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The Influence of Open Dumping Disposal Method on Health Workers in Public Hospitals in Calabar Education Zone, Nigeria			
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Keywords		Abstract	
Open dumping, health workers, public hospitals		The purpose of this study was to ascertain the influence of open dumping disposal method on health of health workers in public hospitals in Calabar Education Zone, Nigeria. To achieve the purpose of this study, a null hypothesis was formulated to guide the study. Conceptual and empirical literatures were reviewed in accordance with the variables of the study. Survey research design was utilized for the study. The population of this study comprised registered laboratory scientists, pharmacists, nurses/midwives and waste management personnel in selected public health care facilities or hospitals in Calabar Education Zone of Cross River State. Proportionate stratified random sampling and simple random sampling techniques were adopted in selecting the 484 respondents sampled for the study. A validated 20 item four-point modified Likert scale questionnaire Open Dumping Disposal Method and Health of Workers Questionnaire (ODDMHWQ) was the instrument utilized for data collection. The reliability estimates of the instrument ranged from 0.82-0.83 using Cronbach Alpha method. To test the hypotheses formulated for the study simple linear regression statistical tool was used at 0.05 level of significance. The findings revealed that there was a significant positive influence of open dumping disposal method on health of health workers in Calabar Education Zone. It was recommended among others that regular and mandatory training workshops should be organized to improve health workers' knowledge of biomedical waste handling and health safety practices.	
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INTRODUCTION

Biomedical waste has recently emerged as a major concern not only to hospitals but to all conventional medical units where treatment of patient (human or animals) is provided such as clinics, dental offices, dialysis facilities, analytical laboratories, pharmacies, university laboratories and nursing home environment. Biomedical waste scattered in and around the health care facilities invite flies, insect, rodent, cats and dogs that are responsible for the spread of communicable diseases like plaque, rabies, typhoid, cholera, etc. It has been found by Habibullah and Afsar (2023) in Mexico that 21% of the injuries occurred during the disposal process. Out of 69 interviewed waste handlers, 34%

(13) reported 22 needle prick injuries between them during the first 12 month, and 96% had seen needles and syringes in waste. Regularly, the cleaning and sewage channeled into the drain generate unpleasant smell or odour and multiplication of vectors that leads to transmission of diseases like cholera epidemic and pollutes the entire environment.

However, improper hospital waste methods and disposal system has been observed by the researcher in the study area to have resulted to many significant health problems for both staff and patients. Among such problems resulting from biomedical waste are skin allergies, eyes irritation, diarrhea, cholera and even injuries from sharp object (Rinhardt & Gorden, 2021; Trim & Elliott, 2023). There are numerous diseases resulting from medical wastes which can be transmitted among groups of people such as health workers, scavengers, patients and hospital visitors who are highly at health risks like acquired immunodeficiency syndrome (AIDs) and hepatitis B and C viruses. In addition, medical waste can have both direct and indirect health risks to workers. Direct risks are in the form of handling the waste physically where injury may occur during diagnosis or disposal process, while indirect harm are as a result of toxic substances from inadequate burning of medical waste and exposure to blood born viruses.

In healthcare facilities in Cross River State, biomedical wastes are generated during diagnosis, treatment immunization, research activities or production, or testing of biological and medical resources such as discarded blood and body fluids along with soiled linen, cotton, body part, organs, bandage and plaster, tissues from surgery or birth, gloves, syringes, needles and blades can cause health risks to healthcare workers. Exposure to hazardous biomedical waste ranging from chemical or reagents, liquid waste, discharged foul odour, and toxic emissions inhalation can result in diseases; while cuts in the skin, injury or injection are the common ways that pathogenic organisms enter the human body, creating the link between the transmission of acquired immunodeficiency syndrome (AIDs) and viral hepatitis B (HBV) infections (Dan, Imam, Ukpata & Akpa, 2023).

In addition, infections caused by exposure to biomedical waste includes skin infections, meningitis, gastro enteric infections, genital and ocular infection, respiratory infections, hemorrhagic fevers, etc. Infections can also spread via; sewage systems or resilient agents such as rats, which feed on them, and may cause health risks to the general public. The World Health Organization (2018) classified waste into eight (8) categories: general waste, pathological, radioactive, chemical, infections to potentially infectious waste, sharps, pharmaceuticals and pressurized containers. Biomedical wastes are mainly generated from government hospitals, private hospitals, nursing homes, dispensaries,

primary health centers, medical colleges/research centers, paramedic services outfits, veterinary colleges, blood banks, mortuary, autopsy centers among others. While minor waste are generated from physicians/dentist clinic, animal houses, blood donation camps, and vaccination centers. Types of waste generated, segregation/storage, collection/transportation, handling/treatment as well as methods of waste disposal in every facility plays an important role concerning health risks.

Open dumping disposal method usually relate to all kinds of planned activities concerned with the proper handling and disposal of wastes from the point of generation to the point of final disposal. Wastes disposal methods are comprehensive, integrated, rational and systematic approach towards the achievement and maintenance of acceptable human health. Modern methods of wastes disposal have emerged in response to the recognition of health influence (Kumar & Singh, 2018).

The waste management departments are statutorily charged with the primary responsibility of biomedical wastes disposal. However, the present state of our hospitals has shown that cleaners in this departments lack the capacity and capability to fulfill this obligation. Several efforts have been made by governments across Nigeria, and intervention projects have been put in place over the years to ensure proper disposal of biomedical wastes. It is also very worrisome to note that most health care facilities do not even have waste management experts or departments and so on.

In Cross River State, there are poor systems of wastes disposal in hospitals. This raises several questions that need answers. What are the biomedical wastes generated by health centers? How are these wastes disposed? How does the disposal systems relate to human health? Hence this study investigated biomedical wastes disposal methods and influence on health of health workers in Public Hospitals of Calabar Education Zone, Cross River State, Nigeria.

Statement of the problem

Healthcare workers are frequently exposed to numerous occupational hazards, including biological, chemical, and physical risks. Their constant contact with patients and infectious materials makes them particularly vulnerable to diseases, injuries, and toxic exposures. One of the most serious threats faced by health workers and the general public is improper biomedical waste disposal. Biomedical wastes, which include syringes, blood-soaked materials, contaminated dressings, sharps, and pathological waste, are often found in open bins around hospitals in Calabar Education Zone. Such poor disposal practices

lead to environmental contamination, foul odour, toxic emissions, and water pollution, posing significant health risks to hospital staff, waste handlers, and nearby residents.

In Calabar Education Zone, the problem is exacerbated by poor waste segregation, inadequate protective gear, irregular waste collection, and limited knowledge among health workers. Although health professionals may possess theoretical knowledge about safe waste disposal, it often does not translate into proper practice due to high workload, weak institutional enforcement, and inadequate motivation. Previous interventions, such as short-term training programs and awareness campaigns, have been introduced in some hospitals. However, these efforts have produced limited and unsustainable outcomes, as compliance remains inconsistent, and behavioural change among staff is minimal.

Given these challenges, it becomes necessary to investigate the influence of open dumping disposal method, and influence on health of health workers in public hospitals in Calabar Education Zone, Nigeria. Understanding these relationships would provide evidence-based insights that can guide the development of sustainable biomedical waste management systems, strengthen policy enforcement, and safeguard both public health and the environment.

Purpose of the study

The purpose of this study was to ascertain the influence of open dumping disposal method on health of health workers in public hospitals in Calabar Education Zone, Nigeria. Specifically, the study sought to:

1. Assess the influence of open dumping disposal method on health of health workers in Calabar Education Zone.

Research questions

The following research questions were posed to guide the study:

1. How does open dumping disposal method influence the health of workers in Calabar Education Zone?

Statement of hypotheses

The following hypotheses guided the study:

1. Open dumping disposal method does not significantly influence health of workers in Calabar Education Zone.

LITERATURE REVIEW

Open dumping of biomedical waste and influence on health of workers

A cross-sectional case-comparison study by Shri, Praveen, Pradeep, Salve and Rahul (2020), examined open dumping site and health risks to proximate communities in

Mumbai, India. The study assessed health effects of dumping site among nearby community members and identifying potential risk factors. A cross-sectional household survey was conducted using a case comparison design. Study population consisted of an exposed group and non-exposed group (nearby and a distant community respectively; n=200 each) having similar socio-economic and living conditions. To assess the health effects of dumping site, data on selected morbidities has been analyzed using the Propensity Score Matching (PSM) method. The study findings suggest a relatively higher prevalence of selected morbidities among exposed group than non-exposed group particularly for respiratory illness (23% v 10%), eye irritation (20% v 9.5%) and for stomach problem (27% v 20%) respectively. Result from PSM suggest that exposure to the dumping site leads to a higher prevalence of respiratory illness (12%), eye irritation (8%) and stomach problems (7%). Multivariate analysis suggest respondents from the exposed group were significantly more likely to suffer from respiratory illness (OR 3.06, $p < 0.01$), eye infection (OR 2.39, $p < 0.01$) and stomach problems (OR 1.66, $p < 0.05$). Assessment of air-quality-index suggests poor levels of PM 10 and PM 2.5 during fire broke-out in Deonar dumping Site. Study concludes that the prevalence of morbidities found to be significantly higher among the exposed group than non-exposed group particularly it is significantly higher for respiratory illness and eye infection. The propensity score matching methods reinstate that morbidities found to be significantly higher among exposed group than non-exposed group.

A related study by Salma, Najibul, Zia-ul-Ain, Abdul, Muhammad, Javaid and Nowsher (2021) examined the current practices of waste management in teaching hospitals and presence of incinerators in densely populated areas. A questionnaire based on World Health Organization (WHO) recommendations was used to survey the selected private and public teaching hospital (n = 16). Site visits and personnel observations were also included in the data. It was spatial-statistically analyzed using descriptive statistics, Krushkal-wallis and Fisher's exact tests. The findings revealed that the lack of HWM practices in all surveyed hospitals ($p > 0.05$), besides statistical difference ($p < 0.017$) in waste generation/day. No proper segregation of waste from generation point to final disposal was practiced. However, the performance of private teaching hospitals (50%) was found better in terms of HWM personnel and practices. In surveyed hospitals, only nine hospitals (56.3%) were found with the incinerator facility while rest of the hospitals (43.7%) practiced open dumping. Moreover, operational parameters of the incinerators were not found satisfactory and located in densely populated areas and emitting hazardous gases.

Proper HWM practices are not being followed in the light of WHO guidelines. Hospital waste imposed serious menace to healthcare workers and to nearby population. WHO issued documents for improving HWM practices but triggered no change in Pakistan. To improve the situation, insights in this context is need for enforcement of rules.

Likewise, Gnaro, Ali, Ayamekpe, Degbey, Salami-Odjo, Ouro-Koura, Adom, Sopoh and Ekouevi (2023) examined hospital stakeholders' perception on environmental effects related to biomedical waste disposal in open dumps in Togo's University Hospitals (UHC). This was a cross-sectional study held from June 24 to August 28, 2021. It targeted three university hospitals, 340 health care providers and services selected by a probabilistic method with a simple random technique in 25 services, 72 directors, deputy directors, supervisors and heads of services, 27 collection and incineration agents selected by a non-probabilistic method with a reasoned choice technique, 44 patients and attendants and 36 householders of neighboring residents selected by a non-probabilistic method with an accidental choice technique. Variables such as the spreading of disease vectors, soil, air and water contamination, the presence of unpleasant odors and unsightly living conditions were assessed. According to the respondents, biomedical waste causes the proliferation of vectors (55.3%), an unsightly environment inside the hospital (47.1%), and unpleasant odors (61.2%). Incineration operations disturb hospital residents (52.8%), according to the householders of the residents. During observation, we note deposits of waste that have not been destroyed and wastewater flowing in some places. Biomedical waste in Togo's university hospitals generate environmental effects and therefore potentially high risks for human health. Improving their management should be a concern for all hospital actors.

In the same vein, Degemegn, Dereje, Asrat, Abeza and Gutama (2023) assessed the level of good HCWM practice and associated factors among health workers in private health facilities. An institution-based cross-sectional study was conducted in the Ilu Aba Bor zone, South West Ethiopia. A random sample of 282 health workers from 143 private health facilities was included in the study. Data were collected using a pretested structured questionnaire that included socio-demographic characteristics, healthcare factors, knowledge assessment and an observation checklist adapted from WHO guidelines. The collected data were entered into EpiData V.3.1 and analysed with SPSS V.25.0. Multivariable logistic regression analysis was used to identify factors associated with HCWM practice. Variables with a p value of <0.05 at 95% CI were declared significant. More than half (58.7%) of private-sector health workers had good HCWM practice. The presence of the HCWM committee (adjusted OR (AOR)=9.6, 95% CI 4.5 to 20.6),

designated healthcare waste storage site (AOR=3.0, 95% CI 1.5 to 6.5), reading the HCWM manual (AOR=4.4, 95% CI 2.2 to 9.0) and having good knowledge of HCWM (AOR=2.6, 95% CI 1.06 to 6.15) were factors associated with good HCWM practice. About three out of five health workers in private healthcare facilities were practicing good HCWM. The presence of an HCWM committee, waste management utilities, reading HCWM guidelines and knowledge of health workers were the identified factors. Health workers should read guidelines to improve their knowledge, and the presence of committees and waste management utilities in private clinics should be followed to ensure compliance with safe HCWM practice.

Also, Fisayo and Henry (2023) assessed factors influencing the choice of biomedical waste management and treatment methods/equipment in use at the Ekiti State tertiary health facilities. The survey questionnaire was used to obtain data from health practitioners of different cadres in the wards and laboratories while the study employed a descriptive research design. Statistical evidence based on ninety-eight purposively selected respondents revealed that all tested factors were significant at 0.01 level as the infectious/hazardous nature of the waste, and cultural and social basis emerged as the most and least influencing factors with 0.831 and 0.597 relative importance indexes, respectively. The study concludes that tested factors inform the choice of biomedical waste handling equipment/methods employed. It is therefore recommended that efforts should not only be geared towards adequate consciousness of these factors by the waste handlers when determining the method to be used, but the government, leadership of healthcare facilities, and health practitioners should also ensure the availability of appropriate management and treatment technologies/methods to inhibit accidental outbreaks of epidemics in the community.

Moreso, Chikwendu, Oluwatolami, Inioluwa, Goodness, Ololade and Somtochukwu (2025) examined healthcare waste management in southwest Nigeria: A cross-sectional study among healthcare workers in a private tertiary hospital. The generation of health-care waste (HCW) has been on the increase due to increasing world's population, increased number of health care facilities, and advancement in technological practices. HCW may contain microorganisms which may be drug-resistant with potentials to cause harm to patients, health care workers and the general public when spread from the facility to the environment. Management of HCW is a big challenge particularly in LMIC due factors related to poor awareness and funding. The study was cross-sectional among 210 health-care workers of Babcock University Teaching Hospital using self-administered

questionnaire using simple random sampling. Data was analyzed using SPSS version 27. Chi-square test and multivariable logistic regression analysis were done to determine the factors associated with knowledge and practices of HCW management. At 95% confidence interval, a $p < 0.05$ was considered statistically significant. Results: the mean age was 29.9 ± 7.8 years with 51% of the participants males. Sixty-five-point five percent (65.5%) of the participants have ever received training on HCW management. The study found that 110 (53.4%) of the participants had adequate knowledge on HCW management while good practices were found among 155 (75.2%) of the participants. Only good knowledge was found to have statistically significant association with practice (aOR: 0.196, 95% CI 0.090-0.423, $p = 0.0001$) while awareness of the availability of HCW management guideline had statistically significant association with the knowledge on HCW management (aOR: 0.344, 95% CI 0.319-0.852, $p = 0.021$). This study found that knowledge on HCW management was fair while practice was good. The study also showed statically significant relationship between good knowledge and practice. Adequate education and training should be provided for health-care workers on HCW management in order to improve practices on the management of HCW. This may reduce exposure of health-care workers and the general public to the health risks associated with poor HCW management practices.

Similarly, Raphela, Manqele and Erasmus (2024) investigated the impact of improper waste disposal on human health and the environment: A case of uMgungundlovu District in KwaZulu Natal Province, South Africa. The study applied a mixed-method pragmatic research approach, using Statistical Package for Social Scientists, and applied a series of Chi-Squared tests of independence, regression, and descriptive statistics to analyse data. This study has shed light on the complex dynamics surrounding the respondents' awareness and perception of risks associated with improper waste disposal. While a fair level of knowledge exists concerning the general risks, there are notable gaps in understanding specific aspects of human health risks related to improper waste disposal. Furthermore, the study findings highlight a critical disparity in awareness regarding specific human health risks associated with improper waste disposal. This study has shed light on the complex dynamics surrounding the respondents' awareness and perception of risks associated with improper waste disposal. This underscores the importance of enhancing public education and outreach programs to ensure a comprehensive understanding of the potential dangers to human health. The study municipality should

explore sustainable waste management practices to mitigate the economic burden posed by increased waste generation.

Furthermore, Shilfa-Baanu and Nuskiya (2020) examined the impact of improper solid waste disposal in Mahaweli Ganga River: A case study of Egoda Kalugamuwa G.N Division in Kandy District. In order to this study achieve its objective, to identify the socioeconomic and environment impact of solid waste disposal and provide some possible strategies to medicate these issues in Egoda Kalgamuwa G.N Division in Kandy, many impacts were identified. In this surrounded open dumping site like: environmental pollution, water pollution, soil degradation, air pollution, bio-diversity around landfill sites and some socio-economic threads also identified. So, this research relied on both qualitative and quantitative methods. In order to this study focused on some primary and secondary data collection methods. Questionnaires, interviews with local people and responsible officers, labors of Pradeshiya Sabha as well as direct observations were collected for primary data collection method. Related reports, research articles, journals publication, newspaper, hospital reports and website were used as secondary data. This study concluded the possible strategies to give solid waste management in this region. And also, in this study provide composition of solid waste of households was determined of disposal. Finally, disposal reduction methods were proposed to improve the efficiency of solid waste management system. Therefore, the relevant authority also should take immediate measures to rescue this area.

RESEARCH METHODOLOGY

This study adopted the survey research design. According to Isangedighi (2012) survey research is a method of having a systematic, intense, accurate and purposeful observation of behaviour, trait or opinion and describing existing phenomenon as precise as possible. It is a design that is directed towards determining the nature of a situation as it exists at the time of investigation. The design is chosen because it will allow the researcher to collect data from a given population who have the same characteristics, using a well-designed variety of instrument concerning participants responses on fact and opinion attitude to objectively describe existing situation without modification. It also gave opportunity to study large and small population to discover relative incidence by selecting and studying the sample of the study.

The area of this study was Calabar Education Zone of Cross River State, Nigeria. It comprises seven Local Government Areas namely Akamkpa, Akpabuyo, Bakassi, Biase, Calabar Municipality, Calabar South and Odukpani Local Government Areas. The area

lies within latitude 4°27'N and 5°32'N and longitude 7°50' and 9°30'E of the equator. It has a landmass of 9980 square kilometers, and is bounded by Akwa Ibom State and Abia to the West, Yakurr Local Government Areas to the North, Atlantic Ocean to the South and the Republic of Cameroon to the East. The area lie within the mangrove swamp and tropical rainforest regions thereby having both wet and dry seasons. The area is characterized with a maximum temperature of about 27°C with a peak of 35°C during January and February (Weatherbase, 2011).

Administratively, the area has 75 political wards with Odukpani Local Government Areas (13), Calabar South Local Government Areas (12), while all the other five Local Government Areas have 10 wards each. Administrative headquarter of the Local Government Areas are Akamkpa-Oban, Akpabuyo-Ikot Nakanda, Bakassi-Abana, Biase-Akpet Central, Calabar Municipality-Akim Qua, Calabar South-Anantigha and Odukpani-Odukpani town respectively. The languages within each of the Local Government Area are Efik, Ejagham, Korop, Ukwa, Ito and devop for Akamkpa; Efik for each of Akpabuyo and Bakassi, Nne, Mehu, Ubaghara, Umon, Isanginyoinyo and Iyonyong for Biase, Efioik and Ejagham for Calabar municipality; Efik and Efut for Calabar South and Ejagham, Efik, Ofot and Kiong for Odukpani Local Government Area.

The population of this study comprised registered laboratory scientists, pharmacists, nurses/midwives and waste management personnel in selected public health care facilities or hospitals in Calabar Education Zone of Cross River State, Nigeria. According to the Cross River State Health System Restructuring Data (2025), the population of healthcare providers is 1,363 in government healthcare facilities in Calabar Education Zone. The population distribution is shown in Table 1.

TABLE 1
Population distribution of government healthcare facilities in Calabar Education Zone of Cross River State

S/N	Name of health care facilities	LGA	Healthcare workers	Population	Total
1.	University of Calabar Teaching Hospital	Calabar Municipality	Nurses/midwives	438	707
			Lab. Scientists	40	
			Pharmacist	61	
			Waste managers	168	
2.	University of Calabar Medical Centre	Calabar Municipality	Nurses/Midwives	26	61
			Lab. Scientists	12	
			Pharmacists	9	
			Waste managers	14	
3.	Federal Neuro Psychiatry Hospital, Calabar	Calabar South	Nurses	20	82
			Lab. Scientists	2	
			Pharmacist	18	
			Waste managers	41	

4.	General Hospital, Calabar	Calabar South	Nurses	26	130
			Lab. Scientists	19	
			Pharmacist	21	
			Waste managers	64	
5.	Cottage Hospital Oban, Akamkpa	Akamkpa	Nurses	19	38
			Lab. Scientists	3	
			Pharmacist	4	
			Waste managers	12	
6.	General Hospital UkemOdukpani	Odukpani	Nurses	21	41
			Lab. Scientists	3	
			Pharmacist	4	
			Waste managers	13	
7.	Navy Reference Hospital Calabar	Calabar Municipality	Nurses	31	56
			Lab. Scientists	5	
			Pharmacist	5	
			Waste managers	15	
8.	General Hospital, Akpabuyo	Akpabuyo	Nurses	36	59
			Lab. Scientists	4	
			Pharmacist	5	
			Waste managers	14	
9.	General Hospital, Akamkpa	Akamkpa	Nurses	39	66
			Lab. Scientists	4	
			Pharmacist	5	
			Waste managers	18	
10.	Police Hospital 1BB, Calabar	Calabar Municipality	Nurses	24	52
			Lab. Scientists	6	
			Pharmacist	8	
			Waste managers	14	
11.	Cottage Hospital, Akpet	Biase	Nurses	41	71
			Lab. Scientists	3	
			Pharmacist	6	
			Waste managers	21	
			Total		1,363

Source: Cross River State Health System Restructuring Data (2025)

The sampling techniques used for this study was proportionate stratified random sampling and simple random sampling techniques. Using stratified sampling technique, all the government health care facilities in Calabar Education Zone were stratified into seven local government areas while simple random sampling was used to select four health care facilities. Here, the method adopted was hat and draw process where all the names of the various health care facilities were written on slips of paper, folded into a container, mixed thoroughly and then picked one after the other with replacement. The healthcare facilities whose names appeared on the picked slips were selected for the study. Proportionate stratified random sampling technique was also adopted in selecting fifty percent of respondents from the entire study population which is not the same in each of the selected health facility used for the study.

The sample for this study consisted four hundred and eighty-four respondents randomly selected from four public care facilities in Calabar Education Zone of Cross River State. This number represented 50% of the population of the four (4) facilities that were selected for the study. They comprised both males and females including nurses, laboratory scientists, pharmacists and waste managers/sanitation workers. The sample distribution is presented in Table 2.

The instrument used for data collection in the study was a questionnaire titled: Open Dumping Disposal Method and Health of Workers Questionnaire (ODDMHWQ). The questionnaire was constructed by the researcher. It was divided into three sections, Section A, B and C. Section A dealt with demographic data of the respondents, section B contained items measuring the sub-independent variables of the study, while section C measured the dependent variable – health influence. The respondents were required to express their opinion based on each item in the instrument.

TABLE 2

Sample distribution of respondents in health care facilities in Calabar Education Zone

S/N	Healthcare facilities	Nurses	Lab scientists	Pharmacists	Waste managers	Total
1.	University of Calabar Teaching hospital	219	20	31	84	354
2.	General Hospital, Calabar	13	10	11	32	66
3.	General Hospital, Akpabuyo	18	2	3	7	30
4.	General Hospital, Akamkpa	20	2	3	9	34
	Total	270	34	48	139	484

Source: Field survey, 2026

The researcher personally visited all the selected health care facilities in Calabar Education Zone and sought the consent of the head of surgery, accident and emergency department by explaining the purpose and intention of conducting a study in their establishment. The researcher administered the questionnaire with the help of a trained research assistant. At the end of the exercise copies of the questionnaire were returned to the researcher for data analysis.

A coding guide was developed containing information in the questionnaire with four-point Likert scale option adopted. The positively worded items were assigned in an increasing (SA – 4 points, A – 3 points, D – 2 points and SD – 1 point) order while the negative worded items were in decreasing (SA – 1 point, A – 2 points, D – 3 points and SD – 4 points) order. However, a key is developed for each item in the instrument with a coding schedule. The coding schedule is presented in Table 4.

RESULTS AND DISCUSSION

In this section, the researcher presented the findings of the study, which are derived from the results of the data analyses. The statistical significance level of 0.05 was utilized to ensure the validity of the findings. The hypothesis formulated for this study was examined through the analysis of the collected data related to the variable under investigation.

Hypothesis

The second hypothesis states that open dumping disposal method does not significantly influence health of workers. The independent variable of this hypothesis is open dumping disposal method while the dependent variable is influence on health of workers. Simple regression statistics was used in testing the hypothesis and the results presented in Table 3 showed that there is a moderate positive relationship between open dumping and health influence ($R = .272$), with an R-Square (coefficient of determination) of .168. This indicates that approximately 16.8% of the variance in the influence on health of workers can be explained by the use of open dumping as a biomedical waste disposal method. The adjusted R-Square value of .165 suggests a minimal shrinkage from the R Square, which affirms the model's validity for generalization.

The F-value of 51.432 with a p-value = .001 indicates that the regression model is statistically significant at the 0.05 level, confirming that open dumping has a significant influence on health impact perceptions among the respondents. This result highlights that health workers view open dumping of biomedical wastes as a notable health threat, likely due to the exposure to pathogens, offensive odors, toxic residues, and vector-borne diseases that arise from unmanaged waste dumps. The standard error of the estimate (132.331) showed the average deviation of the actual scores from the predicted values, further validating the variability in health perception influenced by dumping practices.

The result of hypothesis revealed a moderate positive relationship between open dumping and health influence, suggesting that the variation in health influence among

health workers can be attributed to the practice of open dumping as a biomedical waste disposal method. The result implies that open dumping significantly influences the perception of health impacts among health workers, who associate this practice with increased health risks such as infections, respiratory problems, and exposure to harmful substances.

This finding aligns with the results of a cross-sectional case-comparison study by Shri et al. (2020), which examined health risks associated with open dumping sites in Mumbai, India. Their study found a higher prevalence of morbidities among individuals living near dumping sites compared to those living farther away. Specifically, respiratory illness (23% vs. 10%), eye irritation (20% vs. 9.5%), and stomach problems (27% vs. 20%) were significantly higher among exposed populations. These results reinforce the present study's findings by indicating that exposure to open dumpsites poses serious health hazards. The environmental pollutants and pathogens emanating from such sites may explain the perception of elevated health risks among health workers in the current study.

Supporting evidence comes from Gnaro et al. (2023), who investigated hospital stakeholders' perceptions of biomedical waste disposal in open dumps in Togo. They found that 61.2% of respondents associated open dumping with unpleasant odors, 55.3% with disease vector proliferation, and 47.1% with unsightly environments. Their study highlighted that biomedical waste in open dumps poses potential health and environmental hazards. This aligns with the perception of health workers in the present study, who view open dumping as a significant risk factor for disease transmission and environmental degradation.

Finally, the findings of Stephen and Elijah (2021) highlighted systemic challenges in healthcare waste management in Nigeria, such as inadequate training and poor segregation practices. Their study concluded that biomedical waste management was unsustainable, emphasizing that these lapses increase public health risks. This perspective supports the results of the present study, which confirm that open dumping significantly influences the perception of health risks among health workers. The result of this study reinforces the general consensus across multiple studies that open dumping poses a significant threat to both environmental and human health. Health workers' perceptions of its dangers are validated by empirical evidence from local and international contexts. Consequently, there is an urgent need for healthcare institutions to adopt safer waste management systems, such as segregation, incineration, and autoclaving, in line with WHO guidelines.

TABLE 3

Summary of data and simple regression analysis on the influence of open dumping disposal method and influence on health of workers.

R	R-square	Adjusted R-square	Std. Error of the Estimate		
.272	.168	.165	132.331		
Model	Sum of squares	Df	Mean Square	F	Sig
Regression	323.443	1	323.443	51.432	.001
Residual	241105.271	482	763.221		
Total	82337.729	484			

a. Predictors: (Constant): Open dumping disposal method

b. Dependent Variable: Influence on health of workers

CONCLUSION AND RECOMMENDATIONS

Conclusion

The study concludes that open dumping disposal method and knowledge of open dumping disposal method significantly influenced health workers' perception of health risks in public hospitals. Open dumping is viewed as high-risk practices and requiring stringent regulation. The knowledge of biomedical waste management was found to be a crucial factor in shaping health workers' perceptions, underscoring the need for targeted training and educational interventions. In essence, improving biomedical waste disposal practices and investing in knowledge development among health professionals are essential steps in reducing occupational and public health risks within the healthcare system.

Implication of the findings

The statistically significant influence of various open dumping disposal method particularly open dumping discharge into water bodies on health as perceived by health workers indicates critical lapses in regulatory enforcement. These findings imply the need for the Cross River State Ministry of Health and hospital management boards to strengthen regulatory frameworks guiding biomedical waste disposal in public hospitals. This may involve revising existing waste management policies, introducing stricter enforcement measures, and ensuring compliance with international best practices for biomedical waste handling. The positive perception of incineration and recycling as safer waste disposal methods suggests that hospital administrators must prioritize investment in modern and environmentally friendly waste treatment facilities. Poor infrastructure and outdated

disposal systems currently in place could be exacerbating health risks among healthcare workers and surrounding communities. Therefore, hospital management teams should establish effective internal waste management units and develop protocols for waste segregation, transportation, and treatment to safeguard both staff and patients.

The influence of knowledge on health perceptions highlights the importance of continuous training and retraining of health workers on proper biomedical waste management practices. This points to the need for integrating waste management education into healthcare training programs and providing regular professional development opportunities through workshops, seminars, and certifications. Enhanced knowledge will not only improve compliance but also reduce occupational health risks and promote safety in healthcare environments.

The identified negative health implications of inappropriate waste disposal methods particularly dumping in open areas or water bodies – pose serious environmental and public health concerns. These findings underline the necessity for collaborative efforts between public health authorities, environmental agencies, and local communities to implement sustainable biomedical waste management solutions. Public sensitization campaigns and stakeholder engagement are crucial in preventing environmental contamination and associated health hazards. This study provides a robust empirical foundation for evidence-based policymaking in biomedical waste management. It also highlights the need for continuous monitoring and evaluation of waste management strategies in healthcare facilities. Future researchers and policymakers can utilize these findings to develop targeted interventions and comparative studies across different geopolitical zones in Nigeria to ensure more holistic and responsive health waste policies.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Government and hospital management should enforce proper biomedical waste management protocols, especially in discouraging open dumping and uncontrolled landfills.
2. Regular and mandatory training workshops should be organized to improve health workers' knowledge of biomedical waste handling and health safety practices.
3. Public health education: Awareness campaigns should be extended to auxiliary hospital staff and communities near healthcare facilities to prevent exposure to improperly disposed waste.

4. Regular and compulsory training programs should be organized for all categories of health workers to improve their knowledge and practical understanding of biomedical waste management procedures.

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