Overview of Clinical Waste Management Approach in Bangladesh: An Example of PRISM Bangladesh

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Abstract

Clinical waste contains toxic chemicals and hazardous materials from several diagnostic and treatment processes. The improper disposal of clinical waste poses a high health risk to humans and environment as well as directly or indirectly built environment. The improvement of waste management in clinics and hospitals is essential to minimize the spread of infectious diseases. Since Bangladesh is a lower middle income country, we are yet to reach the criteria of sustainable waste disposal and management system. This study is an attempt to portray one of the present waste management systems in Bangladesh, which can be a beneficial application for the whole country for ensuring better environment. The techniques and procedures, applied by PRISM can be a lesson for all city corporations and municipalities by which they can get into an umbrella with all healthcare institutions.

Introduction

The growth of the world's population, rapid urbanization, improved standards of living, and gradual developments in technology have all contributed to an increase of both the amount and the variety of solid wastes generated by industrial, domestic and other activities, Masud (2013) based on UNEP (1991). Clinical waste is one of the major concerns in environmental issues due to its infectious and hazardous nature that is requires specific treatment and systematic management prior to final disposal (Hossain, 2017). In Bangladesh clinical waste management is growing with an ever-increasing number of hospitals, clinics, and diagnostic laboratories especially in Dhaka City and nearby areas (Dana, 2011). From the updated database of Banglapedia, in 2015 the total number of hospitals in Bangladesh was 1683. Of these 1683 hospitals, 678 were government hospitals and 1005 were non-governmental, (Banglapedia, 2017). A study in 2005 reveals that improper procedures of clinical waste management exist in the country. Hasan et al, also found that some of the hospitals separate infectious wastes from the noninfectious waste stream at the site of production, but during disposal it is done in municipality dustbins where the wastes were mixed together. Thus clinical waste management is neglected and it falls under the auspices of the local municipal bodies which are responsible for the collection, removal and disposal of different kinds of wastes from public places. This study aims

to discover and understand the current situation of clinical waste management system of Bangladesh, the reasons of its failure and the PRISM approach for handling and treatment of clinical wastes in environment friendly manner.

Objectives and Methodology

It is essential to focus on clinical waste management condition of Bnagladesh. This study aims at focusing on present clinical waste management system, reasons of its failure and specifically the existing clinical waste management procedure conducted by PRISM Bangladesh. The study has been conducted with the goal of explaining the clinical waste management system of PRISM which can be applied for the whole country. Secondary based data have been used for explaining the management procedure.

Present Scenario of Clinical Wastes Management in Bangladesh

In Bangladesh the healthcare centers like hospitals, clinics, nursing homes, dental hospitals etc have inadequate waste management systems which is a threat to public health as well as to the environment (Rahman et al, 1999). Hasan et al, (2008) also stated that neither the government nor hospital authorities pay proper attention to this matter. Almost every hospital/clinic is disposing both non-hazardous and hazardous wastes in the nearby municipality dustbins or roadside without any sort of treatment. As a result an unhealthy and hazardous environment exists in and around the hospitals that are affecting the patients, hospital staffs and other people who are exposed to these conditions.

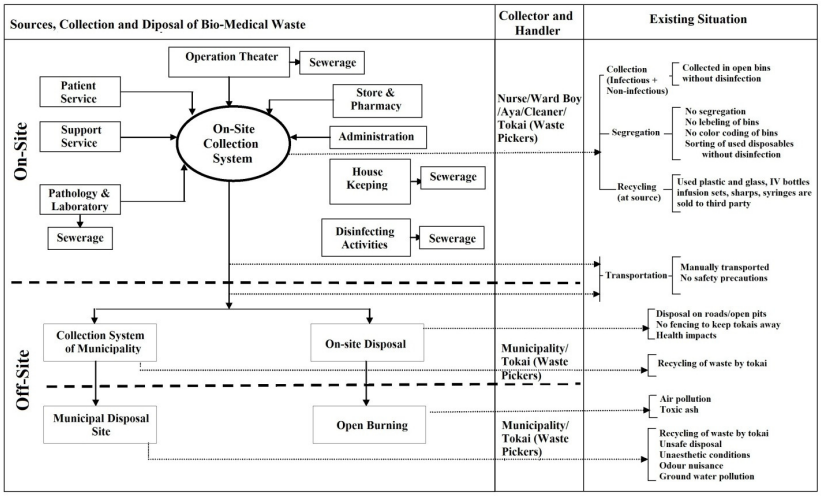

Figure 01: Existing Waste Management System in Bangladesh
Source: Dana, 2011

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Reasons of Clinical Wastes Management Failure in Bangladesh

The clinical wastes management practices somehow have not been given appropriate attention and importance in Bangladesh for which it has not been successful in achieving better clinical waste management. According to Dana (2011), the actual problems observed in both public and private hospitals/clinics and diagnostic centers are:

- No alternative methods for safe disposal
- No system for segregating the waste before disposal
- No specific regular awareness program among all staff
- No protection for waste handlers, which are often infectious and potentially dangerous
- No specific training program for the nurses and cleaners regarding waste handling, disposal or management.
- Lack of implementation of guideline
- Existing gaps within the waste management rule 2008
- Problem in Environmental Act 1995
- Lack of interest and unity
- Economic constrains
- Following the old management
- Corruption of the lower level
- Hazardous waste management is not high in the political agenda
- Lack of responsibilities and supervision
- Inadequate enforcement of existing pollution control laws.

According to Mubarak, (1998), private hospitals and clinics are better off than public hospitals/clinics because in public hospitals autocracy is practiced where policy makers are not interested to improve the hospital environment and follow the waste management procedures even if they are aware about it. He also said that the management of public hospitals is very poor as bureaucratic red tape plays a major role. According to the Conservator Officer of Dhaka City Corporation treatments in private hospitals and clinics may be good but the waste disposal procedure is nothing different from the public hospitals.

According to Dana (1999), the main problem is the lack of awareness at all levels in this occupation and the management plan is so poor that hospital/clinical wastes are mixed with general wastes. Dana (1999) modified PRISM and stated that, the major reason for not being able to achieve a successful management system are: (a) First there is a system for clinical wastes management but no implementation (b) No

effective measures taken by the authority to ensure that hospital follow the guideline
(c) No provision of quantifying and record keeping on waste or any accident occurred
(d) Some hospitals segregates waste in house but dumps together in municipality bin.
(e) No provision for regular training and awareness among the staffs.

New Approach of Clinical Wastes Management: PRISM in Bangladesh

PRISM (Project in Agriculture, Rural Industry, Science and Medicine) Bangladesh, a reputed national NGO in Bangladesh, is now working for clinical wastes management in association with the DSCC and DNCC, (Hasan et al, 2008). With financial and technical support from Water and Sanitation Program (WSP), PRISM Bangladesh carried out a survey on the clinical waste management in Dhaka City (Hasan et al, 2008). Subsequently, PRISM Bangladesh with the financial support from Canadian International Development Agency (CIDA) has recently developed a disposal facility for low cost clinical waste treatment and management in Dhaka City.

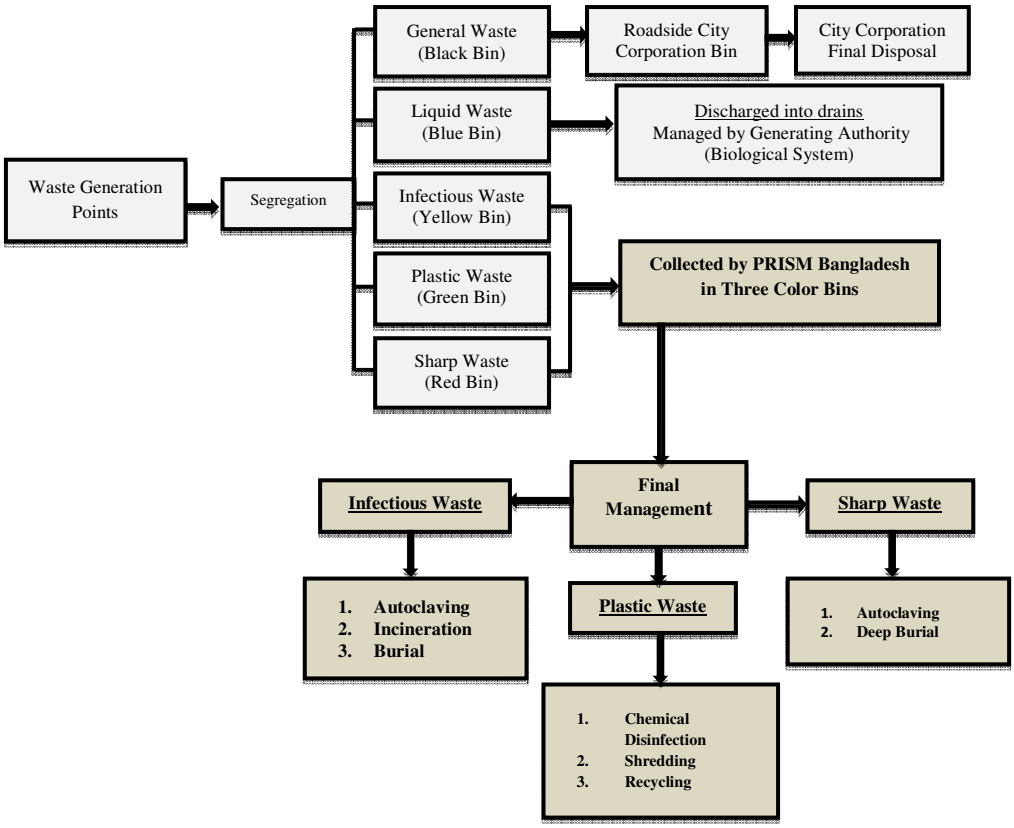

Figure 02: PRISM Approach

Source: Dana, 2011

The city corporation has allocated one acre (0.405 hectare) of land in Matuail, a dumpsite near the city limit for the final disposal of clinical waste. It is inadequate to

handle all the clinical wastes of the city with the limited facilities of final disposal. PRISM Bangladesh is managing the generated clinical waste in different forms, (Hasan et al, 2008). In the new approach, PRISM Bangladesh is involved in training relevant personnel of different HCE (Health Care Establishments) for increasing awareness and proper in-house management of clinical wastes.

A public awareness campaign for proper management of clinical waste would be effective in keeping up the city environment safe. Awareness is essential to solve this problem, particularly with regards to the reuse of syringes and needles and other sharps contaminated with human blood or body fluids. PRISM Bangladesh has recently provided training for more than 3000 personnel in 185 HCE, (Hasan et al, 2008)

Hasan et al, (2008) stated that PRISM Bangladesh has developed a system for collecting segregated hazardous wastes (except radioactive wastes) from each HCE through newly set up vehicles to carry this waste for final dumping at their newly developed Matuail Plant. It has introduced in-house storage of clinical waste in color-coded bins. Segregation of waste at source into suitable color-coded bins is vital to a proper waste management. All of the HCE should now be using the Government of Bangladesh (GoB) approved color-coded high-density polyethylene bags for easy identification and segregation of infectious and non-infectious clinical wastes. This minimizes the actual volume of potentially infectious clinical waste and makes the disposal less costly and more effective. (Hasan et al, 2008)

PRISM Bangladesh and its Clinical Waste Management System

At present PRISM is working with Dhaka North City Corporation, Dhaka South City Corporation, Savar Municipality and Jessore Municipality. In Matuail there has a special treatment plant for clinical waste management which is operated by PRISM Bangladesh. There has also an incineration treatment plant in Jessore. There has a future plan for Sylhet. They collect clinical waste with their covered van with isolated container by trained workers. They take them into the waste disposal place situated at matuail sanitary land fill. For safe collection and transportation facility this institution uses six vehicle of 3 tons and two specialized collection vehicle of 1.5-2 tons. (PRISM Bangladesh, 2017).

Figure 03: Clinical Waste Treatment Plant, Matuail
Source: Source: PRISM Bangladesh, 2017

Figure 04: Different types of bins for different waste and covered truck.
Source: Field Survey and PRISM Bangladesh, 2017

Figure 05: Waste collection system
Source: Field Survey and PRISM Bangladesh, 2017

PRISM Bangladesh follows some processes to dispose clinical wasted. Details about the processes are in the below.

- **Autoclaving**

Infectious wastes are disinfected through autoclaving at 135°-144° temperature and 3 bar atmospheric pressure for a period of 45 minutes following the recommended method of WHO.

Figure 06: Autoclaving system
Source: PRISM Bangladesh, 2017

Then the treated wastes should directly buried into the burial pits providing 2-3 inches soil cover above each layer but this institution do not follow the process and strew it to the water bodies. Sometimes, the infected recyclable wastes are also disinfected through autoclaving process and send for recycle (PRISM, 2017).

Figure 07: Burial pit
Source: PRISM Bangladesh, 2017

Incineration

Infectious wastes (cotton, gauge, bandage, test sample, culture media etc.) which containing relatively low moisture content (less than 33%) and expired medicines materials are being incinerated by double chamber pyloric incinerator. These incinerators are using fossil fuel at a temperature ranging from 800°-1250°. Operational guidelines are followed to minimize dioxin gas keeping within the limit of Bangladesh emission standard. The residue should finally keep into a concrete pit but the residue after incineration mixed up with the solid waste (PRISM, 2017).

Figure 08: Incineration system
Source: PRISM Bangladesh, 2017

Chemical disinfection

Wastes (plastics, glasses, metals etc.) are disinfected through chlorinated water with three chambered tank where the first chamber is poured with 150-250 ppm concentration of chlorine water and here materials are sunk into solution for around 30-45 minutes and it is then transferred from the first chamber to the second chamber, charged with 20-50 ppm and retained for next 15-20 minutes. Further, the materials are transferred from the second chamber to the third chamber to rinse with fresh water. It is mentioned here that if the materials are close tube or containers, it should be cut into small pieces so that all faces can come to the direct contact of chemical before chemical disinfection. But the waste management committee and workers do not maintain this system. Then the materials are categorized into different

types according to their nature and send for recycle without crushed by the shedding machine for recyclers. Required parameters are not tested to the compliance of Bangladesh effluent discharge standard and through all the effluent to the water bodies situated beside the landfill area or with the solid wastes (PRISM, 2017).

Figure 09: Chemical disinfection system
Source: PRISM Bangladesh, 2017

Figure 10: Recycling and shredding system
Source: PRISM Bangladesh, 2017

- **Deep burial**

Body parts and sharp category of wastes is kept through the small door/inlet into well-constructed concrete tank with completely closed in all sides. In addition, bleaching powder is applying to the wastes as disinfectant for additional safety measure. Other recommended wastes are also managed by this process. When the tank/pit is completely filled up, it is sealed forever (PRISM, 2017).

Figure 11: Deep burial method
Source: PRISM Bangladesh, 2017

Conclusion

Clinical waste management is still an ignored phenomenon in Bangladesh. It is also intimate component of improved environment and public health. The environmental management of hospital means proper management of clinical waste has become an urgent necessity. Both private and public sector will have to take initiative to mitigate this emerging problem. Moreover, proper attention is required for the segregation, collection, transportation and final disposal of waste. At present, there exists a rule of clinical waste management in Bangladesh and it contains only disposal system and ignored the responsibility of hospital authorities about waste management. Therefore, it is necessary to upgrade the rules appropriately for the management of clinical wastes. Identification of the hazardous and infectious waste and their segregation from the general waste is necessary at the source of generation of clinical wastes. Primary segregation of hazardous waste is mandatory. Separation at the point of generation and safe handling should be practiced to combat occupational health hazards. Contextually appropriate treatment facilities are urgently required for the disposal of clinical waste. Since the approaches of PRISM are being followed by WHO stated methods, it can be patronizing for all municipal and city corporation level areas. Government should come forward to combat the hazard arising from indiscriminate use of recyclable clinical waste and unsafe disposal of other clinical waste in best approaches.

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