Johson *et. al.,* Babcock Univ. Med. J.2026 9(2):40-50
https://doi.org/10.38029/babcockuniv.med.j..v9i2.1212
eISSN: 2756-4657

RESEARCH ARTICLE OPEN ACCESS

Assessment of exposure to occupational hazards among University of Uyo Teaching Hospital healthcare waste handlers

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Submitted: 12th October 2025
Accepted: 21st November 2025
Published: 30th June 2026
ID: Orcid ID

Abstract
Objective: Healthcare waste handlers play a vital role in medical waste management but face a high risk of exposure to hazardous materials and occupational injuries. This study assessed the extent of exposure to occupational hazards among healthcare waste handlers at the University of Uyo Teaching Hospital, Nigeria.
Methods: A descriptive cross-sectional study was conducted among 53 healthcare waste handlers selected using a stratified random sampling method. Data were collected through interviewer-administered questionnaires and analysed using STATA 16.0 at $p < 0.05$.
Results: The mean age of respondents was 31.6 ± 11.3 years. The prevalence of sharps injuries was 43.4%, with 24.5% occurring in the last six months. Only 18.9% reported these injuries, and 78.3% self-sponsored treatment. The diseases most commonly perceived to be associated with waste handling were HIV/AIDS (81.1%), diarrhoea (67.9%), malaria (66.0%), typhoid (62.3%), and cholera (60.4%). Recognition of Hepatitis B (49.1%) and C (45.3%) was lower. Most (77.3%) had never been screened, and only 13.2% received vaccination for the Hepatitis B virus. The most frequent exposures were to blood and body fluids (69.8%) and sharps (37.7%). While 94.2% practised good hand hygiene, PPE use varied. Face masks were the most used (96.2%) and goggles the least (13.2%). Training on infection prevention significantly predicted PPE use (AOR = 3.87; $p = 0.040$).
Conclusion: Despite awareness of workplace hazards, exposure and injury rates remain high. Regular training, free health screenings, and improved access to protective equipment are crucial for safeguarding healthcare waste handlers.

Keywords: Healthcare waste, Occupational hazards, Waste handlers, PPE, Waste management

Plain English Summary

This study explored the risks faced by healthcare waste handlers at the University of Uyo Teaching Hospital in Nigeria. These workers play a crucial role in managing medical waste but are frequently exposed to injuries and infections. Researchers surveyed 53 waste handlers to gather information about their experiences, safety practices, and use of protective equipment. Nearly half (43%) had been injured by sharp objects, and most did not report these incidents. More than three-quarters paid for their own treatment. Many workers linked their jobs to diseases such as HIV/AIDS, malaria, diarrhoea, and typhoid, but fewer recognised the risks of Hepatitis B and C. Most had never been screened or vaccinated for these infections. Although most workers practised good hand hygiene and used face masks, fewer used other protective gear, such as gloves or goggles. Those who received infection-prevention training were more likely to use protective equipment properly. As such, regular safety

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education, free health screenings, and better access to protective equipment are urgently needed to safeguard their health.

Introduction

Occupational health risk is the likelihood of a long-term or short-term hazard experienced in the workplace leading to damage to health. Such hazards could be chemical, biological, psychosocial, or physical in nature (1). Healthcare waste is all types of waste generated from healthcare facilities like hospitals, clinics, maternity homes, which could consist of hazardous or harmless material, infectious or non-infectious, or chemical (2, 3). Hazardous waste can contain body fluids like blood, nasal secretion, vomitus, or other contaminants generated during a medical procedure, testing, immunisation, or treatment of human beings (4, 5).

As such, healthcare waste handlers who are healthcare workers responsible for the collection, transportation, cleaning and disposal of medical wastes in health institutions, are exposed to occupational hazards related to the content of the materials they are handling, the equipment being used, and their hygiene practices (6, 7).

Globally, it is estimated that 2.3 million workers die every year from occupational accidents and work-related diseases; this equates to 6300 deaths daily, outnumbering deaths due to tuberculosis (TB), AIDS, or road accidents (8, 9). The burden is particularly heavy in low- and middle-income countries as the risks that foster ill health are estimated to be 10 to 20 times higher than in developed countries, due to population growth, industrialisation and urbanisation, making the amount of waste generated increase in the presence of poor implementation of occupational health and safety laws (10, 11, 12). The healthcare setting, being one of the high-risk environments to work in, employs about 59 million people who are constantly exposed to a complex variety of health and safety hazards that significantly impair their health and quality of life, with a multiplier effect on their immediate and extended family members in the course of their work (13, 14).

Approximately 54% of health workers in low- and middle-income countries have latent tuberculosis, which is 25 times higher than the general population (7). A study in India showed that knowledge regarding the potential transmission of disease through biomedical waste was reported among only 27% of sanitary workers (15). In Egypt, 96.4% of the medical waste handlers were exposed to at least one type of occupational health hazard, with 95.2% being physical, 88.4% biological, 71.2% Psychological, and 52% chemical, while 3.6% reported not being exposed to any occupational health hazard regarding medical waste disposal (16). Moreover, in Owerri, Nigeria, biological hazards among health waste handlers were 47.9% cuts and wounds, 29.8% direct contact with contaminated specimens/hazardous materials, and 26.6% sharp-related injuries, while for non-biological hazards, 44.7% fell, and 35.1% were stressed (17).

In addition, a cross-sectional study of healthcare workers in a southwestern Nigerian teaching hospital revealed that work-related stress (83.3%), needle-stick injuries (76%), blood stains on the skin (73.1%), sleep disturbances and hepatitis (8.9%) were some of the commonly encountered occupational health hazards of which waste handlers are often at higher risk than other healthcare professionals as they are mostly involved in its subsequent management (18).

Despite these, segregation of medical waste, which ought to be the standard practice in health care facilities, was observed in less than two-thirds of respondents in a study conducted in ten hospitals in Abakiliki, Ebonyi, Nigeria (19).

Also, in a study among medical waste handlers in Cairo, Egypt, 92.0% had an unsatisfactory level of knowledge about management of medical waste, 89.6% had an unsatisfactory level of knowledge about post-exposure actions, while only one-fifth were vaccinated against the hepatitis B virus (16). Poor knowledge of post-exposure prophylaxis for HIV and its protocols was also noted among 50% of respondents in a similar study in Abakiliki, Nigeria (19).

Furthermore, regarding the utilisation of PPE among medical waste handlers in Uganda, a study revealed that 2% did not know the purpose of PPE, 23.7% did not know how to don and doff PPE, 13.6% did not use PPE even when indicated, and 10% were not using appropriate PPE (20). Common barriers were linked to poor-fitting and weak domestic gloves, lack of availability of PPE, as well as lack of training in PPE (20).

Despite much attention given to the safety of healthcare workers and their protection, the welfare and safety of those in the waste disposal sector have received minimal attention (21). Healthcare waste handlers are more vulnerable among healthcare workers while handling waste, being that they are the least formally educated, and as such, their knowledge and risk perception of healthcare waste varies and may affect their ability to use personal protective equipment when necessary (21, 22). They are also generally considered an ancillary group, even though they play a pivotal role in the success of medical waste management and prevention of

nosocomial infections and accidents within the healthcare premises (22). This occurs in the face of psychological, social, and emotional challenges resulting from various factors such as emotional stress, fatigue, stigmatisation, social isolation, lack of recognition, job insecurity concerns, anxiety, and fear of contracting diseases during their daily duties, as evidenced by a study in Taraba (23).

Hence, poor management of healthcare waste exposes healthcare waste handlers, their families, and the community to preventable infections, toxic effects, and injuries (11).

This study aimed to assess the extent of exposure to occupational hazards among healthcare waste handlers in the University of Uyo Teaching Hospital in order to provide information on the risks faced by this group of healthcare staff during the course of their work.

Materials and Methods

Study Area

This study was carried out in the University of Uyo Teaching Hospital, which is located in the Uyo Local Government Area of Akwa Ibom State. Uyo is one of the local government areas and also the capital city of Akwa Ibom state in the South-southern part of Nigeria, with a projected population of 390,400 as of 2022 (24). University of Uyo Teaching Hospital, the only tertiary hospital in Uyo, is a healthcare setting with a 500-bed capacity and 21 clinical and 4 non-clinical departments, besides several support units, rendering general outpatients and specialist clinics on weekdays from 8 am to 4 pm and 24-hour emergency services for all age groups (25). The Environmental Health and Safety Unit is saddled with the responsibility of keeping the hospital surroundings clean (25). At the time of the study, the total number of healthcare waste handlers was 140, grouped into four zones. Zone A comprised of those working at the ground floor GOPD, Histopathology, Memorandum of Understanding office, Human Resource (first floor of the Administrative block), Microbiology and Haematology laboratories, Community Health complex, Physiotherapy unit, HIV unit, Radiology complex, Administrative block reception, gate entrance and car park, and Dental clinic.

Zone B comprised those working at the Antenatal care unit, Maternity theatre, works department, dietetic kitchen, Paediatric ward, dialysis, medical block, Isolation centre, and Inside walkways.

Zone C comprised those working at the NHIS, ENT/ Eye clinic, dumpsite, mortuary, store, picking, orthopaedics, PCR laboratory, Mother's lodge, TB lab, Mental health, Oxygen plant, and Powerhouse.

Zone D comprised those working at the Accident and Emergency unit, Intensive care Unit, Main theatre, New theatre, and Surgical block/ Gynaecology ward.

Study design

This was a descriptive cross-sectional study carried out among healthcare waste handlers in the University of Uyo Teaching Hospital between June and August 2024.

Inclusion criteria

All healthcare waste handlers in the University of Uyo Teaching Hospital who consented to participate in the study.

Exclusion criteria

Healthcare waste handlers who had worked for less than 6 months, were sick or on leave during the study period, and non-consenting members of the study population were excluded from the study.

Sample Size Determination and Sampling Technique

A sample size calculation for cross-sectional studies was carried out using the formula for estimating a single proportion (26), with a prevalence (p) of 0.05 being the proportion of healthcare waste handlers with injuries from sharps from a previous Indian study (15), with the assumption of z of 1.96 and sampling error of 5%. This was subsequently adjusted for a population less than 10,000 to give a total sample size of 53 after 10% overestimation to account for non-response.

A stratified random sampling technique was utilised to recruit consenting participants for the study. The comprehensive list of healthcare waste handlers and their identifiers was obtained from the Environmental Health and Safety Unit of the facility and was grouped into four zones (Zones A-D) according to their work locations.

A proportionate allocation was used to determine the number of respondents to be selected across the four zones (Zones A-D) based on the calculated sample size above. The minimum number of participants from each level was determined by dividing the population of the healthcare waste handlers in each zone by the total number of healthcare waste handlers in the hospital and multiplying by the adjusted total sample size. Thus, out of a total of 31 (Zone A), 35 (Zone B), 29 (Zone C), and 45 (Zone D), a minimum of 12, 13, 11, and 17 participants were required, respectively. These participants were selected by a simple random sampling method using a computer-generated table of random numbers for each zone.

Data Collection Tools and Procedures
Data were collected using an interviewer-administered questionnaire, which was designed and partly adapted from a previous study after a thorough literature review and evaluation by professionals in public health to ensure quality and content validity (27).
The questionnaire consisted of 6 sections (A-F), with each section addressing each specific objective and an additional section for demographic data. Section A obtained participants' sociodemographic data while Sections B, C, D, E, and F assessed the prevalence of occupational health injuries, the level of awareness of risk associated with exposure to workplace hazards, the availability of safety measures and use of PPEs, factors influencing the utilisation of PPEs and the level of reporting of occupational-related injuries among participants, respectively.
Seven final year medical students who were trained on questionnaire administration were involved in data collection. The sampled staff were identified, and those were the ones interviewed at their location of duty.

Data processing and analysis
The data obtained was cleaned, summarised and analysed using STATA 16.0 Windows and Microsoft Excel versions 2019. Quantitative data were summarised using mean and median as measures of central tendency and standard deviation and interquartile ranges, respectively, as measures of dispersion. Categorical data were summarised using proportions and percentages. The association between selected variables and use of PPEs was determined using Chi-square or Fisher's exact test at a p-value < 0.05. Variables found to be associated with use of PPE at the level of significance of <0.1 at the bivariate analysis were selected and entered into the multivariable binary logistic regression model. Participants who used three or more PPEs were regarded as having adequate use of personal protective equipment.

Study limitations
There was the issue of recall bias, which can affect the validity of the data obtained; hence, the questionnaire was made to comprise questions that are clear and precise to reduce variation in comprehension.
Finally, participants were unwilling to disclose certain illnesses. This was tackled by reiterating that the information given by them will be treated with utmost confidentiality.

Results

Socio-demographic characteristics of respondents
This study recruited 53 participants with a mean age of 31.6 ± 11.3 years. More than half were females (32; 60.4%). Thirty-one (58.4%) had a secondary level of education, and 29 (54.7%) were single, while 50.9% had less than 5 years of job experience. (Table 1)

Table 1. Sociodemographic characteristics of participants (n = 53)

Variable	Frequency (%)	Mean (SD)
Age		31.6 (±11.3)
Gender		
Male	21 (39.6)	
Female	32 (60.4)	
Level of education		
No formal Education	1 (1.9)	
Primary	10 (18.9)	
Secondary	31 (58.4)	
Tertiary	11 (20.8)	
Number of years on the job		
<5	27 (50.9)	5.6 (±4.5)
5 – 10	16 (30.2)	
>10	10 (18.9)	
Marital status		
Single	29 (54.7)	
Married	20 (37.7)	
Separated	1 (1.9)	
Widow/Widower	3 (5.7)	

SD – Standard Deviation

Prevalence of Occupational Health Injuries
On the prevalence of occupational health injuries among participants, 23 (43.4%) reported having sustained injuries from sharps since they started working as waste handlers. However, 13 (24.5%) had sustained this injury from sharps within the last 6 months, out of which 9 (69.2%) resorted to self-care. The majority (18; 78.3%) stated that

treatment associated with injuries resulting from exposure to work hazards was self-sponsored. (Table 2)

Table 2. Prevalence of occupational health injuries among healthcare waste handlers (n = 53)

Variable		Frequency (%)
Ever sustained an injury from a sharp	No	30 (56.6)
	Yes	23 (43.4)
Sustained injury from sharps in the last 6 months	No	40 (75.5)
	Yes	13 (24.5)
If yes, place of treatment (n = 13)	Healthcare Facility	2 (15.4)
	Traditional	2 (15.4)
	Self-care	9 (69.2)
A person who bears the cost of treating an injury (n=23)	Self	18 (78.2)
	Employer	1 (4.4)
	Both	4 (17.4)

Level of awareness of the Risk associated with exposure to workplace hazards

The majority of the participants had never been screened for Hepatitis B and C (41; 77.3%). Also majority (44; 83.0%) stated that they were informed of the health hazards associated with healthcare waste handling at their employment. The top 5 diseases mostly identified to be due to exposure to biological hazards associated with waste handling among participants included HIV/AIDS (43; 81.1%), Diarrhoea (36; 67.9%), Malaria (35; 66.0%), Typhoid (35; 62.3%), and Cholera (32; 60.4%). However, less than half of participants identified Hepatitis B (26; 49.1%) and Hepatitis C (24; 45.3%) as a disease risk associated with their job. The commonest potentially infectious waste participants were exposed to were blood/body fluids 37, 69.8%), followed by sharps (20, 37.7%), while the commonest non-infectious hazardous waste participants were exposed to were pharmaceuticals/drugs (19, 35.8%). About half (28; 52.8%) did not know what pathological wastes. (Table 3)

Table 3. Level of screening and awareness of risks associated with exposure to different types of healthcare wastes (n = 53)

Variable		Frequency (%)
Ever screened for hepatitis B &C	No	41 (77.3)
	Yes	12 (22.7)
Ever screened for HIV	No	20 (37.7)
	Yes	33 (62.3)
Informed of the health hazards associated with healthcare waste handling at employment	No	9(17.0)
	Yes	44(83.0)
Knowledge that the following diseases can be from biological hazards associated with my occupation**	HIV/AIDS	43 (81.1)
	Diarrhoea	36 (67.9)
	Malaria	35 (66.0)
	Typhoid	33 (62.3)
	Cholera	32 (60.4)
	Lassa Fever	29 (54.7)
	Hepatitis B	26 (49.1)
	Hepatitis C	24 (45.3)
Potentially infectious waste is most exposed to**	Blood/body fluids	37 (69.8)
	Sharps	20 (37.8)
	Human anatomical waste	14 (26.4)
	Broken glasses	5 (9.4)
	Pathological wastes	2 (3.8)
	None	12 (22.6)
Non-infectious hazardous wastes are most exposed to	Pharmaceuticals (Drugs)	19 (35.8)
	Chemicals	8 (15.1)
	Radioactive waste	4 (7.5)
	None	22 (41.5)

** Multiple answers were allowed.

Availability of Safety measures and use of PPE
The majority of participants (49; 94.2%) washed their hands with water and soap after handling waste during working hours. Only 7 participants had been vaccinated against Hepatitis B (13.2%). About75.5% of participants reported that containers for disposal of healthcare waste were made of puncture-proof materials. (Table 4)

Table 4. Respondents' workplace practices and safety measures availability in the facility (n = 53)

Variable		Frequency (%)
Handwashing after handling waste during working hours	No	1 (1.9)
	Yes	52 (98.1)
If yes, with what do you wash your hands? (n = 52)	Water only	3 (5.8)
	Water and Soap	49 (94.2)
Vaccination against Hepatitis B?	No	46 (86.8)
	Yes	7 (13.2)
All types of colour-coded waste containers are located in appropriate areas where they are needed	No	38 (71.7)
	Yes	15 (28.3)
Sharp containers are made of puncture-resistant materials	No	17 (32.1)
	Yes	36 (67.9)
Formal or informal separation of waste takes place	No	28 (52.8)
	Yes	25 (47.2)
Presence of a separate storage area for healthcare waste	No	16 (30.2)
	Yes	37 (69.8)

More than half of the participants (34; 64.2%) stated a lack of awareness of safety protocols in the case of a needle prick injury. Thirty-six (67.9%) of them did not have a pre-employment medical screening, and more than 90% did not have any pre-placement medical screening. Furthermore, none of the participants had had a periodic medical screening since being employed. Thirty-four participants (64.2%) had received training on infection prevention and safety measures in the past year. (Table 5)
The most frequently used PPE was a Face mask (51; 96.2%), while the least used PPE was a Goggle (7; 13.2%). Twenty-six participants (49.1%) used three or more PPE. (Table 5)

Table 5. Workplace health and safety protocols and Use of PPE among participants (n = 53)

Variable		Frequency (%)
Availability of safety protocols in case of needle prick injury	No	34 (64.2)
	Yes	19 (35.8)
Pre-employment medical screening	No	36 (67.9)
	Yes	17 (32.1)
Pre-placement medical screening	No	48 (90.6)
	Yes	5 (9.4)
Periodic Medical Screening	No	53 (100.0)
Training on infection prevention and safety measures in the past year	No	19 (35.8)
	Yes	34 (64.2)
Frequency of training on PPE usage and infection prevention	Never	13 (24.5)
	Quarterly	7 (13.2)
	Biannually	4 (7.6)
	Annually	16 (30.2)
	Rarely	13 (24.5)
Type of PPE Used	Heavy-duty gloves	
	No	12 (22.6)
	Yes	41 (77.4)
	Gowns	
	No	39 (73.6)
	Yes	14 (26.4)
	Face masks	
	No	2 (3.8)
	Yes	51 (96.2)
	Long sturdy shoes	
	No	24 (45.3)
	Yes	29 (54.7)

	Goggles	
	No	46 (86.8)
	Yes	7 (13.2)
Number of PPE used	None	2 (3.8)
	1	5 (9.4)
	2	20 (37.7)
	≥3	26 (49.1)

Selected Factors Associated with the Utilisation of PPEs

Only having received training on infection prevention and safety in the last one year (χ^2 = 6.129, df = 1, p = 0.013), and being exposed to blood or body fluids while on duty (χ^2 = 2.908, df = 1, p = 0.088) were significantly associated with use of PPE at p-value <0.1 Other factors not predictive were gender (χ^2 = 0.154, df = 1, p = 0.695), Level of education (χ^2 = 3.808, df = 1, p = 0.244), and Number of years on job (χ^2 = 0.995, df = 1, p = 0.619). (Table 6).

Table 6. Factors associated with the utilisation of PPEs among participants (n = 53)

Variable		Use of PPE (n, %)		χ^2	p-value
		No (n = 27)	Yes (n = 26)		
Gender	Male	10 (47.6)	11 (52.4)	0.154	0.695
	Female	17 (53.1)	15 (46.9)		
Level of Education	None	1 (100.0)	0 (0.0)	3.808	0.244†
	Primary	6 (60.0)	4 (40.0)		
	Secondary	17 (54.8)	14 (45.2)		
	Tertiary	3 (27.3)	8 (72.7)		
Number of years on the job	<5	12 (44.4)	15 (55.6)	0.995	0.619 †
	5 – 10	9 (56.3)	7 (43.7)		
	>10	6 (60.0)	4 (40.0)		
Ever sustained injury from sharps while on duty	No	15 (50.0)	15 (50.0)	0.025	0.875
	Yes	12 (52.2)	11 (47.8)		
Informed about the health hazards associated with healthcare waste handling at employment	No	5 (55.6)	4 (44.4)	0.092	0.761
	Yes	22 (50.0)	22 (50.0)		
Training on infection prevention and safety measures in the past year	No	14 (73.7)	5 (26.3)	6.129	0.013
	Yes	13 (38.2)	21 (61.8)		
Exposure to blood/body fluids while on duty	No	11 (68.7)	5 (31.3)	2.908	0.088
	Yes	16 (43.2)	21 (56.8)		

† Fisher's exact test.

Only receiving training on infection prevention and safety measures was found to significantly predict use of PPE in a multivariable regression model at p < 0.05 (AOR = 3.87 [1.064, 14.069], p = 0.04). (Table 7)

Table 7. Multivariable binary logistic regression of factors associated with the use of PPE (n = 53)

Variable	Odds Ratio [95% CI]			
	COR	p-value	AOR	p-value
Training on infection prevention and safety measures in the past year?				
No	1		1	
Yes	4.52 [1.318, 15.526]	0.016*	3.87 [1.064, 14.069]	0.040*
Ever been exposed to blood/body fluids while on duty?				
No				
Yes	1		1	
	2.89 [0.835, 9.990]	0.094	2.37 [0.620, 9.041]	0.208

COR: Crude Odds Ratio; AOR: Adjusted Odds Ratio; * p significant at < 0.05

Discussions

This study was conducted among 53 healthcare waste handlers, of whom more than half were females (60%) with a mean age of 31.6 ± 11.3 years and is similar to the study in Bhutan, where about half of the respondents were females (54.1%) with a mean age of 32.2 (±7.67) (28). This similarity in the age distribution is possibly because the larger proportion of the workforce, particularly in developing countries, falls within this age bracket.

From our study, 43.4% of the respondents had ever sustained an injury from sharp objects since they started working as healthcare waste handlers. However, only about a quarter of participants had sustained injury from sharps in the last 6 months. This contrasts with findings from a similar study conducted among 79 medical waste handlers in Ahmadu Bello University, Zaria, where almost two-thirds of the respondents (60.8%) had had an injury in the previous 6 months (29). The reason for this high prevalence could be low utilisation of PPEs or high reporting rates among the respondents in that study. Other reasons may be their level of education and lack of infectious disease training upon resumption of duty.

Our study also revealed that 7 out of every 10 respondents who had sustained injuries from sharps resorted to self-care, while only 15.4% resorted to a healthcare facility. Also, three-quarters of the respondents were found to bear the whole cost of treatment for injuries sustained. This was not surprising, as more than 60% reported a lack of awareness of safety protocols in the case of a needle prick injury. Again, this contrasts with findings from a study in Ahmadu Bello University, Zaria, where 45.6% of the respondents received treatment at the workplace (29). This could be a result of policies put in place to ensure that the waste handlers receive proper healthcare services in that hospital, or unawareness of the policies in the present study.

Regarding the awareness of risks associated with exposure to workplace hazards, the majority of respondents (83.0%) stated that they were informed of the health hazards associated with healthcare waste handling at employment. This was not in keeping with a study done in Bhutan, where 56.8% of respondents had not received any waste management-related training/education (28). This great disparity could be a result of different levels of training and also because the present study is more recent, hence workplace hazard consciousness may generally be higher. Despite receiving information on hazards by respondents in the present study at the point of employment, less than half of them identified Hepatitis B and Hepatitis C as potential diseases that could be associated with their occupation, and only about one tenth were immunised against Hepatitis B. This clearly shows the need for periodic training of this group of workers.

Furthermore, the commonest potentially infectious waste participants were exposed to was blood/ body fluid (69.8%), followed by sharps (37.7%). This is similar to a study done in Port Harcourt, Nigeria, where exposure to potentially infectious body fluid accounted for the highest proportion (33.3%), followed by needle stick prick (32.6%) (30). A higher proportion of respondents in the present study were, however, exposed to body fluid compared to the Port Harcourt study. This may be due to a higher level of training (74.2%) and eagerness for training (98%) on Infection prevention and patient safety standards in the latter study, or maybe a lack of segregation of waste in the present study.

Our study revealed that the majority of respondents, 94.2% washed their hands with water and soap after handling waste during working hours. This is in contrast with a study done in Bhopal District, where 38.7% of waste handlers washed their hands with only water, while 30.8% washed with soap and water, and 28.5% did nothing (31). This disparity suggests that the respondents in the present study may have benefited from stricter workplace policies or a stronger cultural emphasis on hygiene compared to the participants in the latter study.

It was also revealed that the most frequently used PPE was a face mask (96.2%), while the least was goggles (13.2%). Almost half of the participants used three or more PPEs, while 50.9% were deficient in one or two PPEs. In a similar study done in selected hospitals in Ota, Nigeria, on the usage of personal protective equipment (PPE), 42.9% of healthcare waste handlers made use of all the materials; 18.4% used all the PPE except overall; boots and nose guards were used by 4.1%; 14.3% used all the gears except gloves. It is well established that 57.1% of the cleaners in the selected hospitals were deficient in the use of one or two of the PPE (32). These differences in the utilisation of PPE may be a result of areas of duty and perceived risks.

Furthermore, less than one-fifth of waste handlers in the present study (18.9%) had ever reported an occupational injury. In a similar study done in Abuja, Nigeria, only 11% of the healthcare waste handlers working in public hospitals and 9% of those working in private hospitals reported cases of needle stick injury (33). The level of reporting in our study, although slightly higher compared to the latter study, is still inadequate. This may be attributed to a lack of awareness about injury reporting procedures,

workplace safety concerns or barriers in reporting injuries within the study populations.
Finally, training on infection prevention and safety measures was found to significantly predict the use of PPE in the model. This is similar to the study analysis done in Southwest Ethiopia, where safety practice was significantly associated with training on infection prevention and safety measures (AOR 2.57 (1.25, 5.29) (34). This stresses the need for adequate periodic training of healthcare waste handlers and regular monitoring to ensure adherence.

Conclusion

This study revealed that almost half of the participants reported sustaining injury from sharps since they started working as healthcare waste handlers, with the majority resorting to self-care. Although awareness of workplace hazards was high, screening and vaccination against Hepatitis B remained low at 22.7% and 13.2%, respectively. The most common exposures were to blood and body fluids (69.8%) and sharps (37.7%). Importantly, receiving training on infection prevention and safety measures was found to significantly predict the use of PPE.
Findings from the study underscore the importance of periodic training on infection prevention and safety measures, as it predicts the use of PPE. Hence, healthcare waste management companies and healthcare facilities should institute measures to bring forth this training.

Declaration

Ethics Approval and Consent to Participate

This study was approved by the Health Research Ethics Committee of the University of Uyo Teaching Hospital (UUTH/AD/S/96/VOL.XXI/911). All participants gave informed consent before completing the questionnaire after the objectives of the study had been carefully explained, and they were assured of confidentiality, fairness, respect for autonomy and anonymity.

Consent for publication

All authors, having met the authorship criteria, approved the manuscript, confirming that it represents honest and original work.

Availability of Data and Materials

The datasets generated and/or analysed during the current study are available from the corresponding author upon reasonable request.

Competing Interest

The authors declare that there are no conflicts of interest related to this study

Funding

This research received no external funding.

Authors' Contributions

JOE was involved in the conceptualisation and supervision of the entire research work and manuscript preparation, critically revising the manuscript for intellectual content. GEE was involved in conceptualisation, design, literature review, data collection, presentation of the initial research work and drafting of the manuscript. MAM, EAO, EDU, AUS, AKN, IEL were involved in research conceptualisation, design, literature review, data collection, data analysis and presentation of the initial research work from which this manuscript was prepared.

Acknowledgement

Nil.

List of Abbreviations

AOR: Odds Ratio
COR: Crude Odds Ratio
ENT: Ear, Nose, and Throat
GOPD: General Out-Patient Department
HBV: Hepatitis B Virus
HIV: Human Immunodeficiency Virus
AIDS: Acquired Immunodeficiency Syndrome
IQR: Interquartile Range
NHIS: National Health Insurance Scheme
PPE: Personal Protective Equipment
SD: Standard Deviation
TB: Tuberculosis

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