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# HOSPITAL AND CLINICAL WASTE MANAGEMENT SYSTEM IN KHULNA CITY

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## ABSTRACT

*The issue of contagious and toxic medical waste is consistently spreading over the world as a direct consequence of fast population-growth and urbanization. The rapidly expanding number of medical facilities in Khulna City seems to have a detrimental effect on both the environment and human health. The purpose of the study is to assess the current situation of the medical waste management system in Khulna. The average medical waste generation for the ten examined healthcare-facilities was 316.41kg/day and 1.32kg/patient/day, respectively. The amount of hazardous waste produced by the HCEs ranged from 14.69%-23.58%, with Prince Hospital generating the highest amount and Khalishpur Clinic and Diagnostic Center producing the least. The existing collection is reported to be systematic by about 65.23% of respondents, whereas the remaining 34.77% stated that it is not. Despite some private HCEs using a hygienic waste management system, practically all government HCEs do not appropriately regulate hospital waste.*

***Keywords:*** *Medical Waste Management System, Health-Care Establishments, Systematic, Health Risks, Disposal, Biological Waste*

## INTRODUCTION

Hospitals complement and amplify the effectiveness of many other parts of the health system, providing continuous availability of services for acute and complex conditions. They concentrate scarce resources within well-planned referral networks to respond efficiently to population health needs (WHO, 2022). Generally, hospital waste is defined as the discarded or unwanted material solid waste which is generated from the diagnosis, treatment, or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biological trash (Lee, 1989). Rapid urbanization and population increase in Khulna city are the direct causes of medical waste and the difficulties it raises. The issue is getting worse as Khulna city's hospital, clinic, and diagnostic laboratory count increases. A daily waste production of 100 tons is projected for these facilities (Lawson, 2003). The equipment needed to dispose of the garbage safely is only available to a select individuals. Medical waste, due to its content of hazardous substances, poses serious threats to environmental health (Klangsin et al., 1998). In hospitals, different kinds of therapeutic procedures (i.e., cobalt therapy, chemotherapy, dialysis, surgery, delivery, resection of gangrenous organs, autopsy, biopsy, para clinical test, injections etc.) are carried out and result in the production of infectious wastes, sharp objects, radioactive wastes, and chemical materials (Prüss et al., 1999). Medical waste may carry germs of diseases such as hepatitis B and AIDS. In developing countries, medical waste has not received much attention and it is disposed of together with domestic waste (Almuneef et al., 2003). Alarming medical waste management practices are endangering the general public's health in Bangladesh (Hassan et al., 2008). Despite the chronic health dangers, it is a frequent observation in Khulna City that destitute scavengers, women, and children gather some medical wastes (such as syringe-needles, saline bags, and blood bags) for reselling. The main objectives of this study were to analyze the existing hospital waste management system and to identify the types and rate of hospital waste generation in Khulna city by gathering information from 10 important Health-Care Establishments in Khulna. This study also proposed an appropriate and improved environmental design of HWM in Khulna city through emphasizing on source separation, proper storage, safe collection and transportation with proper treatment and disposal conducted.

## METHODOLOGY

### Selection of Strategic Healthcare Establishments

Khulna is the third-largest city in Bangladesh after Dhaka and Chittagong (Geonames, 2019). It is the ministerial zone of the Khulna District and Khulna Division. The Bangladesh government revealed at its '6th Population and Housing Census 2022' that the Khulna district has an estimated population of 2,61,3385. [Daily-sun, 27th July 2022]. The Khulna City Corporation (KCC) is home to numerous medical facilities, the majority of which generate untreated hospital waste that poses a substantial health risk

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to city residents. For this research, there was no feasible statistically rigorous sampling method. Study areas were selected after conducting a reconnaissance survey and the selected locations for this research are some busy government & privately owned health care establishments.

Table 1: Description of the Selected Hospitals

| Number of Hospitals | Assessed Hospitals Name | Number of Beds |
|---|---|---|
| 01 | Khulna Medical College Hospital | 600 |
| 02 | Ad-din Medical College Hospital | 375 |
| 03 | Khulna City Medical College Hospital | 250 |
| 04 | Gazi Medical College Hospital | 500 |
| 05 | Abu Naser Specialized Hospital | 250 |
| 06 | Khulna Sadar Hospital | 250 |
| 07 | Islami Bank Hospital Khulna | 80 |
| 08 | Gorib Newaz Clinic & Diagnostic | 25 |
| 09 | Prince Hospital | 12 |
| 10 | Khalishpur Clinic & Diagnostic Centre | 30 |

**Data Collection and Analytical Approach**

A preliminary field inquiry was used to obtain data regarding the research area. The study's aim, scope, and objectives were meticulously upheld throughout the research. To acquire a sense of the research region, a few things were briefly observed, including the HCE infrastructure, dustbin conditions and facilities, municipal dustbin conditions, drainage systems, land use patterns, and communication systems. Direct interviews with respondents in each HCE in a specific region were used to collect primary data. A survey was carried out using a random sampling technique on 10 HCEs out of the total of 70 HCEs in the study region, or around 32.85% of all HCEs in the study site. As a result, randomly selected HCEs represent Khulna City's hospital waste management system. Entry into each HCE was accomplished promptly with their approval. This approach produced quantitative data, with the extensive questionnaire survey providing a wide scope of coverage, while the in-depth interviews with various respondents and the interviews with nurses, technicians, patients, doctors, and administrators of HCEs allowed for a greater depth of understanding of the waste management system within the HCEs. The health hazard information was collected mainly from the nurses and cleaners. A few statistical methods were employed to assess the data, and to help draw attention to the problem, a few graphs in the shape of a diagram and a bar chart were also used. Excel and SPSS were employed in this research to analyze the information and address the aims and objectives.

## RESULTS AND DISCUSSIONS

**Medical Waste Generation**

Medical garbage produced by patients, cleaners, sweepers, nurses, doctors, and administrators, among others, is dumped as unnecessary. This section discusses the current practice of producing various types of medical waste from diverse sources. According to Hossain (2014), the numerous types of medical wastes generated by healthcare facilities are divided into the following categories:

**Non-Hazardous Medical Waste**

General waste, which includes fruit and vegetable waste, clothing waste, paper waste, packing materials, water bottles, and other items, is classified at healthcare facilities as non-hazardous medical waste.

**Hazardous Medical Waste**

The following list of hazardous wastes is specific to healthcare establishments:

**a) Infectious Waste**

Infectious waste includes objects such as gauge, cotton, tissue, organs, human fetuses, dressings, bandages, sticking plasters, gloves, disposable medical equipment, garbage from operating rooms, pathological waste, etc.

**b) Sharp Waste**

Scissors, needles from a blade, broken glass (without a syringe), and other objects are considered to be sharp waste.

**c) Recyclable Waste**

Recyclable wastes are syringes (without needles), saline bags, blood bags, bottles of medicine, plastic materials, etc.

**d) Chemical and Radioactive Waste**

Expired medicine, discarded chemicals (usually from cleaning and disinfecting activities), medicine used in laboratories that is not reused, by products of radioactive materials used in the identification of diseases, X-ray 61m, and other items are chemical and radioactive waste.

**Inventory of Different Health Care Establishments**

Hospital and clinic waste generation rates are influenced by a number of variables, including the number of beds, the services offered, the patients' socioeconomic status, and the general health of the neighbourhood in which the hospital is located. The study shows the average medical waste generation for the examined healthcare facilities was 316.41 kg/day and 1.32 kg/patient/day, respectively. The following table provides comparative information on the waste generation of the 10 HCEs:

Table 2: Comparative analysis of medical waste generation (%) in the studied HCEs

| Name of Hospital Clinic | Hazardous Wastes (%) | | | Non-Hazardous Wastes (%) | Total Hazardous Wastes (%) | Total (%) | Amount of Total General Waste (kg/day) | Amount of Total Hazardous Waste (kg/day) |
|---|---|---|---|---|---|---|---|---|
| | Recyclable Waste | Sharp Waste | Infectious Waste | General Waste | | | | |
| KMCH | 4.92 | 3.8 | 7.88 | 83.4 | 16.6 | 100 | 847.14 | 168.57 |
| AMCH | 7.04 | 4.4 | 9.86 | 78.7 | 21.3 | 100 | 279.29 | 75.56 |
| KCMCH | 7.17 | 4.32 | 11.5 | 77.01 | 22.99 | 100 | 268.57 | 80.14 |
| GMCH | 7.07 | 4.01 | 11.1 | 77.82 | 22.18 | 100 | 385 | 109.71 |
| ANBH | 6.7 | 4.49 | 11.18 | 77.63 | 22.37 | 100 | 298.57 | 86 |
| KSH | 5.29 | 3.53 | 8.81 | 82.37 | 17.63 | 100 | 242.29 | 51.85 |
| IBHK | 5.73 | 3.83 | 9.54 | 80.9 | 19.1 | 100 | 165.86 | 39.14 |
| GNCDL | 5.56 | 3.63 | 9.19 | 81.62 | 18.38 | 100 | 19 | 4.28 |
| PH | 7.07 | 4.72 | 11.79 | 76.42 | 23.58 | 100 | 10.86 | 3.35 |
| KC & DC | 4.41 | 2.93 | 7.35 | 85.31 | 14.69 | 100 | 30.71 | 5.29 |

**General and Hazardous Waste Generation**

General (non-hazardous) and hazardous waste are the two forms of waste that are produced at the healthcare facilities during evaluation. With daily production rates of 847.14 kg of general waste and 168.57 kg of hazardous waste, respectively, Khulna Medical College Hospital created the most waste out of the 10 HCEs that were chosen. Prince Hospital, on the other hand, produced the least non-hazardous waste and hazardous garbage per day with rates of 10.86 kg/day and 3.35 kg/day, respectively. The following two pie charts provide visual representations of waste production data.

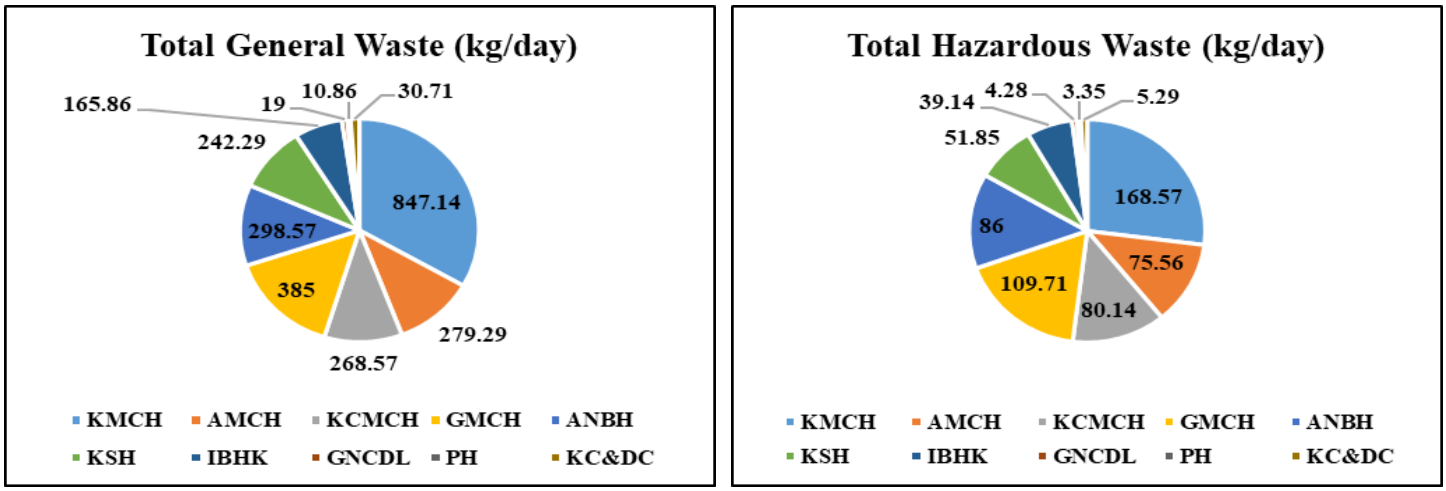


Figure 1: Graphical general (left) and hazardous (right) waste generation

**Development of Diverse Sorts of Hazardous Waste**

The possibility of distinct types of hazardous waste was previously mentioned in section 2.3.2. The data obtained from the 10 healthcare facilities that were evaluated also demonstrated that there are three different forms of hazardous waste: recyclable waste, sharp waste, and infectious waste. Infectious waste accounts for the majority of the hazardous waste created by HCEs,

followed by recyclable waste and sharp waste, which is the least amount of hazardous waste produced. Figure 2 illustrates how much of each of these three waste types is generated on a percentage basis.

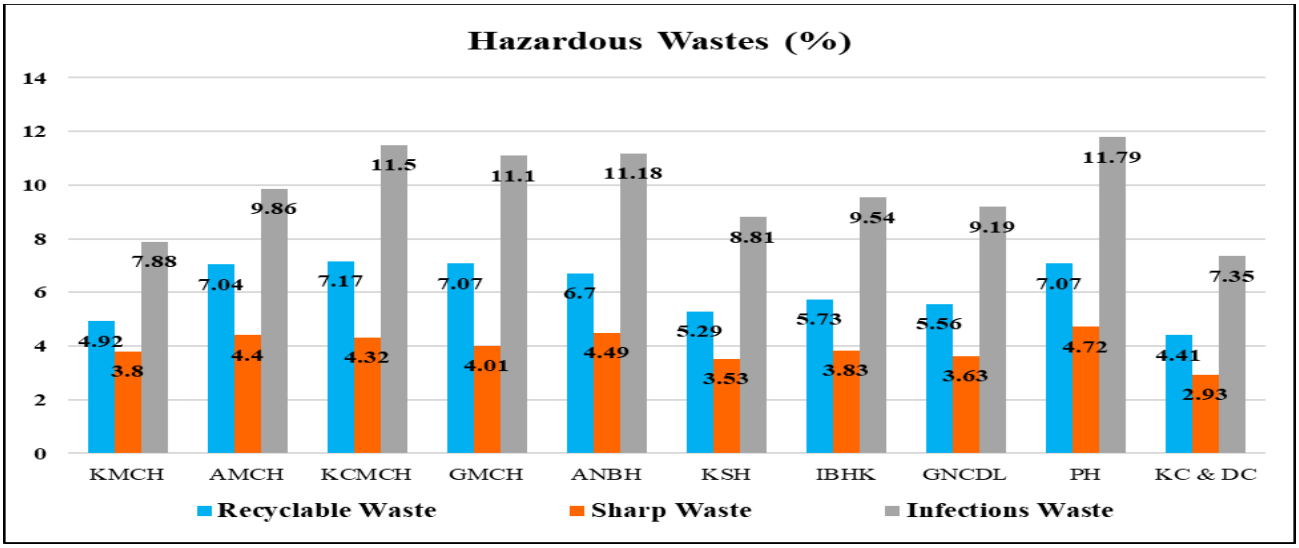


Figure 2: Pictorial representation of different types of hazardous waste production

**Existing Medical Waste Management in the Studied HCEs**

It has been determined that Khulna City's current medical waste management system is neither acceptable nor environmentally friendly, and it lacks any sort of systematic waste disposal management. Only a few of the ten selected healthcare establishments are exceptional in this regard. The majority of HCEs do not separate their garbage, and the cleaners are often in charge of collecting and cleaning it. Instead of adhering to the correct waste management procedures, they combine all types of trash and store it in a bucket under the patient's bed, which they typically clean once per week. Additionally, they lack efficient garbage disposal methods. Even the methods for storing trash: strong plastic bags or containers, are non-existent. The cleaner just disposes of the trash in a large trash can, and then the trash collectors arrive and carry the combined trash to the KCC bin, which is referred to as a temporary waste storage facility, where they dispose of it or incinerate it.

## CONCLUSION

Hospital waste management in Khulna City is becoming an increasingly serious environmental issue that requires quick care before it goes out of control. Medical wastes aren't adequately managed in the HCEs that have been assessed, and the majority of HCEs do not have any budgetary provisions for managing their generated trash in a systematic manner. The Prince Hospital generated the most hazardous waste (23.58%), and the Khalishpur Clinic & Diagnostic Center produced the least (14.69%). The rate of medical waste produced in the HCEs under study was 1.32 kg/patient/day. Approximately 60% of the HCEs under investigation gave their waste to NGOs, compared to 33.33% who dumped it in public trash cans. The Khulna City Corporation (KCC) oversees off-site transportation of hospital medical waste for final disposal or landfill. These hospitals' medical waste is disposed of outside the KCC, close to Batiaghata. Most of the personnel involved in trash collection, separation, transportation, and treatment lack formal education. The majority of the survey participants are dissatisfied with the HCEs' current waste management practices. It is evident that neither a good nor adequate method of managing medical waste exists for the HCEs under study. Systematic medical waste management is hindered by a lack of equipment, a lack of personnel and technology, and challenging maintenance processes. The appropriate management of medical waste must be accomplished through the development of an ecologically friendly management system.

## RECOMMENDATIONS

Waste management and environmental preservation within hospitals should be the focus of separate commitments from health organizations. Employees require regular training for professional health and safety issues and awareness, which can be provided by the administrative monitoring team that is scheduled to monitor the workplace. For the efficient collection of medical waste and its final management, regular monitoring and quality control are crucial. This can be achieved by using a checklist and having the proper authorities inspected. The following topics should be taken into account when monitoring:

* Keep track of the hospital's most recent waste management instructions.
* KCC needs to implement a unique collecting and disposal mechanism for clinical waste.
* Distinguishing hazardous waste from regular clinical waste and identifying it (via color coding).
* Keep track of the quantity of each type of garbage (infectious, general, solid, and chemical waste).

- ***** The authority might make efforts to recycle or reuse non-hazardous garbage.
- ***** Tracking income and expenses.
- ***** Compilation of incidents, comments, and documentation.
- ***** Examine the system's and the staff's actions' efficacy.
- ***** There should be more political awareness so that only an experienced and qualified individual can establish a healthcare facility.

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