should participate in health care waste disposal/management	52(43.3)	60(50.0)	3(2.5)	3 (2.5)	2 (1.7)	0.786	4.31	2nd
It does not really matter to segregate the HCW according to assigned colour code since waste is waste and useless	9 (7.5)	9 (7.5)	4(3.3)	53(44.2)	45 (37.5)	1.209	4.03	4th
Segregation of HCW is a waste of time especially when there is a busy work load	12(10.0)	5 (4.2)	5(4.2)	60(50.0)	38 (31.7)	1.144	4.13	3rd
Nurses should not be concerned with waste segregation since there are health attendants to do the menial job	14(11.7)	50(6.7)	5(4.2)	50 (5.8)	44(41.73)	1.298	3.86	5th
All HCW should be disposed of alike, treatment options does not really matter	21(17.5)	8 (6.7)	8(6.7)	44(36.7)	39 (32.5)	1.298	3.75	6th

Table 4.4 revealed the attitude of nurses toward health care waste management. From the table, vase majority (54.2% and 40.8%) of the nurses strongly agreed and agreed (respectively) that waste should be segregated at the source of generation (mean = 4.46). A statement "Nurses should participate in health care waste disposal/management (mean = 4.31)" was strongly agreed and agreed upon by 43.3% and 50.0% (respectively);. Likewise, majority (50.0% and 31.7%) nurses disagreed and strongly disagreed (respectively) that "Segregation of HCW is a waste of time especially when there is a busy work load" (mean = 4.13).

Categorization of Nurses' Attitude toward HCW Management

Table 5: Categorization of Respondents' Attitude toward HCW Management

Variable	Categorization status	Score range	Frequency	Percentage (%)
Determine respondents Attitude towards HCW management	Negative Attitude	6-17	14	11.7
	Positive Attitude	18-30	106	88.3

Source: Field Survey 2021

A table 4.5 revealed that majority (88.3%) of the respondents has positive attitude toward health care waste management while only few (11.7%) of them have negative attitude toward it.

Factors that Influence Health Care Management among Nurses

Table 6: The Factors Influencing HCW Management among Nurses

Variables	Strongly Agree F (%)	Agree F (%)	Undecided F (%)	Disagree F (%)	Strongly Disagree F (%)	SD	Mean	Rank
Inconsistent correct labeling of the waste bins using the colour coding schedule	41 (34.2)	51(42.5)	9 (7.5)	11 (9.2)	8 (6.7)	1.175	3.88	9th
Inaccessibility to / poor supply of the colour coding schedule and waste bins	36 (30.0)	54(45.0)	14 (11.7)	11 (9.2)	5 (4.2)	1.073	3.88	9th
The wastes not removed when available ones are filled	26 (21.7)	55(45.8)	9 (7.5)	20 (16.7)	10 (8.3)	1.235	3.56	12th
Regular conduction of seminars / workshops on health care waste management	53 (44.2)	52(34.3)	8 (6.7)	6 (5.0)	1 (0.8)	0.853	4.25	1st
A well constituted supervisory / monitory nurses' group on HCW management	45 (37.5)	52(43.3)	11 (9.2)	12 (10.0)	-	0.931	4.08	4th
Lack of materials to maintain and sustain colour coding schedule HCW management	33 (27.5)	69(57.5)	7 (5.8)	4 (3.3)	7 (5.8)	1.000	3.98	7th
Lack of sufficient facts / information regards the best practice in the health care waste management interferes with proper management	35 (29.2)	73(60.8)	3 (2.5)	7 (5.8)	2 (1.7)	0.834	4.10	3rd
High priority is given to the issues of HCW management by the health institutions / stakeholders' facilities.	38 (31.7)	48 (40.0)	12 (10.0)	18 (15.0)	4 (3.3)	1.137	3.82	10th
Poor regulations/enforcement of health care waste management brings about decline concerns on management of HCW	41 (34.2)	56(46.7)	11 (9.2)	8 (6.7)	4 (3.3)	1.004	4.02	6th
Availability financial and human resources as regards HCW management activities	45 (37.5)	56(46.7)	12 (10.0)	5 (4.2)	2 (1.7)	0.882	4.14	2nd
Patients' relatives involvement in the waste disposal hinders proper health care waste management	36 (30.0)	38(31.7)	14 (11.7)	25 (20.8)	7 (5.8)	1.273	3.59	11th
Appropriate and sustained regulations / enforcement regards the health care waste management is ensured	39 (32.5)	63 (52.5)	6 (5.0)	9 (7.5)	3 (2.5)	0.951	4.05	5th
The good nature of waste management and disposal systems	41 (34.2)	52 (43.3)	15 (12.5)	12 (10.0)	-	0.935	4.02	6th
Poor post signs designation of HCW disposal	32 (26.7)	63 (52.5)	13 (10.8)	4 (3.3)	8 (6.7)	1.052	3.89	8th

Source: Field Survey 2021

Result from Table 4.6 showed various factors influencing health care waste management among nurses from different hospitals. Majority (34.2% and 42.5%) of the nurses strongly agreed and agreed (respectively) that "inconsistent correct labeling of the waste bins using the colour coding schedule" (mean = 3.88) is a factor that influence HCW management. Inaccessibility to/poor supply of the colour coding schedule and waste bins is another factor (Mean = 3.88) strongly agreed and agreed by 30.0% and 45.0% nurses (respectively). More so, 37.5% and 43.3% nurses strongly agreed and agreed (respectively) that a well constituted supervisory/monitory nurses' group on HCW management (Mean = 4.08).

Categorization of Factors Influencing HCW Management among Nurse

Table 7: Categorization of Factors Influencing HCW Management among Nurses

Variable	Categorization status	Score range	Frequency	Percentage (%)
Factors that influence HCW management among respondents	Low impact factors	14-41	1	0.8
	High impact factors	42-70	119	99.2

Source: Field Survey 2021

Table 4.7 revealed that almost all (99.2%) of the factors have high impact and influence on health care waste management while only few (0.8%) of the factors is of low impact on HCW among nurses.

Findings from Tests for Hypothesis
H$_1$: There is no significant association between years of clinical practice and Respondents' Knowledge about HCW Management. It was also tested using chi-square analysis and the result presented in Table 4.8. Result shows that there is no significant association (p≥0.05) between Years of clinical practice (χ^2 = 3.659) and the Knowledge of nurses on HCW management. Therefore the null hypothesis was accepted. This deduce that years of experience of nurses have no correlation and effect with their knowledge about HCW management.

Table 8: Significant Association between Years of Clinical Practice and the Knowledge of HCW Management among Nurses using Chi-square

Items	χ^2	df	P-value	Decision
Years of Clinical Experience	3.659	5	0.600	Not Significant

Source: Field Survey, 2021

Decision Criteria: Reject null hypothesis when P≤0.05; Accept null hypothesis when P≥0.05, χ^2 = Chi-square.

H0₂: There is no Significant Relationship between Respondents' Knowledge about HCW Management and the Factor Influencing HCW Management among Nurses using PPMC. The hypothesis was tested using Pearson Product Moment Correlation (PPMC) and the result presented in Table 4.9. The study shows that there is no significant relationship (r = 0.053, p≥0.05) between knowledge of nurses on HCW management and the factor that influence it. Therefore, we accept the null hypothesis and reject that a significant relationship exist between knowledge of nurses on HCW management and the factor that influence HCW management.

Table 9: Results of Pearson Product Moment Correlation (PPMC) between Respondents' Knowledge about HCW Management and the Factor Influencing HCW Management among Nurses

Item	r	P value	Decision
There is no Significant Relationship between Respondents' Knowledge about HCW Management and the Factor Influencing HCW Management among Nurses using PPMC	0.053	0.566	Not Significant

Source: Field Survey, 2021

Decision Criteria: Reject null hypothesis when P≤0.05; Accept null hypothesis when P≥0.05.

H0₃: There is no Significant Relationship between Respondents' Attitude towards HCW Management and the Factor Influencing HCW Management among Nurses using PPMC. The hypothesis was tested using Pearson Product Moment Correlation (PPMC) and the result presented in Table 4.10. The study shows that there is no significant relationship (r = -0.033, p≥0.05) between attitude of nurses toward HCW management and the factor that influence it. Therefore, we accept the null hypothesis and reject that a significant relationship exist between attitude of nurses toward HCW management and the factor that influence HCW management.

Table 10: Results of Pearson Product Moment Correlation (PPMC) between Respondents' Attitude towards HCW Management and the Factor Influencing HCW Management among Nurses

Item	r	P value	Decision
There is no Significant Relationship between Respondents' Attitude toward HCW Management and the Factor Influencing HCW Management among Nurses using PPMC	-0.033	0.718	Not Significant

Source: Field Survey, 2021

Decision Criteria: Reject null hypothesis when P≤0.05; Accept null hypothesis when P≥0.05.

Discussion
Socio-demographically, the study findings revealed that majority (95.8%) of the nurses are female. This might be because nurse profession is mostly practice by female than male due to the nature of the discipline. Similar work was reported from the findings of Okamlawon, (2010), which stated that nursing has traditionally been a female dominated profession; his study examined enrolment ratio of student nurses of six State of South-West male to female in which the percentage of Nigeria of the findings revealed a low percentages of males 7.1% to 19.6% compared to females 80.4% to 92.4%. Vase majority (21.7%) of the nurses fell within the year bracket 1-5 years of clinical practice, 11-15 years and above 25 years (each), Educational qualification of the nurses in the table showed that higher proportional (45.8%) of the respondents had obtained BNSc Degree. Designations of the nurses revealed that majority of the respondent 25.0% are PNO; 20.8% are NO I.

Respondents' knowledge about HCW management in selected hospitals in Abeokuta, Ogun State
The findings from the study revealed that respondents have a high level of knowledge about HCW management. From the data analyzed, it was gathered that majority (98.3%) of the respondents indicated Yes with the statement that "HCW is defined as all types of waste generated from health care environments, whether it is infectious or non-infectious in nature, chemicals, and hazardous as well as non-hazardous materials. This finding was supported by Jang, Lee, Yoon, & Kim, (2006) [8], who said that Health Care Waste (HCW) is defined as all types of waste generated from health care environments, whether it is infectious or noninfectious in nature, chemicals, and hazardous as well as nonhazardous materials. 96.7% of the nurses indicated Yes that HCW management must be consistent and stringent from the point of generation to the point of final disposal. This finding was supported by Babirye, Vuzi, & Mutekanga (2020) [3], who said considering the hazardous potential of HCW, its management must be consistent and stringent from the point of generation to the point of final disposal. 70.8% indicated Yes to the statement that there are only three forms of waste colour coding system this findings is contrary with Siddharudha, Shivalli, and Vasudha, Sanklapur, (2016) [17] whose findings revealed four coloured containers (i.e., yellow, blue, black, and red) were seen and used at all the stations of observation this implies that respondents do not really know that other colours can be used as a coding segregation system. 90.0% indicated Yes

upon the puncture resistant needles safety containers should be at most 3/4th filled before it disposal this is supported by Teshiwal, Fatuman, Kasaw, and Aster, (2018) whose findings revealed 254 (85.8%) of them were aware that a safety box should be filled only a maximum of 3/4th while only twenty-nine (9.8%) of the study participants knew the maximum storage time of infectious wastes before treatment or disposal .Also Majority of respondents do not understand the treatment/disposal that should be done on-site and off-site as findings on the statements Incineration and land fill method of HCW disposal should be done on-site and Autoclaving and chemical treatment should be done off-site showed that 70.0% and 57.5% respectively indicated Yes while 30.0% and 42.5% respectively indicated otherwise this is contrary to the Deepak, (2019) [6] who categorized the disposal options of health care waste as; Onsite disposal (autoclaving chemical treatment etc.) and Off-site disposal (Incineration, land fill disposal).

Respondents' attitude towards HCW management in selected hospitals in Abeokuta, Ogun State
The findings showed that there is a positive attitude towards HCW management based on the data analyzed, it was gathered that majority (95%) of the respondents agreed that waste should be segregated at the source of generation (mean = 4.46) this is in line with Babirye, Vuzi, & Mutekanga (2020) [3], who said to encourage and facilitate segregation at source, reusable waste containers or baskets with liners of the correct size and thickness should be placed as close as possible to the point of generation. 93.3%. agreed that "Nurses should participate in health care waste disposal/management (mean = 4.31)". This finding was supported by Henry, (2016) [7], who said develop a formal waste management plan that should include how to properly manage regulated Healthcare waste, share your plans goals with staff so that everyone is on the same page. Most (81.7%) of the respondents disagreed with the statement that "It does not really matter to segregate the HCW according to assigned colour code since waste is waste and useless" (mean = 4.03) this is in light with the statement "who said waste can be properly colour-coded and have specific symbols marked on them, e.g. yellow or red for infectious waste with clearly marked international infectious waste symbol. The colour coding for segregation of bio-medical waste has been recommended by the recent guiding principles" (Babirye, Vuzi, &Mutekanga, 2020) [3]. Majority (81.7%) of respondents disagreed that "Segregation of HCW is a waste of time especially when there is a busy work load" (mean = 4.13). This finding was supported by Wafulal, Musiime, and Oporia, (2019) [20], who said in developing countries especially in Africa, healthcare waste has not received the much needed attention that it deserves. This is because of the inadequate resources in these countries resulting into low priority for HCW management. In many countries, there is limited segregation of hazardous and medical wastes and usually mixed with non-infectious waste. 69.2% of the respondents disagreed that "All HCW should be disposed of alike, treatment options does not really matter" (mean = 3.75). This finding is supported by Deepak, (2019) [6], who said the HCW especially infectious waste can be disposed off with different treatment options. Many HCC like hospitals and laboratories have their own in-house resources for internal waste treatment. This not only reduces the volume of the medical waste but also

decontaminates infectious waste so that it can be disposed of as non-infectious. The positive attitude of respondents findings can also be supported in findings of Rao, Dhakshaini, Kurthukoti, and Doddawad, (2018) The mean attitude score was 9.20 for the nurses and 9.18 out of 10 for the doctors. Favourable attitude was shown by most of the study respondents towards biomedical waste management. The best attitudes were displayed by the nurses showed, subsequently by doctors, interns, postgraduates, the laboratory technicians, and housekeeping staff (in order). It was concerning that the lacuna in this domain as a factor was that biomedical waste management was considered as additional burden on work.

Factors influencing HCW management among Respondents in selected hospitals in Abeokuta, Ogun State.
Majority (79.2%) of the respondents agreed with the statement that "poor post signs designation of HCW disposal" (Mean = 3.89). This finding was supported by Henry, (2016) [7], who said placing signs throughout the facility that describe the type of waste that can be put into each container. "Visual reminders and pictograms help staffs and patients understand the policies better and do the right thing every time. 75% agreed that inaccessibility to / poor supply of the colour coding schedule and waste bins is another factor (Mean = 3.88). 77.5% of nurses agreed that the good nature of waste management and disposal systems" (Mean = 4.02), These findings was supported by WHO, (2018), who said absence of waste management and disposal systems is a hindering factor because when the materials and schedule system for health care wastes are not in place there will be little or no management of health care wastes in the health institution. Most (78.5%) of the nurses agreed that regular conduction of seminars / workshops on health care waste management is a good factor to aid HCW management (Mean = 4.25). This finding was supported by WHO, (2018), who said lack of awareness about the health hazards related to health-care waste and insufficient understanding by healthcare workers and other handlers of health care waste regarding the a danger posed by the end products of health care wastes is a pointer to careless management or handling of the waste.85% of nurses agreed that "appropriate and sustained regulations / enforcement regards the health care waste management is ensured" (Mean = 4.05). 80.9% of nurses agreed that Poor regulations/enforcement of health care waste management brings about decline concerns on management of HCW" (Mean = 4.02), These findings was supported by Henry, 2016) [7], who said the need to be familiar with state regulations regarding Healthcare waste, so you will know what is considered "regulated Healthcare waste" (waste that is contaminated by blood, body fluids or other potentially infectious material) versus other types of waste. 84.2% of nurses agreed that Availability financial and human resources as regards HCW management activities" (Mean = 4.14). This finding was supported by WHO, 2018), who said that insufficient financial and human resources; poor funding towards acquisition of health care wastes materials like the colour coded containers, injection safety boxes and insufficient hands on deck to properly handle the wastes will interfere with achievement of efficiency and sustenance in health care waste management. 71.7% of nurses agreed that High priority given to the issues of HCW management by

the health institutions/stakeholders' facilities (Mean = 3.82). This finding was supported by WHO, 2018), who said low priority given to the topic; from studies that have been done it has been gathered that little attention and importance is paid to the issues on health care waste management by health care stakeholders and health care policy makers especially in developing countries and this has in its own way affects efficiency in managing health care wastes by health care workers by and large. All these factors are in line with the findings of Diego V de Godoy Delmonico, Hugo H dos Santos, Marco AP Pinheiro, Rosani de Castro and Regiane M de Souza, (2018) the lack of employee awareness regarding waste separation was the most significant barrier for Hospital 1 and Hospital 2, considering all the barriers identified during the analysis. Incorrect waste separation can cause various problems for hospitals, including environmental problems and economic problems. For example, infectious waste disposed of as general waste creates a large-scale environmental impact. Another example is of non-infectious waste being disposed of as infectious waste, which increases the cost of final waste disposal, lack of management guidelines is the second most significant barrier at both hospitals.

Therefore, respondents were of the opinion that the factors listed influences HCW management. From the data analyzed, it was gathered.

Findings of hypotheses test
The inferential findings based on Decision criteria: Reject null hypothesis when $P \leq 0.05$; Accept null hypothesis when $P \geq 0.05$ revealed that;

H0₁: There is no Significant Association between years of clinical practice and Respondents' Knowledge about HCW Management. It was also tested using chi-square analysis and the result presented in Table 4.8. This deduce that years of experience of nurses have no correlation and effect with their knowledge about HCW management.

H0₂: There is no Significant Relationship between Respondents' Knowledge about HCW Management and the Factor Influencing HCW Management among Nurses using PPMC**.** The hypothesis was tested using Pearson Product Moment Correlation (PPMC) and the result presented in Table 4.9. Therefore, we accept the null hypothesis and reject that a significant relationship exist between knowledge of nurses on HCW management and the factor that influence HCW management.

H0₃: There is no Significant Relationship between respondents' Attitude towards HCW Management and the Factor Influencing HCW Management among Nurses using PPMC. The hypothesis was tested using Pearson Product Moment Correlation (PPMC) and the result presented in Table 4.10. This infers that respondents' Attitude towards HCW have no correlation and impact the Factor Influencing HCW Management.

Nursing implication
To nursing practice
Nurses should be more aware of impacts of risks associated with healthcare waste management practices and continually improve on their knowledge on HCW waste management, continually uphold and sustain a positive opinion in the

management of HCW as well as advocate for measures to avert the factors that are identified to be barriers to proper HCW management.

To Nursing Education
There is the need to lay emphasis on topics of HCW management in nursing educational pursuit to be able to distinctly know our vital roles in the topic.

Limitation of the study
The research was faced with limitations/restricted by factors such as;
▪ Extended protocols from the Covid-19 pandemic and bureaucracy to have access to respondents
▪ Very busy work schedule/shifting duties of respondents affected hundred percent retrieval of instruments distributed.
▪ Delays in processing and analysis of data gathered.

Summary
The study surveyed the Knowledge, Attitude, and Factors Influencing Health Care Waste Management (HCW) among Nurses in selected hospitals in Abeokuta, Ogun State.
The study was a non experimental research design using a descriptive approach. Three (3) research questions and Three (3) hypotheses were formulated with review of related literatures, the sample population were male and female nurses of selected hospitals in Abeokuta, Ogun State who are directly involved in the generation and disposal of healthcare waste selected through convenient sampling technique. Data was collected through a self developed questionnaire and analyzed with SPSS version 2.0 same presented with frequency tables and percentages. It was gathered that that revealed that majority (75.0%) of the respondents have high knowledge on HCW management while only few (25.0%) of them have low knowledge on it. Majorities (88.3%) of the respondents have positive attitude toward health care waste management while only few (11.7%) of them have negative attitude toward it. About factors influencing HCW management among respondents almost all (99.2%) of the factors have high impact and influence on health care waste management while only few (0.8%) of the factors is of low impact on HCW among respondents.
The null hypotheses stated were all accepted as the findings revealed that the resultant p-value of the cross tabulated variables were greater than 0.05 hence not significant.

Conclusion
Conclusively, the research revealed that respondents in selected hospitals in Abeokuta, Ogun State have good knowledge on HCW management however still need to brush up their understanding about certain aspect like location or sites to correctly carry out treatment and disposal of HCW and the extensive colour coding segregation system of HCW not just three colour. Respondents opinions showed positive attitude towards HCW management and the findings pointed out that most of the factors stated have high impact on HCW management.

Recommendations
▪ Nurses should further improve their knowledge as regards sites various treatment/ disposal methods should be carried out as well as the various forms of

colour coding waste segregation beyond what is utilized in their health institution.

- Hospital should develop training for all healthcare workers including those handling and transporting the waste.
- Policy should be instituted in hospitals on proper disposal of healthcare waste and principles guiding it.
- Nurses should orientate patient and display information in local languages on segregation of waste.
- Healthcare waste inspectors must be introduced into the health sector for close monitoring of improper healthcare waste management.
- Health risks of improper healthcare waste management should be included in health talks.

Suggestion for further study

This study was delimited to only to Nurses and two selected Public (Government owned) hospitals in Abeokuta, Ogun, it is therefore suggested that study could be conducted on similar study among health care personnel and in private as well as public hospitals extensively to do a comparative study implementing a probability sampling technique to permit more generalization. Also research study can be carried out on the aspects of Impact of HCW to emphasize the importance of sustenance/maintenance of proper HCW management.

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