



Striving for scientific management of medical waste: Challenge for Dhaka City

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Abstract

Although Medical Waste (MW) accounts for less than one percent of total waste generation, it needs much more attention than other wastes do because of its hazardous and infectious nature. Being a developing country, unplanned and unscientific disposal of MW is a common practice in Bangladesh, especially in its capital city Dhaka. This article is a mixture of both quantitative and qualitative study. Data and information were collected through questionnaire survey and interview and were analyzed with simple calculation. It investigated that authorities and staff of the HCEs were well aware of the issue but were less willing to adopt scientific standard for MW. It also explored that process of management from waste generation to final disposal of the HCEs required much more development in achieving full scientific disposal. It found lacking in formulation and enforcement of laws and the deficiency of appropriate organizational for the proper management. Measures like adopting required guidelines, punitive compulsion and government responsibility had to be undertaken for the improvement of the situation. These would have to be accompanied by adopting scientific methods and by incorporating all the HCEs under a systematic management process.

Keywords: Medical Waste, Medical Waste Management, Dhaka City, PRISM Bangladesh

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1. Introduction

Waste Management and especially Medical Waste Management is a big concern in many parts of the world. In Bangladesh, about 89,945 kgs of Medical Waste (MW) are generated everyday; out of them about 22,486 kgs are infectious (MoHFW, 2011). One study found that MW accounts for 1% of total waste generation. Although household wastes can be handled easily things are far different for MW. Unlike household/municipal waste, the MW, if exposed to the people or environment, could be enormously dangerous. In recent time, volume of MW has been increasing in an alarming pace with the development of medical treatment and more importantly with the increasing coverage of healthcare facilities.

MW, which is also referred as clinical waste, has to be handled and disposed in a proper manner to eliminate the possibility infection and safeguarding the environment. The impacts associated with improper Medical Waste Management (MWM) can affect public health both directly and indirectly. It is widely accepted that traditional and out-dated systems of waste management and their improper disposal leads to pollution of the environment and creating health hazards amongst the dwellers of Dhaka city. It was, and still is, a common practice of Health Care Establishments (HCEs) of this city to dispose their waste into Dhaka City Corporation's (DCC) bins without any hesitation.

In the legal side, there was no formal legislation before 2008 except a manual compiled by the Directorate General of Health Services under Ministry of Health and Family Welfare (MoHFW). Although MoHFW had a guiding pocket book, it was not a legal document based on which punishment could be imposed. In 2008, Medical Waste (Management and Processing) Rule 2008 was promulgated that was prepared by Department of Environment (DoE) for processing and management of medical waste in Bangladesh. National Implementation Coordination Committee (NICC) was formed by MoHFW in 2007 for MWM, but it was not of significance as there was no legislative arrangement to base its implementation strategy. The Dhaka City Corporation (DCC) is responsible for maintaining public health, responsible for sanitation and collection and disposal of municipal solid waste, although it is in shortage of sufficient capacity. Currently, DCC is working with a non profit organization naming 'PRISM Bangladesh' to collect and dispose of MW. In this context, MW is really a big threat for the public health and for the environment.

2. Methodology

This study has been done in Dhaka City Corporation area of Bangladesh. It is a mixed-method study. Both qualitative and quantitative approaches were used in this paper although no statistical tool of data analysis was used. Rather analysis had proceeded through the use of numeric data given in the tables and through the use of percentage on different dimensions of analysis. As a qualitative approach, this study unraveled the level of awareness of the respondents, the nature of the planning of the HCEs regarding the MWM, the process of disposal etc. Fourteen HCEs, among more than 1200 HCEs, from the study area had been taken as the sample. While sampling, purposive sampling method had been used. The reason of purposive sampling was to take HCEs both under the service of 'PRISM Bangladesh' and outside of its coverage.

3. Impacts of medical waste on health and environment

Unscientific disposal of waste can cause fatal consequence related to health and environment. One study showed that some 5.2 million people including 4 million children die each year from waste-related diseases all over the world (Akter, 2000). MWs may cause disease and illness in human being, either through direct contact or indirectly by contamination of soil, groundwater, surface water and air etc. Exposure to hazardous medical waste results in fatal disease. Any person exposed to hazardous medical waste is potentially at risk. It includes persons who are engaged in the place of generation of waste, persons who are engaged after the generation till the final disposal and persons who are to face these wastes as a result of careless management. Potential health effects from exposure to medical waste are numerous. Infections may be transmitted by contact with patients' excretions or body fluids contained in the waste. Pathogens may also be distributed by rodents and insects that come in contact with unsafely stored waste (WHO, 1999). Potential health effects through MW include respiratory infections, blood stream infections, skin infections, effects of radioactive substances and intoxication. The reuse of infectious syringes represents a major threat to public health. Based on previous estimates, WHO estimated that in 2000 worldwide, injections undertaken with contaminated syringes caused about 23 million infections of Hepatitis B and Hepatitis C and HIV (WHO, 2005).

In addition to health risks derived from direct contact, MW can adversely affect environment as well. Water bodies can be contaminated during waste treatment as a result of dumping liquid hazardous wastes in water. When wastes are disposed of in a pit which is not lined or too close to water sources, the water bodies may become contaminated. Air can be polluted through emissions of highly toxic gases during incineration. If MW is burned openly or in an incinerator with no emission control, which is the case with the majority of incinerators in developing countries, dioxins and furans and other toxic air pollutants may be produced. This would cause serious illness in people who inhale this air (WHO, 2005).

4. Medical waste management in dhaka city: Analysis

There are 1263 registered private hospitals and clinics, 4458 diagnostic centers and 41 blood circulation centers in Bangladesh. Of them, according to 'PRISM Bangladesh', the number of Health Care Establishments (HCEs) in Dhaka city area is about 1200. Among those, questionnaire survey is conducted in 14 HCEs which covered five hospitals, eight clinics and one diagnostic center for its questionnaire survey. In the studied HCEs, everyday on an average, about 250 to 300 patients take admission for long term treatment and about 4300 to 4500 patients are visiting for consultation with doctors and diagnostic purpose.

4.1. State of awareness of the HCEs

Study found that 90% of the respondents at the administrative level were aware who knew the Medical Waste Management (MWM) related issues and thus responded confidently. Remaining 10% respondent at the administrative level even did not know about any rule regarding the MWM issue. From the study it was

clear that almost all of the respondents from studied HCEs were aware of the importance of managing MW systematically. But in reality very few of those HCEs practiced accordingly. On the other hand 50% of the studied HCEs claimed that they had their own plan for the management of MW. But when they were asked again 'what was that plan?'- they did not give any satisfactory answer. Even two of the most modern and highly equipped HCEs of the country failed to provide any convincing reply. One of the highly reliable HCEs had own Effluent Treatment Plant (ETP). Remaining 50% had no plan; although they stated that they manage wastes in such a way that it did not affect the environment and public health. In the studied HCEs, about 257 kg of hazardous wastes was generated every day (Table 1).

Table 1. Profile of Studied HCEs

HCEs	Type	No. of beds	Patients admitted everyday	Patients visited everyday	Per day* (in kg)
HCE 1	H	250	20-30	1000	30
HCE 2	C	60	4-5	10	6
HCE 3	C	20	4-5	50-55	2
HCE 4	C	70	20-25	200	12
HCE 5	H	320	30-40	1000	80
HCE 6	DC	-	-	100	10
HCE 7	C	40	15	-	13
HCE 8	C	40	10	10	7
HCE 9	C	68	20-25	150-200	12
HCE 10	H	300	60-70	350	15
HCE 11	C	20	10	35-40	5
HCE 12	C	30	5-7	150	15
HCE 13	H	120	15-25	500	20
HCE 14	H	300	30-35	700	30

*H=Hospital, C=Clinic, D=Diagnostic Center *Average estimated by the respected HCEs*

From the above table, it is clear that the amount of waste generation was not dependent on the number of patients' bed available in the HCEs. Rather the nature of HCE, facilities available within it and the nature of treatment provided were the determinant of the amount of waste generation.

4.2. Medical waste management practice in studied HCEs

When MWs are generated as a result of treatment or diagnostic, it becomes necessary to manage those wastes systematically. The process of management ranges from separation to temporary storage to final disposal. Separation of hazardous MW from non hazardous is crucial. Because mixing of hazardous MW with non hazardous may turn the whole waste into hazardous and thus can increase the volume of waste that need special treatment. Separation also needed for the reason that different types of wastes need different disposal mechanism. As found in the study, about 93% of the studied HCEs separate hazardous wastes from non hazardous wastes while 7% of HCEs was found to dispose all of its wastes into DCC dustbin together. To mention, separation of hazardous wastes from non hazardous is not enough. Rather separation within

hazardous wastes is also required. 13 out of 14 HCEs claimed that they separate hazardous wastes into different categories. Of them, one HCE claimed to separate into seven categories; one claimed to separate into five categories; four HCEs separate into three categories; and one HCE separates into two categories. Seven HCEs did not mention the number of categories they make. We found one HCE, which has only 20 beds, did not make any categorization within hazardous wastes. The reason might be because it was small and its resources were limited. To separate waste into different categories means to have more than one container, which requires more money. Separation also needs more human being to do so or consumes more labor hours of the employee. For a HCE with limited number of patients and with limited resources, it might be difficult to bear the extra cost associated with separation of hazardous wastes into different categories, although this logic was not accepted from the public health point of view.

Temporary storage after separation is important too. Negligence in the storage may cause the spread of viruses into air, dispose of waste into patients and visitors and thus can cause health hazards. The proper temporary storage mechanism includes few considerations. It includes the nature of containers (open/capped) within whom the wastes are stored, the safety measures taken to keep the waste room clean and virus free, and the time duration of storing wastes at that place. 22% of the HCEs reported that they use uncovered container for the storage of waste and 78% claimed of having covered container. As shown in the Table 2, wastes are taken outside once in a day in most of the HCEs.

Table 2. Temporary Storage Practice in Studied HCEs

HCEs	Place of storage	Means of storage	Frequency of taking waste outside/day
HCE 1	-	-	1
HCE 2	-	Drum	1
HCE 3	-	Drum	1
HCE 4	Basement	Drum	1(But Irregular)
HCE 5	Dumping spot	Bin	3
HCE 6	Separate room	Bin	2
HCE 7	Separate room	Bin	2
HCE 8	Separate room	Bin	1
HCE 9	Basement	Drum	3
HCE 10	Each floor of HCE	Bucket	2
HCE 11	Ward/Patient room	Bowl	1
HCE 12	Ward/Patient room	Bowl/bucket	1
HCE 13	Separate room	Drum	1(But Irregular)
HCE 14	Separate room	Drum	1(But Irregular)

That means wastes have to have in the HCEs for 24 hours. As per the WHO (1999) caution, in the tropical area, wastes can be stored for maximum of 24 hours in hot season and 48 hours in cooler season before final disposal. From this point of view, studied HCEs were in satisfactory condition. Storage space of MW also needed to be clean in regular basis. In this study, 41% of the HCEs found to clean their storage space once in a day. Cleaning their waste room for remaining 59% ranges from once in two days to once in a week.

Now it comes the final disposal stage. Final disposal is the prime step which surely saves the environment from contamination and public health from being affected by diseases. As previously stated, DCC outsourced the management of MW to 'PRISM Bangladesh', the lone organization to manage MW in Dhaka city. Currently, this organization is covering 325 HCEs out of 1200 HCEs. Four covered van of 'PRISM Bangladesh' go to these HCEs and collect their hazardous waste. Then vans take those wastes to the disposal center. Final treatment is done through autoclaving, incineration, chemical disinfection and deep burial. Half of the studied HCEs, 7 out of 14, were in contract with PRISM Bangladesh for the final disposal. Unfortunately, 'PRISM Bangladesh' had no resources of their own; neither it got any financial support from DCC nor financial assistance from donor agencies. Only income they made by selling recyclable items after treatment. So it had to charge HCEs a reasonable amount for making the provision of salary of its staffs¹. The Table 3 shows the HCEs in contact with PRISM Bangladesh and cost issue of final disposal.

Table 3. HCEs not/under the purview of PRISM & Cost

HCEs	HCEs Under PRISM	Cost associated for final disposal	HCEs not Under PRISM
HCE 1	YES	15,000	
HCE 2	YES	1,200	
HCE 3	NO		DCC dustbin
HCE 4	YES	3,000	
HCE 5	YES		
HCE 6	NO		Self
HCE 7	NO		DCC waste collector
HCE 8	NO		DCC dustbin
HCE 9	YES	3,000	
HCE 10	NO		Unnamed organization
HCE 11	YES	1,000	
HCE 12	NO		Self
HCE 13	YES	4,000	
HCE 14	NO		Self

The considering factor is that the charge taken by 'PRISM Bangladesh' for management were not in accordance with the rate fixed by setting any standard, rather it was set by bargaining. The 'PRISM Bangladesh' had the capacity to manage about 8.5 tons of wastes per day. But it managed about 6 tons per

¹ Currently 'PRISM Bangladesh' has 49 staffs, including its official at Dhanmondi office, drivers and helpers of the vans and employees at the disposal center at Matuail, Dhaka.

day. Associated officials were asked why there was mismatch between capacity and managed amount, as still there were many HCEs to be covered. The official replied that:

"We invite HCEs to come under our services through formal letter. But many of them won't come. We are not encouraging the concerned authority to enforce the rule of MWM, because if the authority does so, we will face incapacity of managing huge volume of wastes. This is why we are proceeding with a gap between capacity and managed amount. The process of enhancing our capacity is on the way; soon we will encourage concerned authority to enforce the law so that large number of HCEs comes under our service of scientific management."

The final disposal was ambiguous to those HCEs who did not take service from PRISM Bangladesh. Some of them claimed that they managed their waste, including hazardous, by themselves and some of them were avoiding their responsibility saying that "we give all types of waste to DCC waste collector, it is their concern what they will do with those waste"². Table 3 shows the scenario of final disposal of seven HCEs who were not under the service of PRISM Bangladesh. As per the table, two HCEs directly dumped their hazardous wastes into DCC dustbin. While they were asked why they did so knowing that these wastes were threat to public health, they responded very frankly. They stated that as their HCEs were small in size, the amount of hazardous waste generation was small too. So it would not pose any threat to public health. One of the HCEs handed over its hazardous wastes to door to door waste collector of DCC. It stated that it was aware of the threat of hazardous wastes to public health and to the environment. This was why it is handing over the wastes to the DCC waste collector. To this HCE, it was DCC's responsibility to manage the wastes systematically.

5. Problems and recommendations

Several impediments against proper management of Medical Waste in Dhaka city had been identified through this study. Lack in enforcing existing laws, constraints of resources, organizational inefficiencies and lack of awareness were some of them. Introduction of scientific management of MW in Bangladesh started in 2000. But the law came in place formally in 2008. In addition, the law was not implemented properly. There were plenty of HCEs who were not taking the path of scientific management and thus continuously posing threat to the environment and public health. For example, HCE 3 was offered four times to come under the service by 'PRISM Bangladesh.' But, according to the interviewed official of PRISM Bangladesh, all the time they refused to come under the service. A counter blaming tendency between 'PRISM Bangladesh' and HCEs was surfaced during the survey. 'PRISM Bangladesh' was blaming that the HCEs did not give some of recyclable wastes, i.e. plastic, although those wastes too were hazardous most of the time. On the other hand, an official of HCE 2 blamed 'PRISM Bangladesh' saying-

² Respondent of the HCE 3 replied in this way while he was asked why they were giving together all the waste to the DCC knowing that MWs should be separated into hazardous and non hazardous (field survey 2011 by the authors).

"We give all our recyclable wastes to them (PRISM Bangladesh) and they sell those wastes for profit making purpose, without disposing them in scientific way".

As found in the study, Dhaka city was in shortage of sufficient management capacity to deal with MW. Least to say, there was only one organization (PRISM Bangladesh) to manage the MW of this mega city. Moreover, this organization is currently operating in an inefficient way as it disposes fewer wastes than it could do. It is doing the task partly from the moral compulsion and partly from the fear of losing customer. The HCEs were involving with 'PRISM Bangladesh' only because of punitive compulsion. It is because if HCEs reject the invitation of 'PRISM Bangladesh' to come under the service then they might be reported could be subject to punishment by concerned authority. There might be another reason though. They fear of being reported as careless regarding the MWM issue and thus may face lose their customers. Issues of public health and environmental degradation are absent in the consideration. Now, to further improve the system of MWM this study recommends the followings:

Firstly, Although awareness building had already been initiated during last 2-3 years back, but it needed to be strengthened and continued. Awareness rising had to be done among the common. To do so, appropriate and clearly understandable guidelines had to be developed for the proper management of MW because these types of wastes include hazardous and infectious categories that require proper technical guidance. Also it needed to provide education and training to the staffs of HCEs about the MWM issue so that they could handle the wastes as per the guidance.

Secondly, outsourcing of the MWM should not be limited to one organization. More organization with technical knowledge on the issue should be incorporated in the process of management to ensure that each and every HCE is under coverage of scientific management. From government part, sufficient resources for managing MW should be provided. These resources either should come from the annual budget of DCC or from the financial assistance of donors. There should be a separate administrative body at the government level to coordinate the whole process for successful implementation of scientific management of MW in Dhaka city. Thus we can save millions of people from the hazard it can cause. Our eyes are set on the horizon.

6. Conclusion

The Medical Waste (MW) generation in Dhaka city has been increasing enormously both in quantity and variety. However, until recently, the management of medical waste has received very little attention. At present, although some Health Care Establishments follow the codes of Medical Waste Management, many of them are yet to adopt/follow any code and regulation related to MW. Lapses were found in all stages such as collection, segregation, storing, treatment and final disposal. This study found that Individuals working at the level of administration were aware of the urgency of proper management. But in practice many of them were not following well defined scientific standard, even some of them were simply dumping their wastes into nearest dustbin without any hesitation. Almost all of the studied HCEs segregated their hazardous wastes from non-hazardous wastes. Most of them were categorizing hazardous wastes according to their nature, but

still there were HCEs who did not make all the required categories. Resource constraint of the respected HCEs was a reason of not making category as it consumed more labor hour to do so and more assets to buy necessary equipments. Half of the studied HCEs were out of the service of this organization. Some of them were used to dump their all kind of waste into Dhaka City Corporation (DCC) dustbin while some just passed those to DCC waste collector. Few of the studied HCEs were claiming that they manage their waste by themselves. But when we considered all the associated factors related to waste management, we concluded that the final destination of their waste was DCC bin.

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