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Assessment of Hospital Waste Generation and Management Practice in Panchlaish Thana of Chattogram City

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ABSTRACT

Hospital waste management is a critical issue in healthcare because incorrect disposal poses environmental and public health risks. This study examined hospital waste generation and management procedures, with an emphasis on the types and quantities of waste produced, as well as the techniques employed for disposal and treatment. Data was gathered from hospitals of Panchlaish Thana in Chattogram city, to provide a thorough picture of current practices. According to the report, medical operations produce a large amount of hospital trash, which includes infectious waste, dangerous chemicals, saline bags, kitchen wastes denoted as hazardous and non-hazardous waste in this study. For example, in Chattogram Metropolitan Hospital, total hospital waste generation rate was 147.66 kg/day, comprising hazardous waste of 41.34 kg/day (28%), and non-hazardous waste of 106.32 kg/day (72%). The management strategies differed substantially. Although some hospitals have distinct color-coded bins for disposing of different sorts of garbage, proper use of those bins was limited due to a lack of awareness among staff and patients. Some hospitals lacked a hospital waste segregation system. Prior to disposal, no specific treatment was used, and rubbish was put beside municipal dustbins, from which recyclable goods were collected by beggars, which is extremely unsanitary and unsafe. The study found that good waste management procedures are critical to lowering environmental damage and protecting public safety. Adopting more sustainable methods, increasing healthcare worker training, and tougher regulatory enforcement are among the recommendations for improving hospital waste management. The study's findings emphasize the importance of a uniform strategy to hospital waste management to reduce its negative effects on the environment and public health.

INTRODUCTION

Waste is defined as unwanted or unusable resources generated by various operations. Medical waste is defined as dangerous and infectious particles created by hospitals, clinics, and other healthcare facilities (*World Health Statistics 2018: Monitoring Health for the SDGs, Sustainable Development Goals*, n.d.). Medical waste management remains a low priority for healthcare facilities in underdeveloped countries as competing health problems compete for limited resources. This issue is especially urgent in lower-middle-income countries like Bangladesh, where inappropriate medical waste disposal poses serious health and environmental dangers. Rapid population expansion has boosted demand for healthcare services, resulting in increasing waste generated by hospitals, clinics, private individual practitioners, diagnostic facilities, and pathology services. The issues of medical waste management have escalated globally as the amount has increased (*PRISM Bangladesh Foundation*, n.d.).

The World Health Organization (WHO) defines medical waste as "waste that is produced in the diagnosis, treatment, or immunization of individuals or animals in research related to these, or in the manufacturing or testing of biologicals". According to the WHO, more than 80% of trash generated in the healthcare industry is non-hazardous, like home rubbish. However, the residual hazardous waste poses threats to persons, communities, and the environment if not properly handled. (*World Health Statistics 2018: Monitoring Health for the SDGs, Sustainable Development Goals*, n.d.).Medical waste can harm the environment and human health, either directly or indirectly, via soil, surface water, and air. As a result, notwithstanding the Environmental Protection Act of 1995, there is an increasing need for governments, NGOs, and private clinic owners to prioritize appropriate medical waste disposal to maintain a safe environment in healthcare facilities. (*PRISM Bangladesh Foundation*, n.d.).

The Ministry of Environment and Forestry (MF) of the Government of Bangladesh has developed the Bio-Medical Waste Management and processing Regulations, which provide guidelines and best practices for biomedical waste processing and disposal. While medical waste disposal procedures carry some dangers, they can be mitigated with sufficient precautions. According to the World Health Organization (2014), 75 to 90 percent of medical waste is non-hazardous, while the remaining 10 to 25 percent contains hazardous compounds and pathogenic bacteria that must be managed properly to reduce dangers to human health and environment. Effective medical waste management methods are critical for decreasing environmental and public health threats. (*World Health Statistics 2018: Monitoring Health for the SDGs, Sustainable Development Goals*, n.d.).

Medical waste is disposed of at certain Bangladeshi hospitals by burning it outside or dumping it in landfills, which emits toxic gasses such as furans and dioxins. According to studies, people living near these disposal sites are at danger for respiratory disorders and cancer due to the exposure to these harmful chemicals (*PRISM Bangladesh Foundation*, n.d.). This underscores the urgent need for implementing safer and more sustainable waste management practices to protect public health and the environment.

HOSPITAL WASTE

WHO has different estimates regarding the hazardous and nonhazardous components of medical waste. Hazardous elements can cause harm, pose risks to human health, the environment or both. Nonhazardous wastes do not have significant risk to human health.

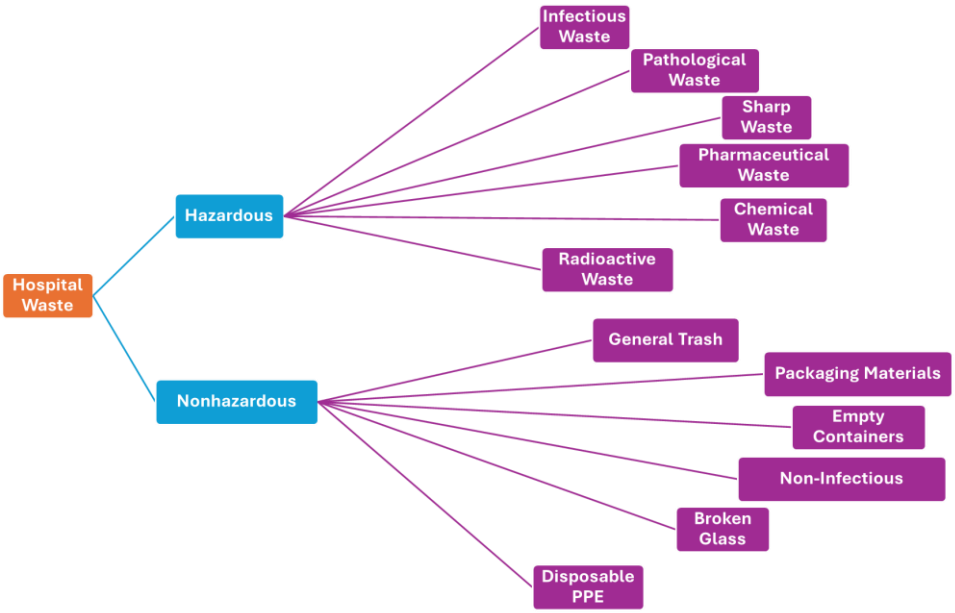

Figure 1 Classification of Hospital Waste

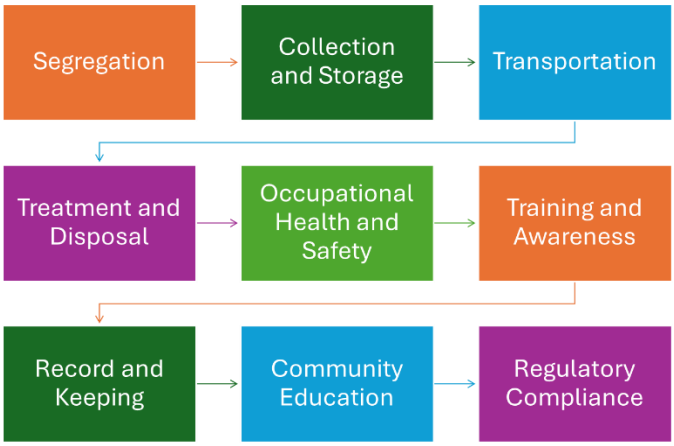

Figure 2 Guidelines for Proper Management of Hospital Waste (*World Health Statistics 2018: Monitoring Health for the SDGs, Sustainable Development Goals*, n.d.)

There have been multiple research projects going on in this sector. The monthly average amount of total waste in ten wards of Rangpur Medical College Hospital. The overall average wastes amount per day per bed from April 2019 to July 2019. It shows the 1.69 kg of wastes in delivery ward, 0.90 kg in child ward, 1.02kg in burn ward, 1.02 kg in surgery and 0.37 kg in urology ward(Haque et al., 2021). The overall bin management scores were 64.5% in DH and 53.1% in MCWC. The labor and gynecology ward (76.2%) in DH had the highest bin management score, followed by the outdoor (76.6%) in MCWC. Although the OT at MCWC received a score of 24.6%, other service areas of both DH and MCWC achieved moderate values (53.1-76.6%) in bin management (Sujon et al., 2022) BIRDEM uses larger bins (70kg) to reduce daily emptying, whereas DMCH, which generates the highest medical waste (15456 kg/day), uses smaller bins (25kg), resulting in frequent emptying (7-10 times daily) and difficulties with bin overflow (Tasnim et al., 2023). Based on the above, our study was designed to compute hospital waste generation rate, check practices and obstacles in the process.

METHODOLOGY

Panchlaish Thana (Chittagong metropolitan) area 13.11 sq km is selected as the study area for this research, which extends from between 22°21' and 22°23' north latitudes and in between 91°48' and 91°50' east longitudes. Most of the important hospitals are located here.

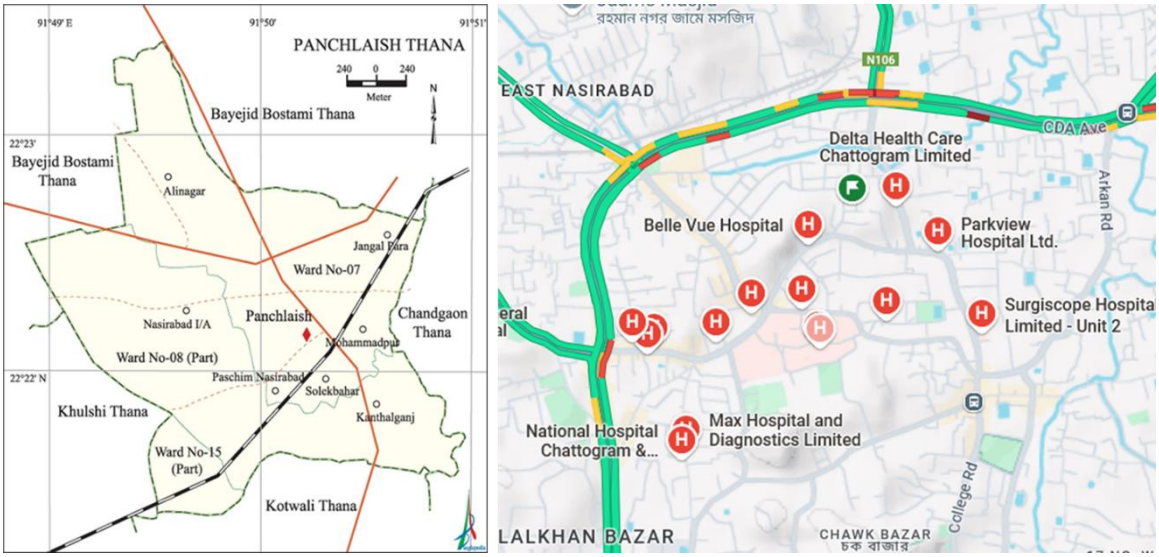

Figure 3 Panchlaish Map and its most important Hospitals

Among the most important hospitals, Max Hospital, CSCR Hospital, Metropolitan Hospital, Delta health care, Parkview hospital can be mentioned.

Primary and secondary data sources were combined for the study. The dialysis unit, labs, x-ray rooms, accident wards, surgical rooms, and administrative offices were among the various hospital departments that were visited. When needed to supplement the data gathered, pictures were also taken during the data collection process. Before starting the survey, prior approval from the hospital administration was acquired. In compliance with the set requirements, a questionnaire survey was used to gather information on the state of waste receptacles, waste segregation, recyclable waste mutilation, plastic, and sharps disinfection, etc. The total work can be described on the flowchart in figure 4.

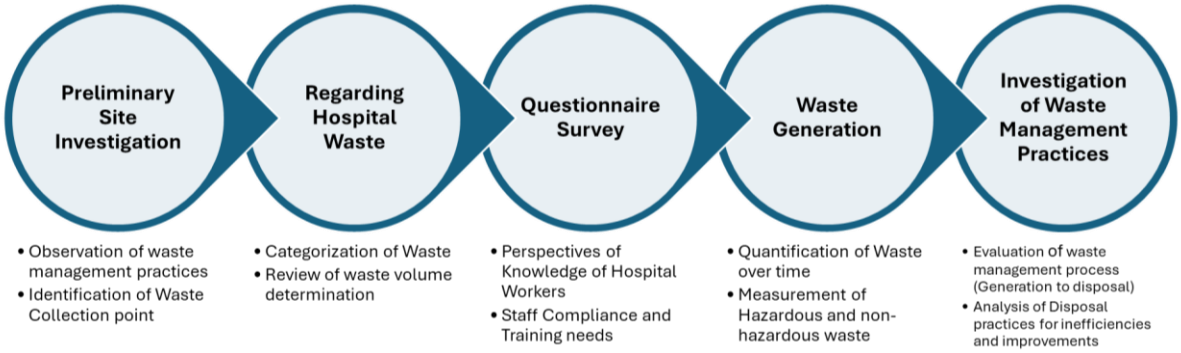

Figure 4 Workflow of our study

RESULTS

This survey investigation revealed the daily solid waste output per bed. Those hospitals were visited many times during this survey period for 3 days. The waste collectors and cleaners have been interviewed on several occasions, both formally and informally. Waste is collected one time per day on average in those hospitals. Only one waste carrying vehicle used in waste collection for each of those hospital. Waste was collected by Chattogram City Corporation and Non-Profitable Organization.
Here is the questionnaire survey of Chattogram Metropolitan Hospital:

Table 1 Questionnaire Survey Summary of Chattogram Metropolitan Hospital

Questionnaire Survey	
Number of beds	101
Average number of patients	69
Average Total Waste	138.33 kg
Waste Disposal Time	About 05:00 am
Daily Disposal Time	1 time
Waste Disposal Location	Arefin Nagar
Waste Collecting Vehicle	01
Safety Measurement used of Cleaners	Mask, Hand Gloves, Safety Shoe.
Treatment Process used	No Treatment Process used
Health Condition of Cleaner	Not Bad
Resell/ Reused	Resell: Cardboard box, Water bottle
Waste Management Organization	Zayeka (Under Chattogram City Corporation)

From table 1, it is observed that in this hospital has total number of beds is 101, average number of patients is sixty-nine, average total waste is 105 kg/day and waste management organization is Zayeka under Chattogram City Corporation.

It is observed that the average number of patients is sixty-eight, the average waste generation rate is 2.04 kg/patient/day, average waste generation rate is 1.37 kg/bed/day and average waste generation rate is 138.34 kg/day tabulated in Table 2

WGR was calculated for patients and beds. Later, only WGR of Kg/patient/day was calculated. Because the hospitals are not fully occupied.

$$WGR_1 = \frac{Total\ Waste\ generated}{Number\ of\ Patients} kg/patient/day \quad (1)$$

$$WGR_2 = \frac{Total\ Waste\ generated}{Number\ of\ Beds} kg/bed/day \quad (2)$$

Table 2 Waste generation rate of Chattogram Metropolitan Hospital

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Field Data

Day	Number of patients	WGR_1 (kg/patient/day)	WGR_2 (kg/bed/day)	WGR (kg/day)
01	75	1.97	1.46	147.66
02	61	2.07	1.25	126.00
03	68	2.08	1.40	141.37
Total	204	6.12	4.11	415.03

Average number of patients	Avg. WGR* (kg/patient/day)	Avg. WGR* (kg/bed/day)	Avg. WGR* (kg/day)
68	2.04	1.37	138.34

For the hospital, they have dustbins for waste disposal and waste is disposed by City corporation and other charitable organizations. Also, they have a responsible team for hospital waste management (HWM) which can be summarized in table 3.

Table 3 Waste Management Frequency of Chattogram Metropolitan Hospital

No	Description	Yes	No
1	Waste Disposal Place		
	Open Place		☑
	Own Place		☑
	Dustbin	☑	
2	Responsibility of HWM		
	Sell		☑
	Non-Profitable Organization	☑	
	Chattogram City Corporation	☑	
3	Waste management regular budget	☑	
4	Have a waste management team	☑	
5	Periodically waste management report	☑	
6	Use protective equipment (gloves, shoes, mask, safety apron, long sleeved clothes) during handling of waste	☑	

The process was repeated in fifteen hospitals in the Panchlaish Thana. It is shown that Max hospital had the most waste generation rate. Also, busier hospitals have a larger WGR than smaller hospitals.

Table 4 Summary of Studied Hospitals Combined

Hospital	Kg per Patient per Day
Max Hospital	2.65
National	2.78
Medical Center	2.27
Metropolitan	2.04
CSCR	2.13
Niramoi	2.27
Holly Health	1.88
Treatment	2.62
Parkview Hospital Limited	1.73
Delta Health Care Chattogram Limited	1.28

Hospital	Kg per Patient per Day
Doctors Hospital	1.536
Ekushey Hospital	2.33
Belle Vue Hospital	1.53
Treatment Hospital	2.44
Surgiscope Hospital 02	1.73

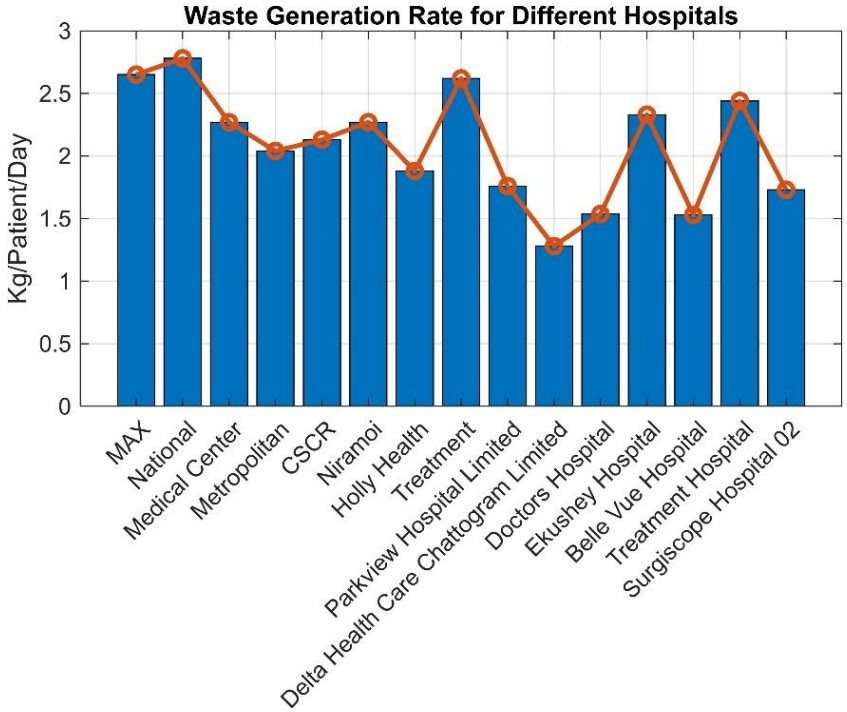

Figure 5 Waste Generation rate (kg/patient/day) for the surveyed hospital

After that, segregation the waste into hazardous waste and non-hazardous waste was done. Luckily, Parkview hospital was kind enough to give their data for the study. The other three hospitals were done manually. As it was hard and dangerous, all hospitals could not be validated. The amount of hazardous and non-hazardous waste was calculated and was summarized in figure 6 shown below.

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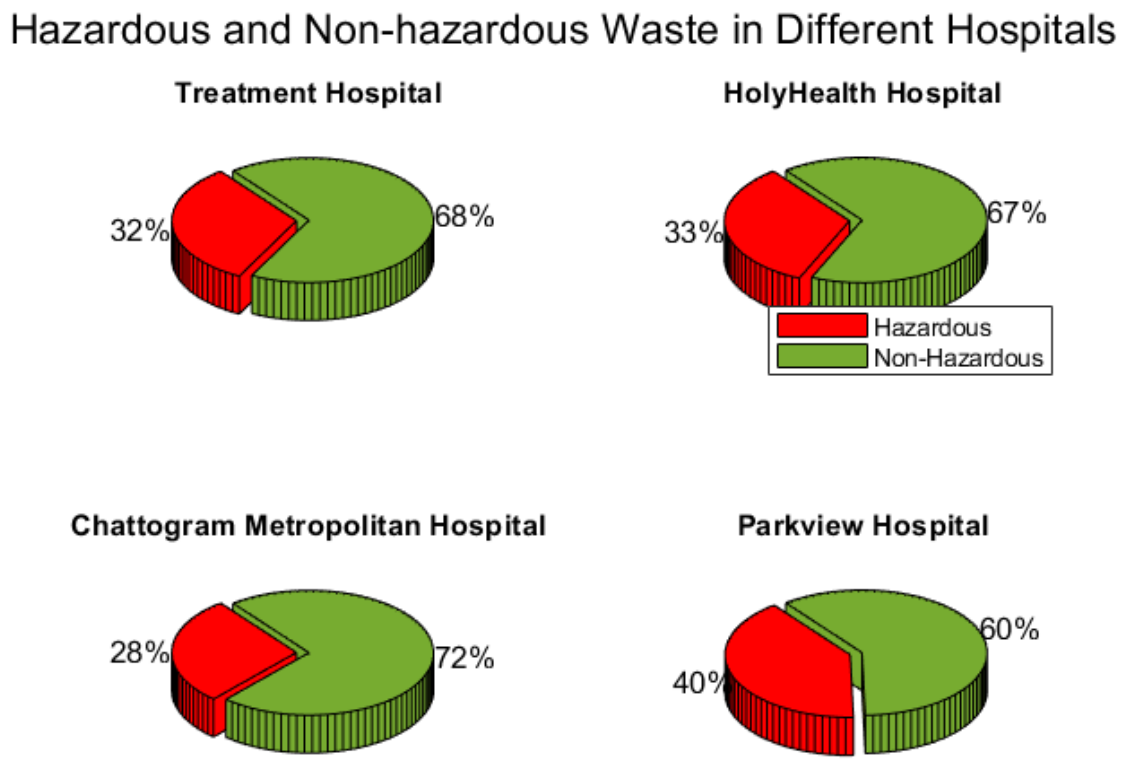

Figure 6 Waste Segregation of Chattogram Metropolitan Hospital

WASTE MANAGEMENT IN DIFFERENT HOSPITALS

Among all the hospitals we have studied, Parkview had the most organized hospital waste management. DeltaCare hospital also had a similar system.

Figure 7 Use of Color-coded Bins in different wards

Parkview Hospital Ltd uses a thorough waste segregation system with four unique color-coded bins, each designated for a specific waste category, as illustrated in figure 7. The Green Bin (Recyclable) accepts disposable paper, plastic or metal containers, empty boxes, polythene bags, sterile disposable products, and other recyclable materials. The Black Bin (Non-recyclable) collects non-recyclable waste such as discarded sterile saline bags, food trash, kitchen garbage, fruit peels, and non-recyclable packing materials. The Red Bin (Sharps) contains sharp objects such as medical needles, shattered glassware, steel wires, and other sharp materials utilized in medical procedures. Finally, the Yellow Bin (Infectious) collects

biohazardous garbage such as tissues, organs, blood, infected bandages, contaminated syringes, and biological samples. This method enables the effective and safe management of hospital trash.

All the hospitals surveyed had their garbage sent to the Arefin Nagar landfill site. There was no effective management for infectious trash from hospitals. This toxic waste can combine with soil and water, rendering the surrounding areas uninhabitable. There are also two prominent universities, as well as a big shopping mall that is now under construction. If appropriate actions are not done as soon as feasible, the situation will deteriorate quickly.

CONCLUSIONS

According to the findings, only a small number of workers and staff are aware of proper hospital waste management and are unaware of emerging and serious issues. The report uncovers severe challenges with trash collection, treatment, and disposal in hospitals, with only two using specialized methods for infectious and hazardous waste. A lack of awareness about proper waste management is obvious, emphasizing the need for reform to reach developed-country norms. This study intends to persuade hospital administrators to reassess current policies and to help future academics oversee this crucial issue, underlining the necessity of well-organized waste management for a healthier society and environment. It is recommended to color-code waste types, separate hazardous and non-hazardous trash at the site of creation, and treat infectious waste (e.g., by autoclaving) before disposal. To limit medical waste generation and ensure proper management, it is critical to train medical staff on safe waste handling, raise awareness, enforce legislation, and embrace practices such as excellent housekeeping and chemical replacement.

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