STM JOURNALS

International Journal of
Pollution: Prevention & Control

ISSN: 3048-6750
Volume 3, Issue 1, 2025
January–June
DOI (Journal):10.37591/IJPPC

https://journals.stmjournals.com/ijppc

Research IJPPC

Inventory of Healthcare Waste Generated at Kambia Government Hospital, Sierra Leone

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Abstract

This research studies the categories and management practices of healthcare waste generated at Kambia Government Hospital and stresses the need for effective waste management to protect health and the environment. The waste is categorized into seven types: general, infectious, pathogenic, pharmaceutical, sharps, chemical, and liquid. Weekly assessments discovered fluctuations in waste generation, with general and infectious waste consistently comprising significant portions. Notably, sharps waste underscored the risks associated with injury and contamination. Despite low chemical and liquid waste levels suggesting effective management, the hospital's overall waste management practices, including segregation, storage, collection, transportation, and disposal, reveal critical deficiencies. The lack of dedicated transport, functional incineration, and adequate staff training poses ongoing risks to safety and compliance with environmental standards.

Keywords: Waste management, segregation, incinerator, infectious, waste disposal, sharps waste, pathological waste

INTRODUCTION

Healthcare facilities worldwide generate a significant volume of medical waste, encompassing a diverse range of materials [1]. This waste stream includes hazardous items such as sharps (syringes, needles), infectious waste (pathological specimens, bandages), and pharmaceutical residues (expired medications, cytostatics) [2]. In order to protect patients, healthcare personnel, and the community at large, ethical waste management techniques are essential [1]. Improper management of this waste presents a substantial threat to human health and the environment.

Medical wastes are defined by laws and best practices in industrialized nations, which also outline the several methods that can be used for their collection, transportation, storage, and disposal. Additionally, the best technologies are employed to create alternatives for the appropriate disposal of medical waste that pose the fewest possible threats to the environment and human health [3].

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Received Date: December 06, 2024
Accepted Date: January 02, 2025
Published Date: January 11, 2025

Citation: Yahaya Kudush Kawa, Abubakarr Mohamed Kamara, Gibrilla Thullah, Hamidu David Mansaray. Inventory of Healthcare Waste Generated at Kambia Government Hospital, Sierra Leone. International Journal of Pollution: Prevention & Control. 2025; 3(1): 20–28p.

However, medical waste has not gotten enough attention in developing nations. Hazardous and medical garbage are still handled and disposed of with household waste in many nations, posing a serious health danger to the environment, the general public, and municipal employees [4].

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However, medical waste has not gotten enough attention in developing nations. Hazardous and medical garbage are still handled and disposed of with household waste in many nations, posing a serious health danger to the environment, the general public, and municipal employees [4]. Hazardous and medical waste are still handled manually in several nations. Furthermore, no thorough attempt has been made to comprehend the management of trash produced by clinics, hospitals, and other healthcare facilities. Waste management is typically left to workers with little education, who carry out the majority of tasks without adequate supervision or protection. Humankind is more at risk of harm and injury from medical waste than from any other type of trash. Inadequate management of medical waste primarily puts patients, healthcare personnel, waste disposal department employees, members of the public, and scavengers at varying risk of infections and diseases [5–7]. Infertility, cholera, human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), hepatitis, and other pathological infections can be contracted from improperly managed waste through sharps tainted with bodily fluids [8].

Healthcare waste management was not widely regarded as a problem until quite recently. worries around exposure to the hepatitis B virus (HBV) and the HIV raised worries about the possible hazards associated with medical waste in the 1980s and 1990s. Because of its multifaceted effects as a risk factor for patient and hospital staff health as well as for the general public beyond the confines of the medical profession, health care waste generation has thus emerged as a major concern. The risks associated with inadequate medical waste management are multifaceted. Healthcare workers are particularly vulnerable to exposure to pathogens through improper handling, increasing the risk of healthcare-associated infections (HCAIs). Furthermore, inappropriate disposal practices, such as incineration without proper controls or open dumping, can lead to air and soil contamination with harmful toxins and pathogens, posing a threat to public health and ecological systems [9].

This study aims to assess healthcare waste generated at Kambia Government Hospital (KGH) in Sierra Leone and its management practices. By investigating the types, quantity, and management practice of healthcare waste (HCW) generated at KGH, this research aims to identify the gaps in the current system and propose strategies for improvement. The findings of this study contribute to the broader of knowledge on HCW management in low-resource settings and inform the development of effective interventions to mitigate the associated health and environmental risk [10–13].

MATERIAL AND METHODS

At KGH, a cross-sectional study that included document examination, interviews, and observations was carried out. Data on HCW generation, segregation, storage, transportation, and disposal were collected.

Study Area

The study was conducted at Kambia Government Hospital (KGH), a public healthcare facility located in Kambia District, Sierra Leone (Figure 1). KGH serves as a primary healthcare provider for the surrounding community.

Study Design

To evaluate the present status of HCW management at KGH, a cross-sectional study approach was used. This design allowed for a snapshot of HCW generation, segregation, storage, and disposal practices at a specific point in time [14, 15].

Data Collection Procedures

A purposive sampling technique was used to select KGH as the study site due to its representative nature of healthcare facilities in the region. The entire hospital was included in the study, encompassing all wards, departments, and units generating healthcare waste.

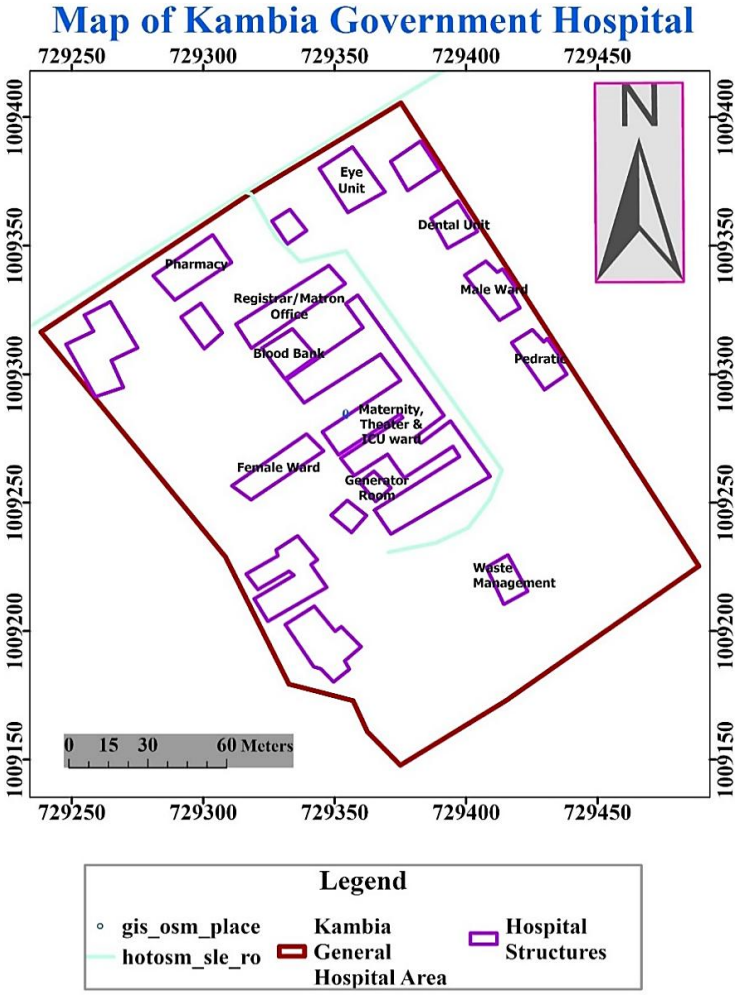

Figure 1. Map of the study area.

Data collection involved a combination of methods: Observations; direct observation of waste handling, storage, and disposal practices in various hospital areas. Semi-structured interviews with key informants, including hospital staff involved in HCW management. Analysis of existing hospital policies, procedures, and records related to HCW management. Visual inspection and sorting of waste samples was made to determine composition and quantity [16–20].

Data Management and Analysis

Data collected through observations, interviews, and document reviews were organized and coded systematically. Quantitative data on waste generation and composition were analyzed using descriptive statistics. Thematic analysis was used to find patterns and trends in the qualitative data gathered from observations and interviews.

RESULTS AND DISCUSSION

Table 1 categorizes the various types of waste produced at KGH, which can be summarized as follows:

Common non-hazardous materials that do not endanger human health or the environment are referred to as general waste

- *Infectious Waste:* Waste that may contain pathogens, posing a risk of infection to persons holding it.
- *Pathogenic Waste:* Similar to infectious waste, this type specifically includes waste that contains viable microorganisms capable of causing disease.

- *Pharmaceutical waste:* It is made up of tainted, unused, or outdated drugs that need to be disposed of carefully.
- *Sharps Waste:* Things that need to be handled carefully include needles, blades, and other sharp objects that can injure people.
- *Chemical Waste:* Hazardous substances from medical processes that need to be disposed of following strict regulations to prevent environmental harm.
- *Liquid Waste:* Any liquid by-products, which may include blood, bodily fluids, or chemical solutions, that require specific treatment before disposal.

Weekly Data Waste Collection

This classification highlights the diverse range of waste types generated in Kambia healthcare setting, emphasizing the importance of proper management practices to ensure safety and compliance with environmental standards. Data was collected for 4 weeks and an analysis is presented below.

Week One

Figure 2 presents the waste generated in Week 1. Result indicates an equal volume of general and infectious waste, both at 12.5 kg, highlighting a significant amount of potentially hazardous material that requires careful handling. The presence of 5.5 kg of sharps waste also emphasizes the need for enforcing safety measures to prevent injuries. Pathogenic waste accounted for 2 kg, while pharmaceutical waste was slightly higher at 3 kg, both of which are crucial to monitor for health risks. Chemical waste was relatively low at 1 kg, and liquid waste was 2 kg, suggesting effective management practices for these types.

Table 1. Types of waste generated at Kambia Government Hospital.

No.	Types of Waste Generated
1	General waste
2	Infectious waste
3	Pathogenic waste
4	Pharmaceutical waste
5	Sharps waste
6	Chemical waste
7	Liquid waste

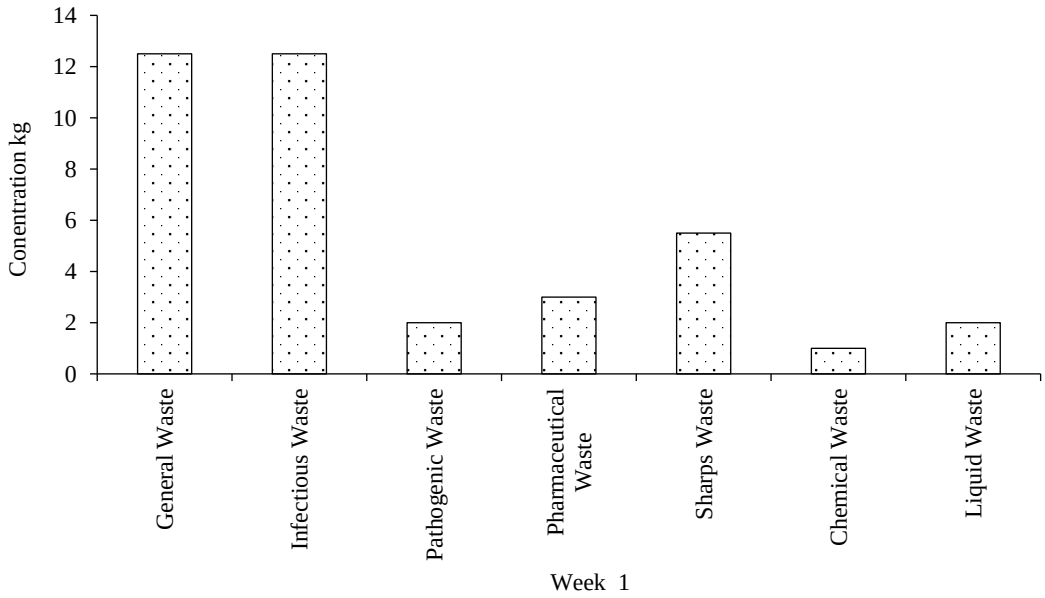

Figure 2. Week 1 waste generation rate.

Week Two

Figure 3 shows the waste generated in Week 2. This is the week with the highest amount waste generated in August 2024. Figure 3 shows that general wastes were produced at largest portion, of 14.0 kg indicating a significant volume of non-hazardous materials. There was also a significant amount of infectious trash, indicating the presence of potentially harmful elements. Sharps waste represented a notable amount as well, underscoring the importance of safe disposal practices for potentially dangerous items. Pathogenic and pharmaceutical wastes were lower in volume but still significant for monitoring due to their potential health hazards. Chemical and liquid wastes were the least generated, suggesting effective management practices in place for these types.

Week Three

Figure 4 shows the distribution of different waste types for the week 3. In Week 3 the amount of waste generated reduced drastically, this may be attributed to the smaller number of patients and visitors visiting the KGH. General waste was the most significant category, closely followed by infectious waste, which indicates a notable volume of potentially hazardous material. The amount of trash from sharps was likewise significant, highlighting the necessity of handling and disposal with caution. Pathogenic and pharmaceutical wastes were present in smaller amounts but still require attention due to their potential risks. Chemical and liquid wastes were the least generated, suggesting effective management of these types. Overall, this data provides valuable insights for optimizing waste management practices in the facility.

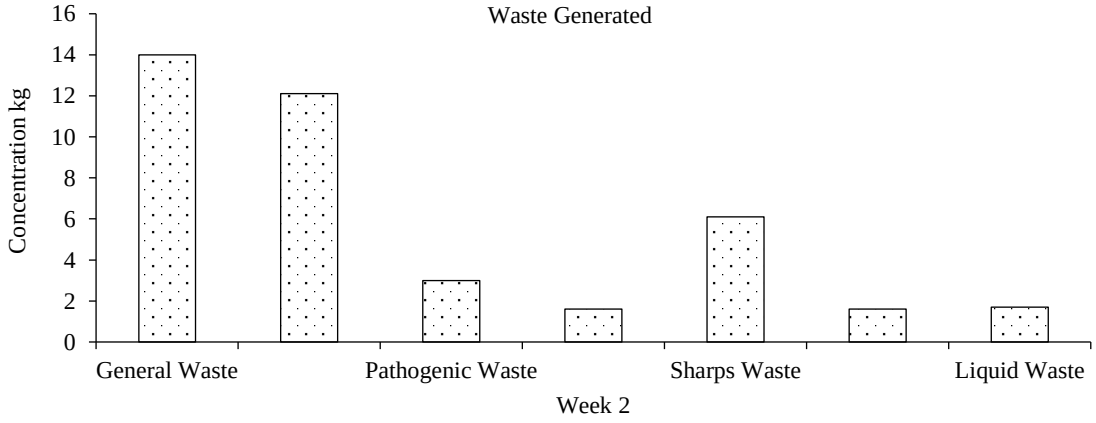

Figure 3. Week 2 waste generation rate.

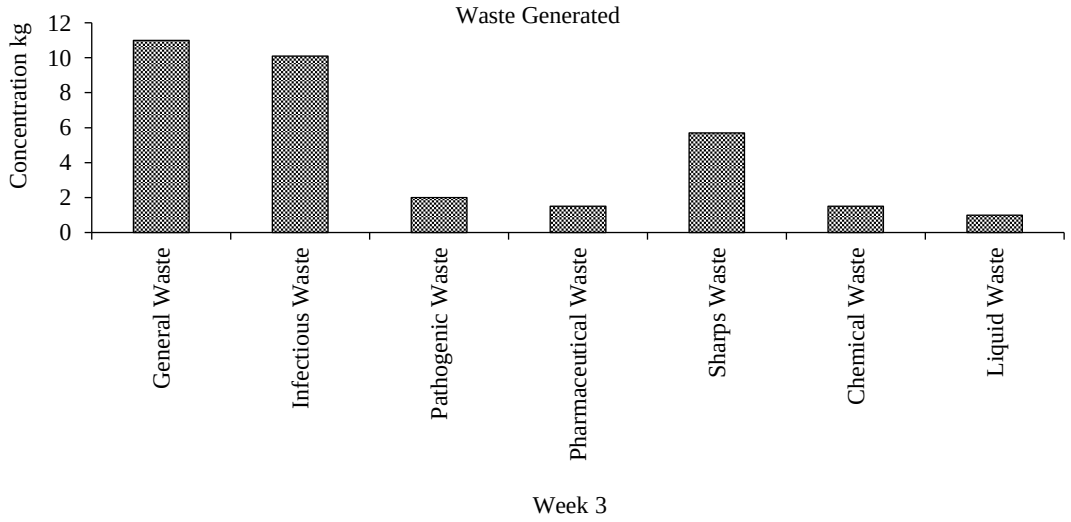

Figure 4. Week 3 waste generation rate.

Week Four

Figure 5 indicates the different types and amounts of waste produced during Week 4. General waste accounted for the highest quantity, followed closely by infectious waste. Sharps waste also mounted a significant amount, highlighting the importance of safe handling practices. Pathogenic and pharmaceutical wastes were relatively lower but still critical to monitor or take care. The amounts of chemical and liquid waste were the least, suggesting that these types may be effectively managed or generated in smaller quantities. Overall, this data can inform waste management techniques and improve practices in handling different waste types.

KAMBIA GOVERNMENT WASTE MANAGEENT PRACTICES

The hospital practices on how to manage their wastes on the following: waste segregation, waste storage, waste collection, waste transportation, and waste disposal.

Waste Segregation

HCW is segregated into general, infectious, sharps, and pharmaceutical waste using color-coded bags and bins (Figure 6). Segregation inconsistencies exist, with some wards using red bags for infectious whilst others using yellow bags.

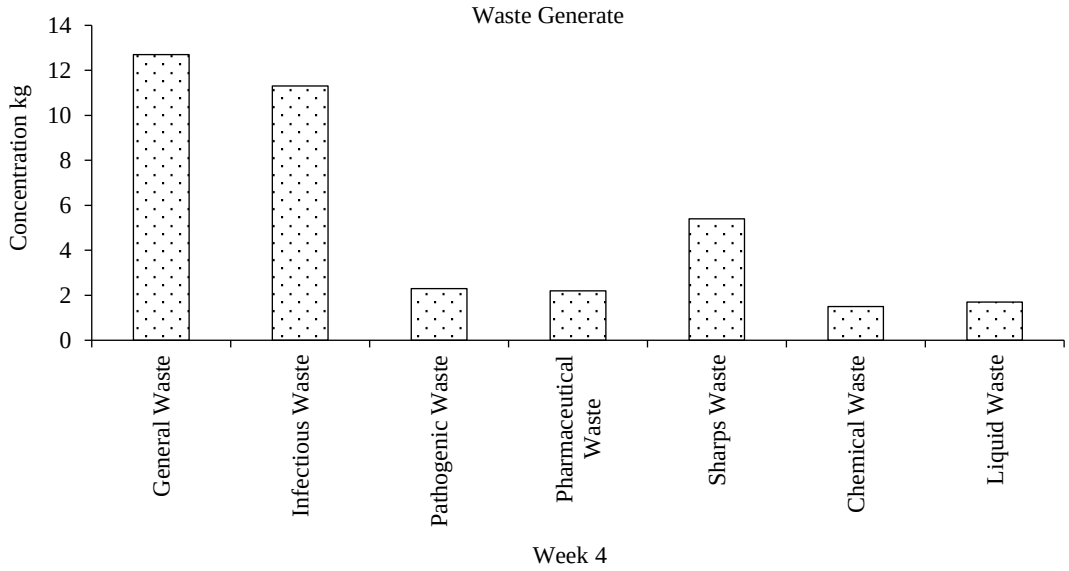

Figure 5. Week 4 waste generation rate.

Figure 6. Color coding of bins.

Waste Storage

A dedicated storage facility is available but not fully functional. Waste is temporarily stored for a day before disposal (Figure 7).

Waste Collection

Waste is collected from wards, pharmacies, laboratories, theatres, and the hospital compound. Cleaners and porters are responsible for segregation and placement in designated bins.

Waste Transportation

No dedicated vehicle is available for HCW transportation. Waste is manually transported to the dumpsite, approximately 200 meters away.

Waste Disposal

The primary disposal method is dumping at an unfenced site near the hospital. The incinerator is non-functional (Figure 8). Autoclaving and deep burial are not practiced.

Figure 7. Waste storage facility at the Kambia Government Hospital.

Figure 8. Kambia Government Hospital's non-functional incinerator.

Infection prevention and control (IPC) staff are responsible for HCW management but lack adequate resources and training. Personal protective equipment (PPE) are provided, but goggles are missing. The hospital lacks a functional mortuary and relies on a non-functional refrigerator [21–24].

CONCLUSIONS

The study's findings draw attention to the serious deficiencies in KGH's HCW management. The generation of substantial quantities of infectious waste, including pathological and pharmaceutical waste, underscores the potential risks to human health and the environment. The lack of proper segregation, storage, and disposal practices increases the likelihood of contamination and the spread of infectious diseases. The absence of a dedicated HCW transportation system and a functional incinerator further compounds the issue. The limited human resources, particularly in terms of trained personnel, hinder effective HCW management.

This report offers a thorough summary of KGH's HCW management procedures. By combining observational data, interviews, and document reviews, the study offers valuable insights into the challenges faced by the hospital. The cross-sectional approach, however, makes it more difficult to determine the causal links between the variables affecting HCW management. Additionally, the study focused on a single hospital, limiting the generalizability of the findings to other healthcare facilities in Sierra Leone. The temporary storage of waste and manual transportation to disposal sites raises safety concerns, necessitating the establishment of a dedicated waste transportation system. Additionally, the non-functional incinerator and inadequate training for infection prevention and control staff hinder proper waste disposal and increase health risks. Addressing these issues through enhanced training, better resource allocation, and the establishment of reliable waste disposal methods will be essential for ensuring compliance with health and environmental regulations and protecting public health.

The results of this study highlight how urgently KGH needs to enhance its HCW management procedures. To mitigate the associated health and environmental risks, it is essential to invest in adequate infrastructure, strengthen human resources, and implement proper waste segregation, collection, transportation, and disposal procedures. This study provides a foundation for future research and interventions aimed at enhancing HCW management in Sierra Leone and other similar settings.

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