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Management of biomedical waste and associated factors in military healthcare facilities in Kisangani, Democratic Republic of the Congo

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ABSTRACT

Introduction
Hospital waste is an inevitable by-product of healthcare activities in medical facilities. It remains a major public health concern, and its management in military healthcare facilities in Kisangani continues to pose a serious challenge due to its health and environmental implications.

Purpose
This study aimed to determine the level of knowledge, attitudes, and practices of healthcare personnel in military medical facilities in Kisangani regarding biomedical waste management, as well as the associated factors.

Methods
This was an analytical cross-sectional study conducted among 475 healthcare workers from 31 July to 30 November 2023. Data were collected using a questionnaire based on structured interviews and observation. Evaluation criteria were represented by a significance score ranging from 0 to 2, where 2 indicated compliance or good practice, 1 indicated partial compliance, and 0 indicated non-compliance or poor practice. Analysis of factors associated with biomedical waste management was performed using odds ratios (ORs) with 95% confidence intervals at a 5% significance level.

Results
The study revealed that 90.5% of respondents had a low level of knowledge regarding biomedical waste management, and 64.7% demonstrated a negative attitude towards improper waste management. Bivariate analysis showed that the availability of functional incinerators (OR = 10.4, $p < 0.001$), the presence of personnel trained in waste management (OR = 3.5, $p < 0.001$), the existence of standard guidelines (OR = 6.7, $p < 0.001$), and the availability of a dedicated waste management budget (OR = 6.2, $p < 0.001$) were significant factors influencing proper biomedical waste management in military healthcare facilities in Kisangani.

Conclusion
The quality of biomedical waste management in these healthcare facilities remains inadequate, mainly due to poor overall knowledge and negative attitudes among healthcare providers. Targeted interventions incorporating corrective action plans, continuous training, and strengthened infrastructure are essential to reduce health and environmental risks.

INTRODUCTION

Public hospital services are required by their founding principles to ensure equal access to healthcare for all individuals whose condition necessitates medical intervention (Public Health Code [CSP], 2023). However, in fulfilling this mission, healthcare facilities generate large quantities of residues of diverse nature, collectively referred to as healthcare waste or biomedical waste (BMW).

Biomedical waste originates from both major sources, such as hospitals, clinics, laboratories, and research centres, and minor sources, including dental clinics, ambulance services, and home-based care, among others (Chardon, 2022).

Within hospital structures, BMW includes all substances—solid, liquid, or gaseous—directly resulting from healthcare, diagnostic, or related activities (Mouankié et al., 2021).

Globally, the estimated amount of waste generated per patient per day depends on several factors. Studies have shown that the average quantity varies by country: 3.5 kg per occupied bed per day in France, 7–10 kg in the United States, 1.5 kg in Japan, 2.5 kg in Taiwan, and 3 kg in Morocco (Keita, 2020).

In Africa, policies for quantifying waste generated by healthcare activities are poorly established. A 2018 study estimated the annual production of medical waste at 270–320 tonnes in Ouagadougou, 143.73 tonnes in Cotonou, between 14.12 and 76.84 tonnes in hospitals in Dakar, and 49.26 tonnes in Bamako (Bop et al., 2021).

Moreover, inadequate waste management in healthcare facilities exposes healthcare staff, patients, caregivers, cleaning personnel, administrative workers, and surrounding communities to multiple risks. In 2021, data from the World Health Organization (WHO) showed that only 61% of healthcare facilities had basic and effective waste management services. This proportion remains particularly low in fragile settings, where, according to WHO data, only 25% of health facilities were equipped with these essential services (World Health Organization [WHO], 2023).

A study conducted in Benin estimated that approximately 3 million accidental injuries occur annually among healthcare workers, accounting for 37% of new hepatitis B cases, 39% of hepatitis C cases, and about 5.5% of HIV cases. In 2021, unsafe injection practices were responsible for 33,800 new HIV infections, 1.7 million hepatitis B cases, and 315,000 hepatitis C cases (Makoko et al., 2021).

Poor hospital waste management practices have been reported in several studies. In Côte d'Ivoire, 71.1% of staff in a regional hospital did not segregate waste, and waste was transported using wheelbarrows, contrary to WHO recommendations. In the absence of a functional incinerator, sharps, pharmaceutical waste, non-sharp/non-cutting waste, and household waste were openly burned, while anatomical waste was buried (Famago et al., 2020). Another study in the same country revealed that BMW management was irrational due to the absence of a management policy, insufficient material resources, and inadequate staff training. As a result, the biological risk to workers was significant. The study reported the absence of microplans in 92.23% of facilities, a lack of waste management tools in 83.50%, and the absence of a designated waste management officer in 78.64% of facilities (N'Guessan et al., 2021).

In Algeria, although all surveyed healthcare institutions used colour-coded systems for waste segregation, the mixing of general and infectious waste was common due to insufficient staff training and a lack of appropriate equipment. Furthermore, storage areas were unsafe in most facilities (Fetouhi, 2017).

In Senegal, a study reported that BMW segregation was inadequate in 53.5% of services, and colour-coded systems were effectively applied in only 31.4%. Sharps containers were available in 82.5% of services but were properly used in only 51.1%. In many cases, inappropriate containers such as plastic bottles and overflowing bins were observed (N'Zi et al., 2018).

Neglecting BMW management significantly contributes to environmental pollution, adversely affects public health, and leads to the depletion of natural and financial resources. Biomedical waste poses a higher risk of infection and injury than other types of waste. Inadequate handling and disposal can have severe health

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consequences and negative environmental impacts. These concerns underscore the critical importance of BMW management in military healthcare facilities (Ndiaye et al., 2021), which constitutes the primary motivation for this research.

In the Democratic Republic of the Congo (DRC), most healthcare facilities fail to manage medical waste properly, thereby exposing both the population and the environment to contamination risks. For patients to receive medical care and recover in a safe environment, safe waste disposal and effective biosafety management are essential. Exposure to biomedical waste represents a real danger to mothers, newborns, and healthcare workers (WHO, 2022).

Currently, biomedical waste management remains a pressing issue, as waste production continues to rise nationwide, increasing potential risks to human health and the environment. Most studies conducted in the DRC have demonstrated systemic failures in BMW management at all stages of the process, with unsafe contact between the population and healthcare waste posing major health risks. Consequently, current biomedical waste management practices in health facilities remain unsatisfactory (Management Guide, 2023).

A study conducted in Kinshasa in February 2023 found that healthcare facilities poorly implemented the national hospital waste management plan and related regulations. Insufficient material and financial resources were identified as the primary causes of these shortcomings (Okieng et al., 2024). The same study revealed that needle-stick injuries and cuts accounted for HIV, hepatitis B, and hepatitis C infections in 41.2% of cases, despite the requirement for all hospitals to have a hospital hygiene unit (Ndumba et al., 2023).

In Kikwit, a 2024 study showed that 62% of respondents had insufficient knowledge of BMW management, and 52% admitted to discarding waste improperly in open areas, in violation of WHO standards (Makelele et al., 2024).

In Mbuji-Mayi, a 2022 study revealed that 89.6% of healthcare providers did not properly segregate waste by type, and waste collection was not systematic, highlighting significant gaps in BMW management and the associated risks (Bukassa et al., 2022).

A 2018 study conducted at the Provincial General Reference Hospital of Bukavu found that although 91% of respondents demonstrated good knowledge of BMW management, no improvement strategy for the waste management system was in place (Mwisa et al., 2018).

In Kisangani, a study on hospital waste management revealed that pharmaceutical, infectious, and anatomical waste were present in all services (51.7%). Waste segregation and colour-coding systems were inadequate, and manual waste transport occurred in 73.3% of cases. Knowledge of BMW management was rated insufficient by 61.6% of workers, although 84.7% acknowledged the associated health risks (Lohohola et al., 2018).

Military healthcare facilities in Kisangani are not exempt from the poor waste management conditions observed across the DRC. These facilities lack proper documentation, biosafety monitoring systems, data collection tools, staff training, and adequate equipment—factors that contribute significantly to poor hospital waste management practices.

The specificity of military healthcare facilities lies in their administrative dependence on the Ministry of Defence, which does not provide the same level of technical and logistical support as the Ministry of Health does for civilian facilities. As a result, there is no routine supervision, no periodic data analysis, no structured training plan, and the needs related to infrastructure, personnel, and equipment are not incorporated into the Provincial Health Division's operational action plan—hence the rationale for the present study.

METHODS

Study Setting

This study was conducted in all military healthcare facilities in Kisangani, namely: the Military Hospital of the 3rd Defence Zone, located within the Makiso Kisangani General Reference Hospital (Makiso Commune); the Ketele Military Health Centre (Makiso Commune); the Lokusa Military Health Centre (Lubunga Commune); and the General Bahuma Military Health Centre (Makiso Commune). All these healthcare facilities are located in the city of Kisangani, situated in the northern part of the

Democratic Republic of the Congo (DRC). Kisangani is the capital of Tshopo Province.

Study Population

The study population consisted of, on the one hand, all personnel working in military healthcare facilities and, on the other hand, the military healthcare facilities themselves.

Type and Period of Study

This was an analytical cross-sectional study conducted from 31 July to 30 November 2023.

Sample Size

The sample size was calculated using Schwartz's formula as follows:

$$n = \frac{Z^2 x\, p\, .\, (1\ -\ p)}{d^2}$$

n = required sample size;
Z = 95% confidence level;
P = estimated proportion of biomedical waste management service utilisation (50%);
d = margin of error (5%).

After accounting for an anticipated non-response rate of 10%, a minimum sample size of 422 subjects was obtained.

Sampling Technique

An exhaustive sampling of all military healthcare facilities in Kisangani was carried out.

Within these facilities, two main aspects were assessed: (i) the biomedical waste management process, including segregation, collection, storage, transportation, and disposal; and (ii) the level of knowledge and practices of personnel involved in waste management.

Given that the total number of personnel involved in the biomedical waste management cycle across these facilities was close to the calculated sample size, all eligible personnel were included in the study, resulting in an exhaustive sample of 475 participants.

Inclusion Criteria

Included in the study were all personnel involved in at least one stage of biomedical waste management, working in the targeted military healthcare facilities, and who voluntarily consented to participate.

Classification of Biomedical Waste Management (Good or Poor)

Biomedical waste management was considered "Good" when the following conditions were met:

i. Waste segregation was performed at the source; waste was collected using colour-coded containers or plastic bins, properly transported, and stored separately; and disposal was carried out appropriately through incineration and/or burial of ashes.

ii. There was no waste observed on the ground, around bins, or along the path leading to the incinerator.

Data Collection Techniques

Data were collected using a combination of interviews, direct observation, and document review.

A guided interview using a structured questionnaire was administered to staff working in military healthcare facilities. Direct observation was conducted using a structured observation grid based on a checklist, focusing on staff behaviour, the biomedical waste management process, and the availability of waste management infrastructure and equipment.

Document review involved verifying the existence of official documents, policies, or guidelines related to biomedical waste management.

Statistical Analysis

Data were entered and processed using Microsoft Excel and subsequently analysed using STATA version 13 software.

Respondents' ages were summarised using the mean ± standard deviation, while categorical variables were presented as proportions. Bivariate analysis was performed to assess associations between biomedical waste management and selected factors. Crude odds ratios (ORs) with their 95% confidence intervals (CIs) and p-values were reported.

Operational Definitions

The operational definitions used in this study are presented below (in **Table 1**) and describe the parameters assessed and their corresponding meanings.

Table 1:
Operational Definitions of Key Variables

Parameter	Score / Meaning
1. Knowledge of biomedical waste management	The ability to correctly define biomedical waste management as the handling of waste generated from diagnostic, monitoring, preventive, curative, or palliative care activities in human medicine that pose physical or biological contamination risks to humans and/or the environment.
2. Level of knowledge of biomedical waste management (low or high)	Knowledge was assessed using a scoring scale ranging from 1 to 6, corresponding to the six stages of biomedical waste management: segregation, collection, storage, transportation, treatment, and disposal. • A score of **6** (high level of knowledge) was assigned when the respondent correctly listed all six stages in the correct chronological order. • A score of **< 6** (low level of knowledge) was assigned when fewer than six stages were listed or when the sequence was incorrect.
3. Biomedical waste management (good or poor)	Biomedical waste management was considered **Good** when all the following conditions were met: • Waste was collected using colour-coded receptacles or plastic bins with lids and was properly transported and stored separately, indicating full compliance with all stages of biomedical waste management (segregation, collection, storage, transportation, treatment, and disposal); • Waste was properly disposed of through incineration and/or ash burial; • No waste was present on the ground, around bins, or along the route to incinerators, ash pits, or placenta pits; • Adequate and sufficiently trained personnel were available; • Personal protective equipment (PPE) was sufficiently available; • A dedicated budget was allocated for biomedical waste management; • A functional hygiene committee existed in each healthcare facility. Biomedical waste management was considered **Poor** when one or more of these criteria were not met.
4. Respondents' attitudes towards biomedical waste management (good or poor)	Respondents' attitudes were considered **Good** when solid, liquid, and non-biodegradable biomedical waste were treated and disposed of separately, without mixing sharps, pointed objects, or contaminated waste. Attitudes were considered **Poor** when treatment and disposal were carried out without regard to the specific nature of each type of biomedical waste.

RESULTS

Socioprofessional Characteristics of Respondents

Table 2 presents the distribution of respondents according to their socioprofessional characteristics.

Table 2:
Distribution of Respondents According to Socioprofessional Characteristics (N = 475)

Variable	Category	Frequency (n)	Percentage (%)
Age *(years)*	Mean ± SD	35 ± 9	–
Sex	Male	252	53.1
	Female	223	46.9
Level of education	Primary	3	0.6
	Secondary	26	5.5
	Higher	300	63.2
	University	146	30.7
Professional category	Physician	29	6.1
	Nurse	270	56.8
	Pharmacist	21	4.4
	Biologist	55	11.6
	Administrative manager	1	0.2
	Cleaner	24	5.1
	Midwife	75	15.8
Years of experience	1–5 years	323	68.0
	6–10 years	127	26.7
	≥ 10 years	25	5.3
Training in biomedical waste management (BWM)	Yes	182	38.3
	No	293	61.7

Overall, respondents had a mean age of 35 ± 9 years, with males slightly more represented than females. Most respondents had a higher level of education, were nurses, had 1–5 years of professional experience, and had not received training in biomedical waste management.

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Respondents' Knowledge of Biomedical Waste Management

The distribution of respondents according to their knowledge of biomedical waste management is presented in **Table 3**.

Table 3:
Distribution of Respondents According to Knowledge of Biomedical Waste Management (N = 475)

Variable	Category	Frequency (n)	Percentage (%)
Knowledge of BWM	Yes	228	48.0
	No	247	52.0
Knowledge of correct definition of BWM	Yes	89	18.7
	No	386	81.3
Knowledge of BWM steps	Yes	39	8.2
	No	436	91.8
Knowledge of BWM equipment	Yes	170	31.8
	No	324	68.2
Availability of PPE	Yes	121	25.5
	No	354	74.5
Overall level of knowledge of BWM	High	45	9.5
	Low	430	90.5

Nearly half of the respondents reported lacking knowledge of biomedical waste management. Knowledge of the definition and stages of BWM was particularly poor. Overall, the level of knowledge was low among the vast majority of respondents.

Respondents' Attitudes Towards Biomedical Waste Management

Respondents' attitudes towards biomedical waste management are summarised in **Table 4**.

Table 4
Distribution of Respondents According to Attitudes Towards Biomedical Waste Management (N = 475)

Variable	Category	Frequency (n)	Percentage (%)
Attitude towards treatment and disposal of solid BMW (sharps, needles)	Good	151	31.8
	Poor	324	68.2
Attitude towards treatment and disposal of liquid BMW and contaminated care waste	Good	161	33.9
	Poor	314	66.1
Attitude towards treatment and disposal of non-biodegradable BMW	Good	191	40.2
	Poor	284	59.8

Most respondents demonstrated poor attitudes towards the treatment and disposal of solid, liquid, and non-biodegradable biomedical waste.

Respondents' Practices in Biomedical Waste Management

The practices related to biomedical waste management are presented in **Table 5**.

Table 5:
Distribution of Respondents According to Practices in Biomedical Waste Management (N = 475)

Variable	Category	Frequency (n)	Percentage (%)
Existence of waste storage area	Yes	205	43.2
	No	270	56.8
Waste segregation practiced	Yes	218	45.9
	No	257	54.1
Availability of coded bins	Yes	173	36.4
	No	302	63.6
Colour of bins identified	Yellow	155	32.6
	Black	143	30.1
	Red	177	37.3
Mode of waste transport	Wheelbarrow	152	32.0
	Cardboard bins	203	42.7
	Bare hands	120	25.3

The majority of healthcare facilities lacked designated waste storage areas, did not practise waste segregation, and did not have coded bins. Only about one-third of respondents correctly identified bin colour codes, and waste transport was predominantly carried out using cardboard bins.

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Factors Influencing Biomedical Waste Management in Military Healthcare Facilities

The analysis of factors associated with biomedical waste management is presented in **Table 6**.

Table 6:
Factors Associated with Biomedical Waste Management in Military Healthcare Facilities (N = 475)

Variable	BWM Management	OR (Crude)	95% CI	p-value
	Good (n = 52)	Poor (n = 423)		
Level of education				
Primary	0 (0.0)	3 (0.8)	—	<0.001
Secondary	3 (5.8)	23 (5.4)	—	0.008*
Higher	19 (36.5)	281 (66.4)	—	<0.001
University	30 (57.7)	116 (27.4)	—	<0.001
Work experience		1.3	[0.2–2.8]	0.901
1–5 years	26 (50.0)	213 (50.4)		
6–10 years	24 (46.2)	194 (45.9)		
≥ 10 years	2 (3.8)	16 (3.8)		
Training in BWM		3.5	[1.8–6.8]	<0.001
Yes	34 (65.4)	148 (35.0)		
No	18 (34.6)	275 (65.0)		
Availability of PPE and functional incinerator		10.4	[5.1–22.4]	<0.001
Yes	40 (76.9)	103 (24.3)		
No	12 (23.1)	320 (75.7)		
Knowledge level of BWM		2.6	[1.1–5.9]	0.011
High	10 (19.2)	35 (8.3)		
Low	42 (80.8)	388 (91.7)		
Existence of waste management guidelines		10.8	[5.3–23.3]	<0.001
Yes	40 (76.9)	100 (23.6)		
No	12 (23.1)	323 (76.4)		
Presence of standards/documentation		6.7	[3.4–13.6]	<0.001
Yes	37 (71.2)	114 (27.0)		
No	15 (28.8)	309 (73.0)		
Existence of a dedicated budget		6.2	[3.2–12.1]	<0.001
Yes	34 (65.4)	99 (23.4)		
No	18 (34.6)	324 (76.6)		

OR = crude odds ratio; CI = confidence interval.

The analysis revealed statistically significant associations between good biomedical waste management and higher or university education levels, training in biomedical waste management, availability of PPE and a functional incinerator, higher knowledge levels, the existence of guidelines and standards, and the availability of a dedicated budget ($p < 0.05$).

DISCUSSION

Education Level of Healthcare Providers

The present study demonstrated that the education level of respondents was significantly associated with proper biomedical waste management ($p < .008$). This finding indicates a statistically significant relationship between higher educational attainment among healthcare providers and effective biomedical waste management practices. These results are consistent with those reported by Touat et al. (2021), who also found that respondents' education level was a significant determinant of appropriate healthcare waste management.

Length of Service of Healthcare Providers

The findings of this study showed that the length of service of healthcare providers was not significantly associated with proper biomedical waste management ($p = .901$; OR = 1.3; 95% CI [0.2, 2.8]). This suggests that professional seniority does not necessarily influence biomedical waste management practices. This result contrasts with the findings of Makelele et al. (2025), who reported that the length of service had a highly significant impact on biomedical waste management ($p < .001$).

Training Received by Healthcare Providers

Military healthcare facilities with personnel trained in biomedical waste management were significantly more effective in managing biomedical waste ($p < .001$; OR = 3.5;

95% CI [1.8, 6.2]). Facilities with trained staff were therefore 3.5 times more likely to practise effective biomedical waste management than those without trained personnel. This finding is supported by Zayed et al. (2023), who demonstrated that healthcare facilities with trained personnel adhered more closely to proper waste management procedures. Continuous training in biomedical waste management is therefore essential, as it plays a critical role in preventing contamination resulting from improper waste handling.

Availability of Personal Protective Equipment and Waste Management Standards

This study revealed that the availability of personal protective equipment (PPE) and compliance with biomedical waste management standards and guidelines were significantly associated with proper waste management ($p < .001$; OR = 10.4; 95% CI [2.5, 28.4] and $p < .01$; OR = 2.6; 95% CI [1.1, 5.2], respectively). Facilities equipped with adequate PPE were 10.4 times more likely to manage biomedical waste appropriately, while adherence to recognised standards increased the likelihood of proper management by 2.6 times. These findings are in line with those of Souleymane et al. (2020), who reported that healthcare facilities equipped with PPE and operating under established standards demonstrated better biomedical waste management practices.

Existence of a Budget and a Hygiene Committee

Effective biomedical waste management requires key enabling factors, particularly the availability of a dedicated budget and a functional hygiene committee. In the present study, the presence of a budget ($p < .001$; OR = 6.2; 95% CI [3.2, 12.1]) and a functional hygiene committee ($p < .001$; OR = 4.3; 95% CI [2.3, 8.3]) were significantly associated with proper biomedical waste management. Facilities with a dedicated budget were more than six times more likely to manage waste effectively, while those with an operational hygiene committee were over four times more likely to achieve adequate management. These findings are consistent with those reported by Dicko et al. (2024) in Mali, where healthcare facilities with allocated budgets and functional hygiene committees ensured proper waste management to reduce contamination risks.

Attitudes of Healthcare Providers Towards Waste Treatment and Disposal

Respondents' attitudes towards the treatment and disposal of biomedical waste were also examined. Attitudes towards the management of solid and liquid biomedical waste were significantly associated with proper waste management ($p = .0026$; OR = 2.4; 95% CI [1.1, 4.0] and $p = .0087$; OR = 2.1; 95% CI [1.1, 3.9], respectively). Conversely, attitudes towards the disposal of non-biodegradable waste were not significantly associated with biomedical waste management ($p = .122$; OR = 1.16; 95% CI [0.8, 2.9]). Djidda et al. (2023) reported a significant association between staff attitudes and proper management of solid, liquid, and non-biodegradable biomedical waste. These findings underscore the importance of staff training and awareness in shaping positive attitudes towards biomedical waste management.

CONCLUSION

The quality of biomedical waste management in military healthcare facilities in Kisangani remains inadequate. Poor waste management exposes inpatients, outpatients, healthcare workers, and surrounding communities to injuries, infections, and environmental pollution. This situation is largely attributable to insufficient knowledge of the various stages of biomedical waste management and negative attitudes among healthcare staff.

Key factors promoting effective biomedical waste management included the presence of a functional hygiene committee, staff training and qualifications, availability of PPE, adherence to management guidelines and standards, and the allocation of a dedicated budget. Addressing these factors constitutes a priority for improving hygiene practices in military healthcare facilities.

These findings highlight the urgent need for targeted interventions to strengthen biomedical waste management in Kisangani's military healthcare facilities. Enhancing infrastructure, ensuring continuous staff training, and improving access to essential resources through a comprehensive approach will reduce health and environmental risks and improve the overall quality of care. Adherence to World Health Organization (WHO) recommendations for safe, sustainable, and effective

biomedical waste management is essential. This study may serve as a valuable reference for military healthcare leadership in revising waste management practices in line with WHO guidelines.

Recommendations

1. To the Government of the Democratic Republic of the Congo

i. Implement a national programme to modernise military healthcare infrastructure and improve sanitary conditions for armed forces personnel and their dependants.

ii. Provide adequate resources to improve biomedical waste management across all military healthcare facilities.

iii. Establish structured training programmes for healthcare workers on hospital waste management.

iv. Strengthen regulations and oversight mechanisms to ensure strict compliance with WHO standards and guidelines.

v. Allocate dedicated budgets for functional incinerators, ash pits, placenta pits, and biomedical waste transportation systems.

2. To the Military Health Corps (CORS-M)

i. Develop collaboration frameworks with Provincial Health Divisions to benefit from available technical and logistical support.

ii. Integrate awareness campaigns and regular training on biomedical waste management into military health policies.

3. To Military Healthcare Facilities

i. Ensure regular monitoring and supervision of biomedical waste management practices.

ii. Provide biomedical waste management training to newly recruited staff.

iii. Implement standardised protocols for all stages of waste management in accordance with WHO recommendations.

iv. Equip facilities with appropriate infrastructure, including functional incinerators, storage areas, and operational ash and placenta pits.

4. To Healthcare Staff

i. Consistently use personal protective equipment (gloves, masks, boots, gowns).

ii. Verify incinerator functionality before each operation.

iii. Conduct incineration at appropriate times and remove ashes after each cycle.

iv. Regularly update skills related to infection prevention and biomedical waste management.

v. Strictly adhere to waste segregation at the source.

vi. Educate colleagues, patients, and caregivers on the risks associated with poor waste management.

vii. Actively participate in continuous training programmes on biomedical waste management and hospital hygiene.

5. To the Community

i. Collaborate with local authorities to advocate for adequate infrastructure and improved monitoring of biomedical waste management.

ii. Participate in awareness campaigns addressing the health and environmental risks of biomedical waste.

iii. Engage with educational materials displayed in healthcare facilities to enhance understanding of sanitation practices.

6. To Future Researchers

i. Conduct comparative studies on biomedical waste management between public and private healthcare facilities in Kisangani.

ii. Explore context-specific strategies to improve biomedical waste management.

iii. Assess the environmental and health impacts of poor biomedical waste management to inform policy and institutional decision-making.

Administrative and Ethical Considerations

The study protocol was submitted to and approved by the Ethics Committee of the University of Kisangani. Authorisations were obtained from the Commander of the 33rd Health Zone and the commanders of the respective military healthcare facilities. Oral informed consent was obtained from all participants. Confidentiality and anonymity of personal data were strictly maintained throughout the study.

Ethical Approval: The study protocol was submitted to and approved by the Ethics Committee of the University of Kisangani. Authorisations were obtained from the Commander of the 33rd Health Zone and the commanders of the respective military healthcare facilities.

Conflicts of Interest: None declared.

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