J. Appl. Health Sci. Med., 5(6):21–30, 2025. DOI: 10.58614/jahsm564

Journal of Applied Health Sciences and Medicine

Journal name homepage: https://www.jpub.org/journal-details.php?journal-id=39

ISSN (E): 2583-1887

Research Article

Assessing the knowledge and practices of healthcare workers at Osun State University Teaching Hospital (OSUTH) regarding healthcare waste management

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Article Info

Keywords: *Healthcare, Waste management*

Received: *12.04.2025*
Accepted: *09.06.2025*
Published: *21.06.2025*

Abstract

Background: Poorly managed hospital waste exposes healthcare workers, waste handlers, and the community to infections, toxic effects and injuries and may damage the environment. This study assessed the knowledge and practices of healthcare workers at Osun State University Teaching Hospital (OSUTH) regarding healthcare waste management.
Method: A total of 500 health care workers were interviewed for this study. Data was collected through the use of a structured questionnaire.
Result: Majority of the respondents were female nurses or midwives, with a considerable portion holding degrees or higher qualifications. The average age of the respondents is approximately 33 years, with a mix of experience levels. The level of knowledge regarding healthcare waste management was found to be good among 70.2% of the participants. However, the study revealed that while demographic factors like age, sex, and education had minimal impact on waste management practices, work experience and knowledge significantly influenced these practices. Specifically, those with more experience (especially over five years) and better knowledge were more likely to engage in effective waste management. 48.6% have a positive attitude, while 51.4% exhibit a negative attitude. Also, 305 (61%), possess a good level of practice, while 195 (39%) exhibit a poor level of practice. Healthcare workers' educational attainment, work experience, and knowledge with their practices in healthcare waste management.
Conclusion: The findings indicate that educational attainment, work experience, and knowledge are significant factors influencing the effectiveness of healthcare waste management practices among workers at Osun State University Teaching Hospital, Osogbo. The findings highlight the importance of enhancing knowledge and experience among healthcare workers to improve waste management practices, while also indicating that demographic factors may not play as significant a role as previously thought. The study calls for targeted training and educational programs to bolster waste management practices in healthcare settings.

How To Cite: O.P. Oladeji, O.T. Alex, O.J. Adedayo, M. Mayowa, A. Olakunle and A.H. Adetayo. Assessing the knowledge and practices of healthcare workers at Osun State University Teaching Hospital (OSUTH) regarding healthcare waste management. *Journal of Applied Health Sciences and Medicine*, 5(6):21–30, 2025. https://doi.org/10.58614/jahsm564

1. Introduction

The handling of medical waste has emerged as a significant challenge for healthcare facilities globally. Insufficient knowledge, inappropriate worker attitudes and behaviors, and inadequate waste management services exacerbate the issue. Health care personnel, especially trash handlers, primarily engaged in waste management services and the mitigation of potential risks [1]. Numerous studies indicate that the amounts of various waste elements, along with their handling, treatment, and disposal procedures, fluctuate between hospital settings and that these approaches are often insufficient in the majority of cases. The study indicated that the dangers linked to inadequate healthcare waste management and relevant deficiencies in current systems have been recognized by numerous studies as primary concerns for public health and living circumstances [2], [3] and [4]. The primary reasons leading to inadequate management of healthcare waste encompass healthcare personnel's knowledge, attitudes, and behaviors across various healthcare environments [5]. The healthcare team must possess adequate knowledge, maintain positive attitudes towards the necessity of clean environments, and execute timely actions to properly manage medical waste, thereby positively influencing individuals, the community, and the environment [6]. Healthcare workers with training in HCW management were more inclined to exhibit effective behaviors in safeguarding individuals' health. They effectively used their training6. Inadequately handled hospital waste endangers healthcare personnel, waste handlers, and the community by exposing them to diseases, harmful repercussions, and injuries, while also being a threat to the environment. Furthermore, it may facilitate opportunities for the collecting, resale, and eventual re-utilization of disposable medical equipment, particularly syringes, without sterilisation [7]. This may exacerbate the illness burden in Nigeria, where inadequate injection safety practices and healthcare waste management constitute a significant health issue [8]. Health issues linked to inadequate collection, treatment, and disposal of healthcare waste encompass typhoid fever, cholera, dermatological conditions, malaria, intestinal parasitosis, and hepatitis [9], [10]. Medical and ancillary workers, along with sanitary laborers, may sustain injuries during waste management if the waste is not securely contained, such as being improperly gathered in safety boxes or if these boxes are overfilled. Disease transmission typically happens via injuries from infected sharp objects. The general public can be infected directly or indirectly via several contamination routes, such as through punctures, abrasions, or cuts in the skin, mucous membranes, inhalation, and ingestion. It is essential to evaluate the most economical and sustainable methods for the management, collection, and disposal of healthcare waste at Osun State University Teaching Hospital, Osogbo. Furthermore, insufficient research, the absence of suitable and contemporary technologies, limited capacity among health stakeholders, inadequate partnerships, and poor information dissemination among relevant health sector stakeholders impede the effective implementation of strategies to address the waste management issue. At present, there are no targeted research examining the influence of knowledge bases, attitudinal expositions, and working styles of healthcare personnel associated with healthcare waste management specifically at Osun State University Teaching Hospital, Osogbo. This study evaluated the influence of knowledge bases, attitudes, behaviors, and work modalities of healthcare professionals regarding healthcare waste management at Osun State University Teaching Hospital, Osogbo.

2. Materials and Methods

2.1. Study settings and design

The study was a cross-sectional design, which involves collecting data from a sample population. The study was conducted at Osun State University Teaching Hospital, Osogbo. UNIOSUN Teaching Hospital (formerly known as LAUTECH Teaching Hospital) is a state-owned medical teaching hospital located in Osogbo, Osun State, Nigeria to provide tertiary health care and support undergraduate medical students from Osun State University.

2.2. Study population

The study population for this research comprises healthcare workers at Osun State University Teaching Hospital (OSUTH), Osogbo. This includes a diverse group of professionals who are directly or indirectly involved in the handling, management, and disposal of healthcare waste. The inclusion of various categories of healthcare workers ensures a comprehensive assessment of healthcare waste management practices across the hospital. Categories of Healthcare Workers Included: Doctors, Nurses, Laboratory Technicians, Housekeeping Staff, Pharmacists, Radiology Technicians, waste handlers, and Support Staff. Staff on leave during the data collection period, a decline to participate or are unwilling to provide informed consent were excluded from the study.

2.3. Sampling methods and sample size determination

Convenience sampling was chosen for this study because it allows for the practical and feasible recruitment of participants who are readily accessible and willing to participate. A total of 500 health workers participated in this study.

2.4. Data collection tool

The research instrument used in this study is a structured questionnaire designed to assess the knowledge and practices of healthcare waste management among healthcare workers at Osun State University Teaching Hospital (OSUTH), Osogbo. The question was divided into three sections: A contains Demographic Information, B Knowledge Assessment, C Attitude assessment and D. Practice Assessment.

2.5. Data collection procedures

The initial step involves obtaining necessary approvals and ethical clearance from relevant authorities and ethical review boards.

The structured questionnaires was administered in paper formats The questionnaires was distributed during staff meetings, through the hospital's intranet system, and by placing them in strategic locations within the hospital, such as staff lounges and departmental offices. Participants were given adequate time to complete the questionnaires, with reminders sent to ensure a high response rate.

2.6. Statistical analysis

All data collected during the study were recorded on paper forms and then transferred onto a secure digital platform for storage and analysis. The digital data stored in a password-protected database and backed up regularly to ensure data security.

All completed copies of the questionnaire and other data collected were analyzed with the use of Statistical Package for Social Sciences (SPSS) 28.0 version.

Descriptive Statistics such as frequencies, percentages, means, and standard deviations to summarize the socio-demographic characteristics of the study participants. Tables and graphs to visually represent the distribution of responses for demographic information, knowledge levels, and practice patterns. Inferential Statistics to determine relationships and differences between variables. chi-square tests to examine associations between categorical variables (e.g., job role and knowledge level).

2.7. Ethical consideration

Ethical approval for this study was obtained from Osun State University Teaching Hospital (OSUTH) Ethical Review Committee. Informed consent was obtained from all participants before their involvement in the study.

3. Results

A total of 500 participated in the study in table 1; their mean age was 32.99 $\pm$ 5.907 years. About 67.2% of the study participants were female and 69.4% identified to be Nurses/Midwifery with a tertiary level of education Degree/HND 64.2%.

Table 1: Demographic Characteristics of Health Care Workers in Osun State University Teaching Hospital (OSUTH)

Variables	Frequency	Percentage (%)
Age $\pm$ S.D	32.99 $\pm$ 5.907	
20-29	68	13.6
30-39	369	73.8
40-49	56	11.2
50-59	7	1.4
Sex		
Male	164	32.8
Female	336	67.2
Field Profession		
Clinicians	41	8.2
Nurse / Midwife	347	69.4
Pharmaceutical Personnel	34	6.8
Laboratory Personnel	57	11.4
Cleaners	21	4.2
Highest Level of Education		
Primary	2	0.4
Secondary	14	2.8
Diploma	78	15.6
Degree /HND	321	64.2
Postgraduate	85	17.0
How Long Have You Been Working As A Health Care Worker		
1	17	3.4
2	32	6.4
3	30	6
4	17	3.4
5	281	56.2
$\leq$9	118	23.6
$\geq$10	5	1

Source: Field Survey 2024

In table 2 and figure 1 shows that the most workers (58.4%) recognize that improper waste management can cause hazards, while 31.8% believe it does not, and 9.8% are unsure. Majorities (59.6%) are aware of government guidelines for BMW management, but 32% are not, and 8.4% are uncertain. When asked about healthcare waste disposal methods, nearly half (49.8%) hand it over to biomedical waste managers, 20.8% dump it directly into garbage bins, 18% use other methods, and 11.4% give it to garbage collectors.

Regarding sharp injuries, 55.6% correctly indicated that the appropriate response includes washing the area, applying antiseptic, reporting the incident, and covering the wound. In terms of pharmaceutical waste disposal, 54.6% opt for incineration, 27% prefer sewer disposal, 15% choose burial, and 3.4% favor landfills.

When disposing of blood-soaked materials, 68% use infectious waste bins (biohazard), while 26.2% use general waste bins, 3% use chemical waste bins, and 2.8% use sharps containers. The maximum allowable storage time for healthcare waste is seen by 55% as 24 hours, while 32% suggest 48 hours, 12.2% think it is 72 hours, and 0.8% believe it is one week. In the event of a chemical spill, 56% would contain the spill first, 23.4% would evacuate the area, 14.2% would notify the supervisor, and 6.4% would clean the spill immediately. The level of

Table 2: Knowledge of Health Care Waste Management in Osun State University Teaching Hospital, Osogbo

Knowledge Questions	Frequency	Percent (%)
Can Improper Waste Management Cause Hazard		
No	159	31.8
Yes	292	58.4
I don't Know	49	9.8
Do You Know About Any Government Guideline For BMW Management?		
No	160	32
Yes	298	59.6
I don't Know	42	8.4
Disposal Of Health Care Waste?		
Dumping Directly into Garbage Bins	104	20.8
Handing it over to Garbage Collectors	57	11.4
Handing Over to the Bio-medical Waste Mange	249	49.8
Other methods	90	18
Is Maintaining A BMW Records Mandatory In Your Hospitals/ Clinic?		
No	289	57.8
Yes	166	33.2
I don't Know	45	9
Does Improper Waste Management Cause Environmental		
No	203	40.6
Yes	278	55.6
I don't Know	19	3.8
What Is The Correct Protocol For Handling A Sharps Injury		
Immediately wash the area with soap and water	17	3.4
Apply antiseptic and cover with a bandage	278	55.6
Report the incident to a supervisor	126	25.2
All of the above	79	15.8
What Is The Appropriate Method For Disposing Of Pharmaceutical Waste?		
Incineration	273	54.6
Landfill	17	3.4
Sewer Disposal	135	27
Burial	75	15
What Type Of Waste Container Should Be Used For The Disposal Of Blood-Soaked Materials?		
General waste bin	131	26.2
Infectious waste bin (biohazard)	340	68
Chemical waste bin	15	3
Sharps container	14	2.8
How Frequently Should Healthcare Waste Be Collected And Transported From The Point Of Generation To The Storage Area?		
Daily275	275	55
Every 2-3 days	158	31.6
Weekly	36	7.2
When Full	31	6.2
What Is The Maximum Allowable Storage Time For Healthcare Waste Before It Must Be Treated Or Disposed Of?		
24 hours	275	55
48 hours	160	32
72 hours	61	12.2
One week	4	0.8
In The Event Of A Chemical Spill Involving Healthcare Waste, What Is The First Step To Be Taken?		
Evacuate the area	117	23.4
Contain the spill	280	56
Notify the supervisor	71	14.2
Clean the spill Immediately	31	6.4

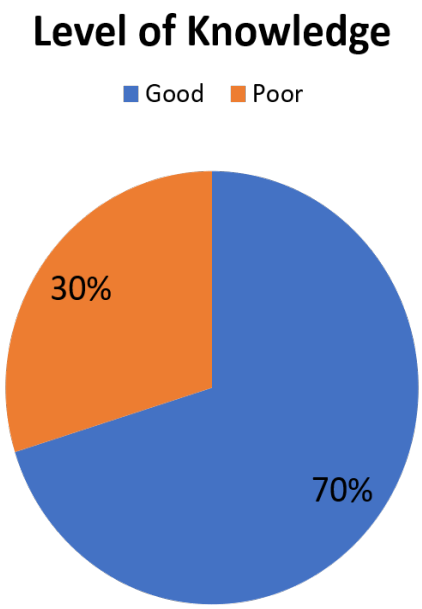

Figure 1: Level of Knowledge of Health Care Waste Management in Osun State University Teaching Hospital, Osogbo

knowledge of health care worker in regards to waste management a total of 70.2% of the workers demonstrated a good level of knowledge, while 29.8% showed poor knowledge.

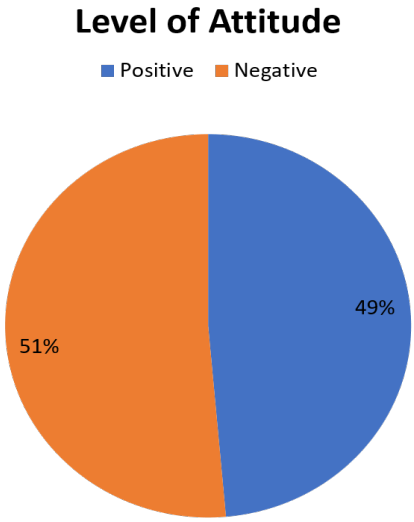

Figure 2: Level of Attitude of Health Care Waste Management

The attitude of healthcare workers at Osun State University Teaching Hospital, Osogbo, towards waste management shows that 59.6% of respondents do not consider safe management of healthcare waste a personal issue, while 40.4% believe it is table 3 and figure 2. When asked if healthcare waste management is the responsibility of the government, 55% agreed, while 45% disagreed. Most workers (57.2%) view waste management as a team effort, with no single class of people being solely responsible, while 42.8% disagreed. The level of attitude towards healthcare waste management among healthcare workers at Osun State University Teaching Hospital reveals that 48.6% have a positive attitude, while 51.4% exhibit a negative attitude.

Table 3: Attitude of Health Care Worker towards Waste Management in Osun State University Teaching Hospital, Osogbo

Attitudinal Questions	Frequency	Percent (%)
Safe Management Of Health Care Waste Is Not An Issue Me At All?		
No	298	59.6
Yes	202	40.4
Safe Management Of Health Care Waste / BMW Is The Responsibility Of The Government?		
No	225	45
Yes	275	55
Waste Management Is Team Work / No Single Class Of People Is Responsible For Safe Management?		
No	214	42.8
Yes	286	57.2
Safe Waste Management Efforts By Hospitals Increases Financial Burden On Management?		
No	223	44.6
Yes	277	55.4
Safe Management Of Health Care Waste / BMW Is An Extra Burden On Work?		
No	243	48.6
Yes	257	51.4

Variables	Frequency	Percent (%)
How Frequently Are Healthcare Waste Disposal Bins Emptied In Different Departments Of The Hospital?		
Hourly	261	52.2
Daily	122	24.4
Weekly	112	22.4
Monthly	5	1
Are There Designated Areas For Storing Different Categories Of Healthcare Waste In Our Hospital?		
No	156	31.2
Yes	287	57.4
I don't know	57	11.4
How Often Are Audits Conducted To Assess The Effectiveness Of Healthcare Waste Management Practices?		
Daily	114	22.8
Weekly	272	54.4
Monthly	93	18.6
Yearly	21	4.2
Is There Any Segregation Of The Waste Before Its Disposal?		
No	289	57.8
Yes	211	42.2
Are Different Coloured Bags Used To Segregate And Dispose Different Types Of BM Waste?		
No	188	37.6
Yes	250	50
I don't know	62	12.4
Are There Separate Containers For Different Types Of Wastes?		
No	200	40
Yes	300	60
Are The Waste Collection Containers Enough?		
No	300	60
Yes	200	40
Are The Waste Collection Containers Suitably Located		
No	227	45.4
Yes	273	54.6
Are the containers above labelled appropriately?		
No	241	48.2
Yes	259	51.8
Are The Waste Collection Containers Above In Good Condition?		
No	268	53.6
Yes	232	46.4

Are Wastes Separated Before Disposal?		
No	180	36
Yes	320	64
Has The Institution Any Complaints From The General Public About Waste Disposal Method Used?		
No	251	50.2
Yes	249	49.8
Do You Use Personal Protective Equipment (PPE) While Handling Healthcare Waste?		
Always	102	20.4
Often	113	22.6
Sometimes	258	51.2
Rarely	24	4.8
Never	5	1
How Do You Transport Healthcare Waste Within The Hospital?		
Trolleys	86	17.2
By hand	86	17.2
Dedicate waste Transportation Cart	281	56.2
Others	47	9.4
Are There Any Challenges You Face In Managing Healthcare Waste?		
Lack of training	63	12.6
Inadequate Resources	115	23
Insufficient PPE	257	51.4
Lack of awareness	40	8
Others	25	5

Table 4: Health Care Waste Management practices in Osun State University Teaching Hospital, Osogbo

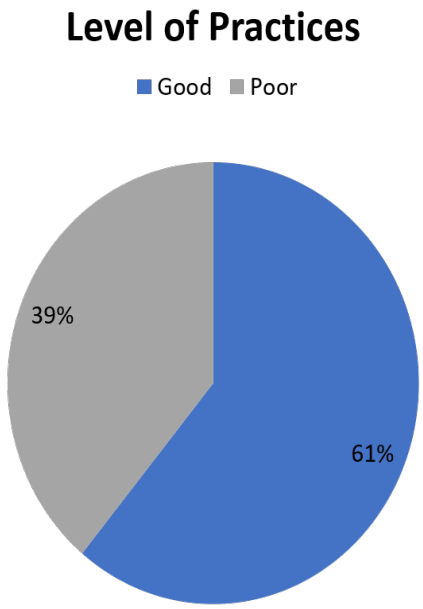

Figure 3: Level of Practice Health Care Waste Management practices in Osun State University Teaching Hospital, Osogbo

The assessment of healthcare waste management practices. A significant majority, 52.2%, indicated that healthcare waste disposal bins are emptied on an hourly basis, while 24.4% reported daily emptying, and 22.4% said weekly, with only 1% noting a monthly schedule table 4 and figure 3. Most respondents, 57.4%, affirmed that designated areas for storing different categories of healthcare waste exist within the hospital, although 31.2% disagreed and 11.4% were unsure. Personal protective equipment (PPE) usage while handling healthcare waste was varied: 20.4% always use it, 22.6% often do, while 51.2% sometimes, and 4.8% rarely or never use PPE. Waste transportation methods include using dedicated waste transportation carts (56.2%), with 17.2% using trolleys or transporting by hand. Challenges faced in managing healthcare waste include insufficient PPE (51.4%), inadequate resources (23%), and a lack of training (12.6%). the evaluation of healthcare waste management practices at Osun State University Teaching Hospital indicates that a majority of respondents, 305 (61%), possess a good level of practice, while 195 (39%) exhibit a poor level of practice.

Table 5: Factors That Affect Health Care Waste Management Practices in Osun State University Teaching Hospital, Osogbo

Variables	COR	Pvalue	AOR	P Value
Age				
20-29	1.646(0.298,9.105)	0.568	1.59(0.203,12.43)	0.659
30-39	1.60(0.306,8.36)	0.577	1.343(0.19,9.487)	0.768
40-49	1.618(0.288,9.082)	0.585	1.25(0.18,8.67)	0.821
50-59	1		1	
Sex				
Male	1.040(0.71,1.53)	0.839	1.075(0.73,1.6)	0.720
Female	1		1	
Field Profession				
Clinicians	0.944(0.326,2.74)	0.916	0.954(0.318,2.86)	0.933
Nurse / Midwife	0.859(0.353,2.094)	0.739	0.835(0.33,2.1)	0.702
Pharmaceutical Personnel	1.185(0.396,3.545)	0.761	1.16(0.374,3.59)	0.801
Laboratory Personnel	0.567(0.202,1.593)	0.028*	0.522(0.179,1.59)	0.026*
Cleaners	1		1	
Highest Level of Education				
Primary	0(0)	0.999	0(0)	0.999
Secondary	0.663(0.192,2.289)	0.515	0.634(0.177,2.27)	0.484
Diploma	1.28(0.684,2.395)	0.440	1.25(0.656,2.36)	0.501
Degree /HND	1.03(0.628,1.695)	0.910	1.008(0.609,1.667)	0.976
Postgraduate	1		1	
How Long Have You Been Working As A Health Care Worker				
1	0.608(0.201,1.837)	0.377	0.509(0.14,1.84)	0.304
2	1.134(0.515,2.497)	0.754	1.037(0.397,2.712)	0.941
3	1.115(0.496,2.507)	0.792	1.085(0.429,2.745)	0.863
4	1.021(0.363,2.869)	0.969	0.932(0.304,2.86)	0.902
5	0.897(0.578,1.391)	0.017*	0.804(0.461,1.401)	0.022*
$\leq$9	0.365(0.040,3.363)	0.003*	0.429(0.037,5.005)	0.005*
$\geq$10	1		1	
Knowledge				
Good	0.702(0.476,1.037)	0.025*	0.735(0.492,1.098)	0.033*
Poor	1		1	
Attitude				
Positive	0.974(0.680,1.396)	0.888	0.986(0.679,1.43)	0.941
Negative	1		1	

Factors affecting healthcare waste management practices at Osun State University Teaching Hospital in table 5. Educational attainment demonstrated some significance; individuals with a secondary education had a COR of 0.663 (p = 0.515) and an AOR of 0.634 (p = 0.484), indicating no substantial impact on waste management practices. Those with diploma qualifications had a COR of 1.280 (p = 0.440) and an AOR of 1.250 (p = 0.501), while degree holders and those with postgraduate education showed no significant differences in practices.

The duration of work experience as a healthcare worker revealed more pronounced findings. Specifically, those with five years of experience had a significant COR of 0.897 (p = 0.017) and a significant AOR of 0.804 (p = 0.022), indicating that experience in the field influenced waste management practices. Furthermore, those who had worked for less than nine years had a COR of 0.365 (p = 0.003), emphasizing a strong relationship between the length of service and effective waste management practices. The findings indicates that while demographic factors such as age, sex, and education had minimal impact on healthcare waste management practices, the duration of work experience and knowledge significantly influenced these practices at Osun State University Teaching Hospital.

4. Discussion

The study's findings indicate a predominantly positive knowledge, with 58.4% acknowledging the dangers of inadequate waste management and 59.6% recognizing government regulations. Nevertheless, approximately half (49.8%) indicated employing diverse disposal techniques, signifying discrepancies in practices. In total, 70.2% of respondents exhibited a commendable level of knowledge, whilst 29.8% shown inadequate comprehension, underscoring the necessity for continuous education and training programs to guarantee the consistent implementation of appropriate waste management methods throughout the workforce. This aligns with a survey conducted in Bhutan, which found that approximately 74.4% are knowledgeable about medical waste management, while 98.2% recognize the significance of utilizing appropriate personal safety equipment. Only 37.6% were aware that the maximum duration for retaining medical waste on hospital premises is 48 hours. Approximately 61.3% of the assessed units/wards/departments accurately sorted garbage in compliance with national criteria [11]. at contrast to a study conducted at a Nigerian hospital, the awareness of health waste management in that study was poor (41.5%) [12]. Furthermore, advanced educational levels are associated with increased understanding, consistent with research that underscores the significance of formal education in improving adherence to waste management guidelines. The survey revealed that 55% of respondents perceive safe waste management as exacerbating the financial burden on hospital administration, potentially fostering a negative disposition towards waste management procedures. The healthcare waste management methods at Osun State University Teaching Hospital (OSUTH) provide significant insights into the efficacy of existing protocols. A substantial majority of participants (52.2%) indicated that hospital waste

disposal bins are emptied hourly, reflecting a proactive waste management strategy. Nonetheless, 57.8% of participants saw an absence of waste segregation prior to disposal, which raises apprehensions over the efficacy of waste management procedures. Furthermore, although 57.4% confirmed the presence of designated zones for the storage of various categories of healthcare waste, some respondents conveyed doubts regarding the sufficiency and labelling of trash collection receptacles. Approximately 61% demonstrate a proficient level of practice. This parallels a study conducted in a Nigerian facility, where the percentage of responders exhibiting effective methods of healthcare waste management was 53.9% [12]. A total of 71.5% of Hungarian respondents exhibited favourable responses indicating effective practices in waste management, while Swedish healthcare workers demonstrated a 72.0% favourable response regarding practices related to healthcare waste management, encompassing activities such as waste segregation, utilisation of personal protective equipment, and infection prevention [13].

The survey indicated that a substantial majority of respondents (55%) reported producing above 2 kg but under 4 kg of garbage daily. The significant volume of garbage generated need appropriate management to reduce potential health concerns and environmental consequences. 25.8% of respondents indicated creating between 0-2 kg, implying heterogeneity in waste production, perhaps driven by factors such as departmental type, patient volume, and the sort of medical treatments conducted [14]. The waste disposal methods utilized for different categories of trash also indicate significant trends. The primary utilization of red bags (60.6%) for the disposal of used disposable plastic objects signifies an acknowledgement of the necessity for appropriate segregation of biomedical waste, as red bags are conventionally allocated for infectious waste.

5. Conclusion

This study has provided valuable insights into the knowledge, attitudes, and practices of healthcare workers at Osun State University Teaching Hospital (OSUTH) regarding healthcare waste management. With a majority of participants demonstrating good knowledge, the study found that work experience and knowledge significantly influence effective waste management practices. While demographic factors such as age, sex, and education played a minimal role, those with more than five years of experience and a higher level of knowledge were more likely to engage in better waste management practices. Despite a positive level of practice among 61% of healthcare workers, there remains room for improvement, particularly in addressing the negative attitudes and poor practices exhibited by a significant portion of the workforce.

The findings underscore the importance of continuous education and targeted training to enhance both knowledge and practical skills in healthcare waste management.

Recommendations

Based on the findings of this study, the following recommendations are proposed to improve healthcare waste management practices among healthcare workers at Osun State University Teaching Hospital (OSUTH). Targeted Training Programs, Regular and structured training sessions should be conducted to enhance the knowledge and practical skills of healthcare workers, especially in areas of waste segregation, disposal, and management. Continuous Professional Development, establish continuous education programs to ensure that healthcare workers stay updated on the latest guidelines and protocols in healthcare waste management. Mentorship and Peer Learning, encourage experienced healthcare workers to mentor their less-experienced colleagues in waste management practices. This peer-to-peer approach could help build practical skills and foster better waste management behaviors across all experience levels.

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