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Hospital Waste Management Practises in Dhaka City: A Case Study

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ABSTRACT: Wastes generated from hospitals, clinics and places where treatment and diagnosis are done tend to cause the fatal diseases. Although understanding the techniques of medical waste management and existing practises is important, the field of environmental and civil engineering place less importance for this area of study. The study was therefore undertaken to investigate the medical waste categories and management practises followed by two prominent hospitals situated at Dhaka city in Bangladesh which are Dhaka Medical College Hospital and Holy Family Red Crescent Medical College Hospital. The daily average waste generated in Dhaka Medical College Hospital is 4028.33 kg among which Hazardous waste are 871.84 kg (21.64%) and Non-Hazardous waste are 3156.5 kg (78.36%), The daily average waste generated in Holy Family Red Crescent Medical College Hospital is 761.33 kg among which Hazardous waste are 216.83 kg (28.48%) and Non-Hazardous waste are 544.5 kg (71.52%). In case of the disposal of wastes, it was found that disposal at open dumpsites is preferred to other disposal techniques. The study also shows that the existing medical waste management practises are not satisfactory. So, the knowledge and awareness among the individuals carrying out this task should be risen up to a standard level.

KEYWORDS: Medical Waste, Improper Disposal, PRISM, Waste Management

I. INTRODUCTION

Medical wastes are sources of contamination and pollution to both humans and the natural environment. Bangladesh, a developing country defining trend for its economy and society is rapidly growing urban population. As results Hospitals, diagnostic centers, pathology services etc. are growing as a feature of health care provision to meet the demands. At the current time, there are more than 900 health care establishments situated in Dhaka City Corporation areas (DG health). These facilities generate an estimated 250 tons of waste a day (Lawson, 2003). Almost all of these hospitals are disposing every kinds of wastes (hazardous, non-hazardous, infectious, sharps, pharmaceuticals etc.) in nearby municipal dust bins without any pretreatment what so ever. An unhealthy, filthy and hazardous environment exists in and around these hospitals, affecting patients, hospital staff and other people (Rahman et. al. 1999). Medical wastes carry the dreadful diseases such as AIDS and Hepatitis B and C which are linked to discarded syringes (Lawson, 2003). This study was therefore undertaken to assess the medical waste categories and management practices at DMC (Dhaka Medical College) hospital and Holy family hospital in Dhaka city of Bangladesh. Establishing the medical waste management institution such as PRISM is such a step in this case. The objective of this paper is to give the readers about the regulatory acts regarding medical waste management, definition of the medical wastes, risk of exposure and waste management techniques and controls adopted by DMC and Holy Family medical college hospitals.

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II. RELATED WORK

Medical wastes include non-hazardous and hazardous wastes (infectious, pathological, Pharmaceutical, genotoxics). Hazardous wastes can make the whole waste stream toxic if they are not properly segregated from the non-hazardous portion. Poorly managed health care waste (HCW) expose health care workers, waste handlers, and the community to diseases like hepatitis and AIDS (HIV) infections and may damage the environment (Waste Concern, 2005).

Many reports in the literatures have been shown that infection with human immunodeficiency virus (HIV) and hepatitis virus B and C can present a mechanism for transmission of diseases through medical waste (Mulish *et. al.*, 2003). These micro-organisms are mainly transmitted through occupational injuries from infectious sharps by human blood and fluid (Hagen *et. al.*, 2001).

Micro-organism resistant to antibiotics and chemical disinfectants can also add to the hazards formed by improperly managed medical waste in healthcare establishment (Muhlichet. *al.*, 2003). Concerted cultures of pathogens and infected sharps such as hypodermic needles are most likely the waste items, which can most sensitive potential hazards to health (Muhlichet. *at.*, 2003).

Chemical waste discharge into the sewerage system is caused for adverse effects on the operation of biological wastewater treatment plants (PRISM, 2004).

Project Oriented Research

In 1999, The Bangladesh Legal Aid Service Trust (BLAST) carried out a study particularly in Sir Salimullah Medical College Hospital, Holy Family Hospital, and Bangabandhu Sheikh Mujib Medical University. The survey assessed the existing medical waste management system. JICA (Japan International Cooperation Agency), working on "Clean Dhaka Master Plan" for solid waste management (JICA, 2004). PRISM Bangladesh a non-governmental environment oriented organization working on different type of waste management such as wastewater treatment by duckweed, solid waste management with safe and final management by compost and eco-friendly hospital waste management in Dhaka, Khulna, Jessore and Tangail district of Bangladesh (PRISM, 2004). They have started their project on hospital waste management since 2002 in Khulna. Now their project is running in Dhaka, Khulna and Jessore district.

III. METHODOLOGY

The study area was covered with two hospitals namely Dhaka Medical College and Hospital (DMCH) and Holy Family Red Crescent Medical College and Hospital (HFMCH). At the beginning of the project formal questionnaires were prepared to interview different personnel attached with health care sectors as well as hospitals. Hospital authorities, managing directors, doctors, coordinators, doctor students, ward masters, waste cleaners and other health care occupants were interviewed through formal and non-formal questionnaires. This study was conducted for a period of time starting from January 2014 to August 2014. All hazardous wastes generated from health care establishment were weighed before disposal. The described data for this study with the questionnaire were analysed applying various statistical methods. A number of statistical graphs in terms of histogram, pie diagram, bar chart, etc. were used to clearly point out the project.

IV. RESULTS AND DISCUSSION

Hospital waste management system in Dhaka Medical College Hospital (DMCH) and Holy Family Red Crescent Medical College Hospital

Dhaka Medical College Hospital (DMCH) established in 1946, the largest government hospital in Bangladesh is situated at ward no 56 in Dhaka. On the other hand Holy Family Red Crescent medical College Hospital established in 1953 in Dhaka near the Ramna Thana.

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Table 4.1: Capacity of DMCH and HFMCH

Medical College and Hospital	DMCH	HFMCH
No of departments	28	20
No of wards	45	10
No of operation theatre	11	7
No of beds	1700	528
No of cabins	93	93
No of inpatients	2000	350
No of outpatients	3500	280

Waste generation rate in DMCH and HFMCH

Composition of different categories of waste generated in DMCH and HCMCH is presented in Table 4.2& Figure 4.9 & 4.10.

Table 4.2: Composition of different categories of waste generated in DMCH and HCMCH

Medical College Hospital	Wastes observation day	General wastes (kg)	Infectious wastes (kg)	Plastic wastes (kg)	Sharp wastes (kg)	Grand total (kg)	Average wastes generation (kg)
DMCH	Day-01 (18-6-2014)	3187	726	65	63	4041	4028.33
	Day-02 (19-6-2014)	3108	717	68	71	3964	
	Day-03 (26-8-2014)	3263	746	76	68	4153	
	Day-04 (27-8-2014)	3121	735	70	65	3991	
	Day-05 (16-9-2014)	3184	723	67	61	4035	
	Day-06 (17-9-2014)	3076	763	78	69	3986	
HFMCH	Day-01 (12-4-2014)	541	166	14	18	739	761.33
	Day-02 (13-4-2014)	536	174	17	21	748	
	Day-03 (26-8-2014)	553	194	24	25	796	
	Day-04 (27-8-2014)	546	187	20	23	776	
	Day-05 (16-9-2014)	565	176	18	20	779	
	Day-06 (17-9-2014)	526	163	13	28	730	

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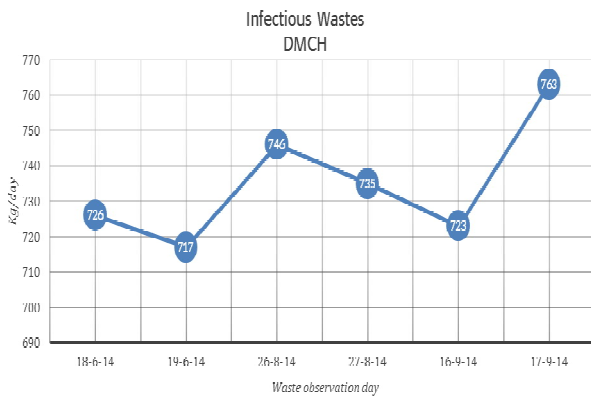


Figure 4.1: DMCH Infectious Waste Generation



Figure 4.2: DMCH Hazardous Waste Generation

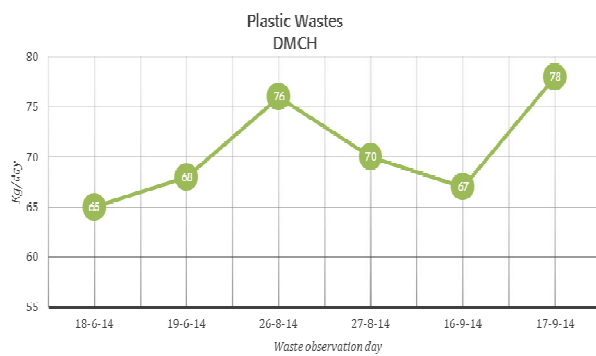


Figure 4.3: DMCH Plastic Waste



Figure 4.4: DMCH Sharp Waste

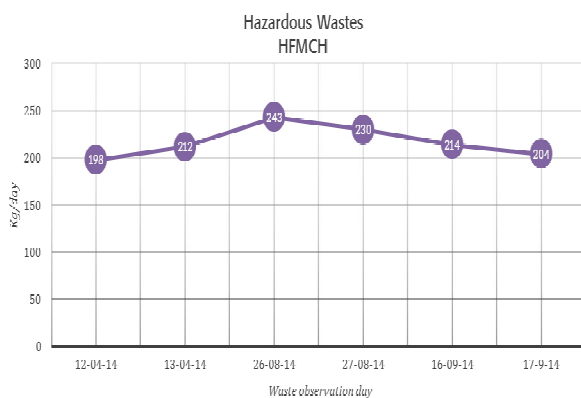


Figure 4.5: HFMCH Infectious Waste

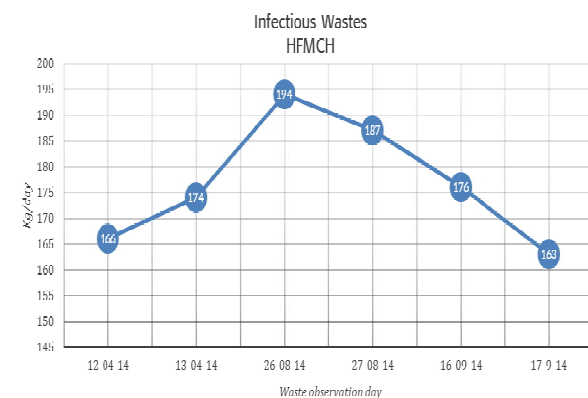


Figure 4.6: HFMCH Hazardous Waste

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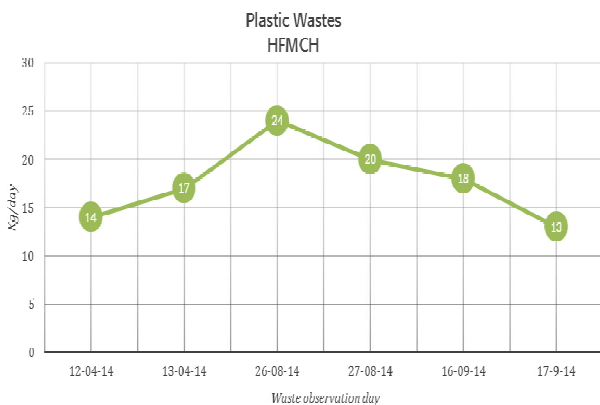


Figure 4.7: HFMCH Plastic Waste

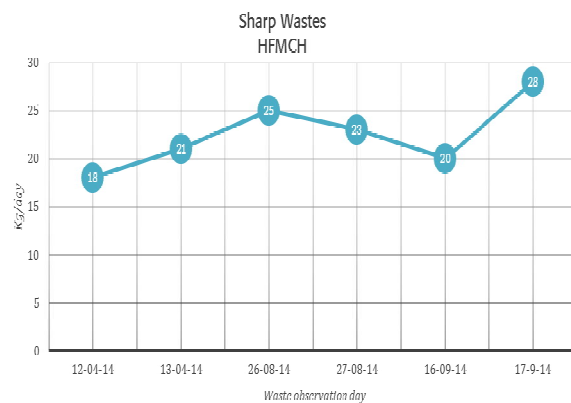


Figure 4.8: HFMCH Sharp Waste

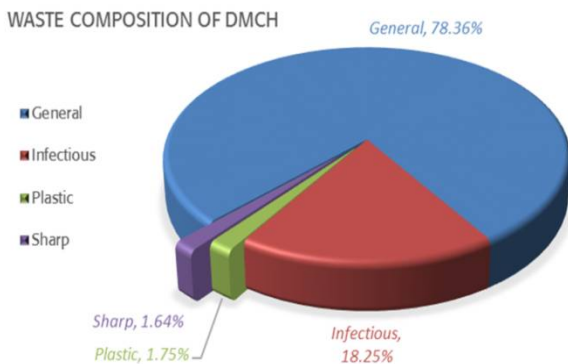


Figure 4.9: Waste Composition of DMCH

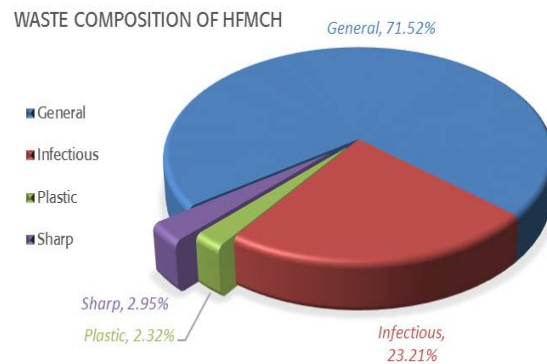


Figure 4.10: Waste Composition of HFMCH

Waste management systems in Dhaka Medical College Hospital:

- **Collection:** In DMCH there is a bowl with capacity 2-3 kg kept below the bed of various wards for collecting general waste. This general waste includes plastic, packaging, paper, food, vomit, pharmaceutical waste both liquids and tablets etc.
- **Separation and segregation:** Syringes, needles and saline bags are claimed to be separated for the interchange with the new products from the suppliers by the ward masters and cleaner. But at present some swindle cleaners mishandle the bags and syringes for further selling to the dishonest recycling vendors who are then responsible to supply the improperly treated syringes and bags to the market again.
- **Disinfection and treatment:** Chemical disinfection such as chlorination is also performed in this hospital to disinfect surgical instruments. There was an onsite incinerator for treatment of pathological and infectious waste which has been out of order for the last several years. Basically infectious wastes are now disposed off to the DCC bin without any prior treatment.
- **Internal temporal storage bin:** Waste collected from different wards, cabins, departments and operation theatres are then stored in a temporal storage bin until they are finally disposed off to the nearest DCC bin outside the hospital boundary.
- **Recycling and reuse:** Some cleaners are involved in separating plastic and glass bottles, drinking and pharmaceuticals containers for selling to the recyclers after throwing off into the internal bin.
- **Disposal to the DCC bin:** Wastes are then transported by the hospital authorities to the nearest DCC bin outside the boundary. As no segregation and separation of hazardous infectious waste is performed, the waste

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thus disposed off to the open DCC bin causes serious health hazard to the scavengers, tokais, waste handling personnel and the public as well as to the environment also.



Figure 4.11: DMCH Waste Collection Bin



Figure 4.12: DMCH Container Fill with Waste in Storage Room



Figure 4.13: DMCH Incinerator Machine



Figure 4.14: DMCH Sharp Wastes on Ground

Waste management system in Holy Family Red Crescent Medical college Hospital

- **Collection:** In Holy family Red Crescent Medical College Hospital there is a bowl with capacity 2-2.5 kg kept below the bed of various wards for collecting general waste which is collected by cleaners and maids to the internal dustbin for temporal storage.
- **Separation and Segregation:** Syringes, needles, saline bags, blood bags and other hazardous pathological and infectious wastes are separated and stored in place within the hospital premises.
- **Disinfection and treatment:** Surgical instruments, patients' cloths, gloves etc. are autoclaved regularly for sterilization. There are three autoclaved in total. Two of them are computerized vertical type autoclaves and one is non-digital manually driven autoclave.
- **Internal temporal storage bin:** General waste collected from different wards, cabins, departments and operation theatres are thrown away from each floor through an opening into a hollow duct. The duct extends from ground floor to the top of the buildings and is connected to each floor through an opening. The waste thus thrown away are dropped and gathered at the bottom of the duct.
- **Disposal:** Wastes are then transported by the DCC collector vehicle from the hospital bin to the landfill disposal site. Separated sharps and infectious wastes are carried to a place near the Burigangariver at a distance which is less than 1 km away from the hospital and locality.



Figure 4.15: Holy Family Waste Collection Container



Figure 4.16: Holy Family Saline Bags

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Figure 4.17: Sharp Wastes of Holy Family



Figure 4.18: Holy Family Internal Zone for Used Syringes

Lacking of existing waste management system in surveyed hospitals: From the conducted survey the following drawbacks of the existing health care waste management system were discovered.

- **Segregation at source:** Very poor segregation at the point of origination, e.g. at bedside bowls pharmaceuticals are thrown off together with general waste, no particular separation for needles and sharps are performed except for DMCH where the needles and syringes are collected in boxes for returning to the suppliers.
- **Sharps management:** Used needles and syringes are not always destroyed or disposed of properly in a standard method specified by any guideline.
- **Waste collection and containerization:** No puncture proof container is used for sharp wastes collection. Colour coding is practiced in some hospitals but not in a standardized way.
- **Internal transport:** Trolleys are hardly used for internal transportation of waste.
- **Occupational health and safety measures for workers:** Not safety gowns, masks, gloves or protective clothing are worn by the cleaners.
- **Recycling and reuse:** Some cleaners and scavengers are involved in separating plastics and papers in the temporal storage or DCC bin for recycling.
- **Treatment:** Treatment of plastics for recycling under PRISM is performed in the open place in Matuail land fill site which is not healthier enough for such act as flies roam around the site.
- **Transportation and ultimate disposal of HCW:** Hospital wastes are dumped in the outside DCC bin without much segregation of infectious and anatomical wastes. Wastes are transported by open DCC collector vehicle without any cover at irregular time period during day at pick hour causing health hazard to city people.

V. CONCLUSION

The hospitals in Dhaka city are increasing day by day due to the increase of private entrepreneurship. The daily average waste generated in Dhaka Medical College Hospital is 4028.33 kg and Hazardous waste are 871.84 kg (21.64%) and Non-Hazardous waste are 3156.5 kg (78.36%), The daily average waste generated in Holy Family Red Crescent Medical College Hospital is 761.33 kg and Hazardous waste are 216.83 kg (28.48%) and Non-Hazardous waste are 544.5 kg (71.52%). The staff education particularly for the workers involved in collection, segregation and in house management in HCW can minimize the quantity in hazardous portion in many situations. The management of HCW in Internal and External management is required by a systematic approach to the handling, storage, transport treatment and disposal of waste by methods that all stages minimize the risk to public and the environment.

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