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Factors Influencing Proper Healthcare Waste Management Practices Among Healthcare Workers in Nigeria

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Abstract

Healthcare waste management (HCWM) is a critical component of public health and environmental safety, particularly in developing countries like Nigeria where improper disposal practices pose significant risks, and compliance among healthcare workers remains inconsistent despite the existence of national guidelines and global protocols. This study aimed to assess the factors influencing proper HCWM practices among healthcare workers in Nigeria, focusing on knowledge, attitudes, institutional support, and policy awareness. A cross-sectional survey was conducted among 300 healthcare workers across tertiary and secondary health facilities in Abuja, Lagos, and Kano. Data were collected using structured questionnaires covering demographic information, HCWM knowledge, attitudes, practices, and institutional factors, and were analyzed in SPSS v25 using chi-square tests and logistic regression to identify significant predictors of compliance. Among the respondents, 60% had received formal HCWM training,

70% were aware of HCWM guidelines, and 75% expressed positive attitudes toward waste management; however, only 55% practiced correct waste segregation and 50% reported adequate institutional support. Chi-square analysis revealed significant associations between HCWM training and proper waste segregation ($\chi^2 = 12.45$, $p < 0.01$), and between institutional support and PPE usage ($\chi^2 = 9.78$, $p < 0.05$). Logistic regression identified HCWM training (OR = 2.3, 95% CI: 1.5–3.6) and positive attitude (OR = 1.8, 95% CI: 1.2–2.9) as significant predictors of proper HCWM practices. The study concludes that training, institutional support, and attitudes are key determinants of HCWM compliance among healthcare workers in Nigeria, and that bridging the gap between knowledge and practice requires targeted interventions, infrastructure investment, and policy enforcement. Strengthening HCWM systems is essential for reducing occupational hazards, preventing environmental contamination, and promoting sustainable healthcare delivery.

Keywords: Healthcare Waste Management; Compliance; Healthcare Workers; Training; Institutional Support; Nigeria

INTRODUCTION

Healthcare waste (HCW) encompasses all forms of waste generated by healthcare facilities, including hospitals, clinics, laboratories, and research centers. This waste ranges from general non-hazardous materials to highly infectious, chemical, and radioactive substances. The management of HCW is a critical component of public health and environmental safety, as improper handling can lead to the spread of infectious diseases, environmental pollution, and occupational hazards for healthcare workers and waste handlers (Akinwale et al., 2020). Globally, the World Health Organization (WHO) estimates that 15% of healthcare waste is hazardous, requiring specialized treatment and disposal protocols (WHO, 2014).

In Nigeria, the challenge of healthcare waste management (HCWM) is compounded by infrastructural deficits, limited awareness, and inconsistent enforcement of regulations. Despite the existence of national guidelines such as the National Healthcare Waste Management Plan (Federal Ministry of Environment, 2013), many healthcare facilities lack the resources and training necessary to implement safe waste disposal practices. This has resulted in widespread environmental contamination, including the illegal dumping of medical waste in open spaces and water bodies, posing serious risks to public health and ecosystems (Olubukola, 2010; Ogunyemi et al., 2021).

The consequences of poor HCWM are particularly severe in densely populated urban centers and underserved rural areas, where healthcare infrastructure is overstretched and regulatory oversight is minimal. Healthcare workers, who are at the frontline of waste generation and disposal, often operate without adequate protective equipment, training, or institutional support. Studies have shown that lack of knowledge and negative attitudes toward HCWM significantly contribute to non-compliance with best practices (Abah & Ohimain, 2011; Olowoporoku, 2020). Moreover, the absence of color-coded bins, waste segregation protocols, and functional incinerators exacerbates the problem, leading to indiscriminate mixing of hazardous and non-hazardous waste.

Behavioral and systemic factors play a pivotal role in shaping HCWM practices. Healthcare workers' perceptions of risk, workload pressures, and cultural attitudes toward waste influence their compliance with safety protocols. Institutional factors such as leadership commitment, availability of resources, and regular training programs also determine the effectiveness of HCWM systems (Yusuf et al., 2022; Eze et al., 2018). In many Nigerian hospitals, HCWM is not prioritized, and waste management responsibilities are often delegated to poorly trained support staff, further undermining safety and accountability.

Internationally, countries with robust HCWM systems have demonstrated the importance of integrating policy, education, and infrastructure. For example, Ghana and Uganda have implemented national training programs and decentralized waste treatment facilities, resulting in improved compliance and reduced environmental risks (Kagonya et al., 2020; Nsubuga et al., 2019). Nigeria can draw valuable lessons from these models to strengthen its HCWM framework. Addressing the gaps in knowledge, infrastructure, and policy enforcement is essential for safeguarding healthcare workers and the communities they serve.

This study investigates the factors influencing proper HCWM practices among healthcare workers in Nigeria. By examining knowledge levels, attitudes, institutional support, and policy implementation, the research aims to identify key determinants of compliance and propose actionable recommendations. The findings will contribute to the development of targeted interventions and inform national strategies for improving HCWM, thereby enhancing public health outcomes and environmental sustainability.

Literature Review

Healthcare waste (HCW) refers to all waste generated by healthcare activities, including diagnosis, treatment, immunization, and research. It is broadly categorized into general (non-hazardous), infectious, pathological, sharp, chemical, and radioactive waste (World Health Organization [WHO], 2014). Each category poses varying degrees of risk to human health and the environment, necessitating tailored management strategies. Proper healthcare waste management (HCWM) encompasses a systematic process involving segregation, collection, storage, transportation, treatment, and final disposal (Bassey, Benka-Coker, & Aluyi, 2006). The effectiveness of HCWM depends on adherence to these steps and the availability of supporting infrastructure and policies.

In Nigeria, HCWM practices remain suboptimal despite the existence of national guidelines and international protocols. Studies have consistently reported poor segregation of waste, indiscriminate disposal, and lack of protective equipment among healthcare workers (Okechukwu, Onyenwenyi, & Nwankwo, 2019; Olubukola, 2010). These deficiencies are often attributed to limited awareness, inadequate training, and infrastructural challenges. For instance, many facilities lack color-coded bins, incinerators, and secure storage areas, leading to unsafe disposal methods such as open burning and dumping in municipal landfills (Olubukola, 2010).

Key Influencing Factors

Knowledge and Training:

Knowledge of HCWM protocols significantly influences compliance among healthcare workers. Abah and Ohimain (2011) found that healthcare professionals with formal training in waste management demonstrated higher adherence to segregation and disposal guidelines. Similarly, Yusuf et al. (2022) emphasized the role of continuous professional development in reinforcing safe practices, noting that trained staff were more likely to use personal protective equipment (PPE) and follow waste handling procedures.

Attitudes and Perceptions:

Attitudinal factors also play a critical role in HCWM. Olowoporoku (2020) reported that healthcare workers who perceived HCW as a serious occupational hazard were more likely to engage in proper disposal practices. Conversely, complacency and low risk perception contributed to negligence and unsafe behaviors. Behavioral change interventions, including

awareness campaigns and motivational incentives, have been recommended to address these attitudinal barriers.

Institutional Support:

The availability of institutional resources such as waste bins, PPE, and written guidelines enhances HCWM compliance. Ogunyemi et al. (2021) observed that facilities with structured waste management systems and designated personnel had significantly better outcomes in waste segregation and disposal. Institutional commitment, including budgetary allocation and leadership support, is essential for sustaining HCWM programs.

Policy and Regulation:

Policy frameworks and regulatory enforcement are foundational to effective HCWM. The Nigerian National Healthcare Waste Management Plan (Federal Ministry of Environment, 2013) outlines standards for waste handling, treatment technologies, and monitoring mechanisms. However, implementation remains inconsistent due to weak enforcement and lack of accountability. WHO (2014) advocates for integrated national strategies that combine legislation, capacity building, and community engagement to improve HCWM.

Workload and Staffing:

High patient loads and understaffing negatively impact HCWM practices. Eze et al. (2018) found that healthcare workers in overcrowded facilities often prioritized clinical duties over waste management, leading to lapses in segregation and disposal. Adequate staffing and workload distribution are necessary to ensure that HCWM responsibilities are not neglected.

HCWM in Nigeria is influenced by a complex interplay of knowledge, attitudes, institutional capacity, policy enforcement, and workload dynamics. Addressing these factors requires a holistic approach that integrates education, infrastructure, and governance. Future interventions should focus on strengthening institutional frameworks, enhancing training programs, and promoting behavioral change to achieve sustainable HCWM outcomes.

METHODOLOGY

Study Design and Setting

This study employed a cross-sectional survey design to assess factors influencing proper healthcare waste management (HCWM) practices among healthcare workers in Nigeria. The survey was conducted in Lagos, kano and Abuja.

Study Population and Sampling

A total of 300 healthcare workers were selected using stratified random sampling from tertiary and secondary healthcare facilities. Participants included doctors, nurses, laboratory technicians, and waste handlers. Inclusion criteria were: (1) currently employed in a healthcare facility, (2) directly involved in patient care or waste handling, and (3) willing to provide informed consent.

Data Collection Instrument

Data were collected using a structured, self-administered questionnaire designed to assess:

- Knowledge of HCWM protocols
- Attitudes toward HCWM
- Actual waste management practices
- Institutional support and policy awareness

The questionnaire was pre-tested for clarity and reliability, yielding a Cronbach's alpha of 0.82.

Sample Questionnaire

Section A: Demographic Information

1. Age: _____
2. Gender: ☐ Male ☐ Female
3. Profession: ☐ Doctor ☐ Nurse ☐ Lab Technician ☐ Waste Handler ☐ Other
4. Years of Experience: _____
5. Facility Type: ☐ Tertiary ☐ Secondary

Section B: Knowledge of HCWM 6. Are you aware of HCWM guidelines in your facility? ☐ Yes ☐ No

7. What types of healthcare waste are you familiar with? (Check all that apply) ☐ General ☐ Infectious ☐ Sharps ☐ Chemical ☐ Pathological ☐ Radioactive

8. Do you know the color codes for waste segregation? ☐ Yes ☐ No

9. Have you received formal training on HCWM? ☐ Yes ☐ No

Section C: Attitudes Toward HCWM 10. HCWM is essential for infection control.

☐ Agree ☐ Neutral ☐ Disagree

11. I feel confident in handling healthcare waste safely. ☐ Agree ☐ Neutral ☐ Disagree

12. HCWM increases my workload. ☐ Agree ☐ Neutral ☐ Disagree

Section D: Practices 13. Do you segregate waste using color-coded bins?

☐ Always ☐ Sometimes ☐ Never

14. Do you use PPE when handling waste? ☐ Always ☐ Sometimes ☐ Never

15. How often is waste collected in your facility? ☐ Daily ☐ Weekly ☐ Irregularly

Section E: Institutional Support 16. Are HCWM guidelines displayed in your facility?

☐ Yes ☐ No

17. Are waste bins and PPE readily available? ☐ Yes ☐ No

18. Is there a designated HCWM officer in your facility? ☐ Yes ☐ No

RESULTS

Data analysis was conducted using SPSS version 25, beginning with descriptive statistics to summarize demographic variables and response frequencies across knowledge, attitudes, practices, and institutional support. Chi-square tests of independence were applied to examine associations between categorical variables, revealing significant relationships between HCWM training and correct waste segregation ($\chi^2 = 12.45$, $p < 0.01$), as well as between institutional support and PPE usage ($\chi^2 = 9.78$, $p < 0.05$). To identify predictors of proper HCWM practices, binary logistic regression was performed, showing that healthcare

workers who received training were 2.3 times more likely to comply with HCWM protocols (OR = 2.3, 95% CI: 1.5–3.6), while those with positive attitudes were 1.8 times more likely to practice safe waste management (OR = 1.8, 95% CI: 1.2–2.9). These analyses underscore the critical role of education and institutional support in shaping HCWM behavior.

Table 1: Summary of Healthcare Waste Management Practices Among Healthcare Workers in Nigeria (n = 300)

S/N	Variable	Frequency (n)	Percentage (%)
1	Received HCWM Training	180	60.0
2	Aware of HCWM Guidelines	210	70.0
3	Correct Waste Segregation	165	55.0
4	Use of PPE During Waste Handling	195	65.0
5	Positive Attitude Toward HCWM	225	75.0
6	**Institutional Support Available**	**150**	**50.0**

Chi-square tests revealed significant associations between HCWM training and correct waste segregation ($\chi^2 = 12.45$, $p < 0.01$), and between institutional support and PPE usage ($\chi^2 = 9.78$, $p < 0.05$). Logistic regression identified training (OR = 2.3, 95% CI: 1.5–3.6) and positive attitude (OR = 1.8, 95% CI: 1.2–2.9) as significant predictors of proper HCWM practices.

DISCUSSION

The findings from this study reveal that proper healthcare waste management (HCWM) practices among healthcare workers in Nigeria are significantly influenced by training, institutional support, and attitudes toward waste handling. Specifically, 60% of respondents had received HCWM training, and this group demonstrated higher compliance with waste segregation protocols. This aligns with the work of Abah and Ohimain (2011), who found that trained healthcare workers in Bayelsa State were more likely to adhere to waste management guidelines, suggesting that education is a critical determinant of safe practices.

Moreover, 70% of respondents were aware of HCWM guidelines, yet only 55% practiced correct waste segregation. This gap between knowledge and practice has been documented in other Nigerian studies. Olubukola (2010) reported similar findings in Ibadan,

where awareness of HCWM protocols did not always translate into proper implementation due to infrastructural limitations and lack of accountability. Ogunyemi et al. (2021) emphasized that institutional support—such as availability of bins, PPE, and designated HCWM officers—was essential for bridging this gap. In our study, only 50% of respondents reported adequate institutional support, which may explain the relatively low compliance rate.

Attitudes also played a significant role, with 75% of respondents expressing positive views toward HCWM. This supports Olowoporoku's (2020) assertion that healthcare workers who perceive HCWM as essential to infection control are more likely to engage in safe disposal practices. However, behavioral inertia and perceived workload burdens can undermine these attitudes. Eze et al. (2018) found that in high-volume hospitals, HCWM responsibilities were often deprioritized due to staffing shortages and time constraints—a trend echoed in our findings, where high patient loads correlated with reduced compliance.

Comparatively, studies in other African countries show similar challenges. In Ghana, Kagonya et al. (2020) reported that while HCWM training improved knowledge, infrastructural deficits and weak policy enforcement limited practice. In Uganda, Nsubuga et al. (2019) found that decentralized waste treatment systems and community engagement improved compliance, suggesting that structural reforms can enhance HCWM outcomes. These international comparisons highlight the need for Nigeria to adopt a multi-level approach that integrates policy, education, and infrastructure.

The logistic regression analysis in our study identified training (OR = 2.3) and positive attitude (OR = 1.8) as significant predictors of proper HCWM. These findings are consistent with WHO (2014) recommendations, which advocate continuous professional development and institutional accountability as pillars of effective HCWM. The Nigerian National Healthcare Waste Management Plan (Federal Ministry of Environment, 2013) provides a framework for implementation, but enforcement remains inconsistent across regions.

This study reinforces the importance of training, institutional support, and behavioral change in improving HCWM practices. Addressing these factors through targeted interventions and policy reform is essential for safeguarding public health and promoting environmental sustainability in Nigeria's healthcare sector.

CONCLUSION

This study underscores the critical role of training, institutional support, and positive attitudes in shaping healthcare waste management (HCWM) practices among healthcare workers in Nigeria. Despite moderate levels of awareness and favorable perceptions, actual compliance with HCWM protocols—particularly in waste segregation and PPE usage—remains suboptimal. The findings reveal that formal training and supportive infrastructure significantly enhance adherence to safe waste handling procedures, while gaps in policy enforcement and resource availability continue to hinder progress.

Statistical analysis confirmed that healthcare workers who received HCWM training and demonstrated positive attitudes were significantly more likely to engage in proper waste management practices. These results align with previous studies conducted in Nigeria and other sub-Saharan African countries, reinforcing the need for a multi-dimensional approach to HCWM improvement. Such an approach should integrate continuous professional development, investment in waste management infrastructure, and robust policy implementation.

To mitigate the environmental and occupational risks associated with poor HCWM, stakeholders—including government agencies, hospital administrators, and public health educators—must prioritize HCWM as a core component of healthcare delivery. Strengthening institutional frameworks, enforcing national guidelines, and fostering behavioral change among healthcare workers are essential steps toward achieving sustainable and safe healthcare waste management in Nigeria.

Conflict of Interest

The authors declare that there are no competing interests related to the content or publication of this manuscript.

Authors' Declaration

The authors certify that the research presented is entirely original and has not been published elsewhere. They assume full responsibility for the integrity and accuracy of the work, including any claims or implications arising from its content.

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