Revisiting Medical Waste Management of Healthcare Facilities in Bangladesh

Gaylan Peyari Tarannum Dana*
Sanjit Roy**

Abstract

Waste generated from the healthcare facilities are infectious and hazardous that poses serious threats to environment. So it requires proper management prior to its final disposal. This paper shows the exiting scenario of medical waste management practice in the healthcare facilities of Bangladesh. This cross-sectional study utilizes data from the Bangladesh Health Facility Survey (BHFS) 2014. The study shows that open burning of both sharp and medical wastes are practiced in rural areas as well as government own healthcare facilities. On the other hand, privately owned and urban healthcare facilities usually remove offsite. The paper also shows that general wastes are managed same as sharp wastes though the type of wastes are different. Therefore, medical waste management needs sufficient consideration in both private and governmental hospitals as there is inadequate medical waste management. The Ministry of Health and Family Welfare should pay more attention towards policies for the disposal of wastes and proper management to ensure improvement and adequacy in the medical waste management practices. Moreover, there is need for regular worker training, continuing education, and management evaluation processes for systems and personnel for awareness.

Key words: Sharp waste, general waste, management system, divisions, healthcare facilities, urban rural.

Introduction

Medical wastes are generated in the healthcare facilities, diagnosis centers and in research pertaining either in solid or liquid forms like blood-soaked bandages, culture dishes and other glassware, surgical gloves, instruments, needles, lacents, cultures, stocks and swabs used to inoculate cultures and removed body organs (WHO 2000, (Tudor, Noonan, & Jenkin, 2005). In Bangladesh there are about127, 360 hospitals run by Directorate General of Health Services and registered private hospitals including some non-registered hospitals

* Gaylan Peyari Tarannum Dana, Associate Professor, Department of Population Sciences, University of Dhaka.

** Sanjit Roy, Assistant Professor, Department of Population Sciences, University of Dhaka.

(DG Health 2016). Over the last decades the number of healthcare establishment has increased the volume of highly hazardous medical waste (Blenkharn, 2006; Karamouz, Zahraie, Kerachian, Jaafarzadeh, & Mahjouri, 2007; Patwary et al., 2009). Everyday about 89,945kgs of medical wastes are being generated out of which 22,486kgs are highly infectious (MHOFW, 2011). The total amount of waste generated by the healthcare facilities about 85 percent is non-hazardous and remaining 15 percent is infectious (WHO 2015). Therefore, management of medical waste management is becoming severe problem and it's getting with an ever-increasing number of hospitals, clinics, and diagnostic laboratories in Bangladesh.

This problem is an emergent concern in both developed and developing countries as the hazards related to the waste are increasing the possibilities of spreading infection and injury among the individuals, communities and environment through direct or indirect contact if not cautiously handled (Bardy et al., 2005; Jang, Lee, Yoon, & Kim, 2006; Ray, Roychoudhury, Mukherjee, Roy, & Lahiri, 2005; Silva CE, 2005).The particular concern is for the people who are dealing with the recycling of medical waste components especially waste collectors, scavengers and recycle operators (Patwary, O'Hare, & Sarker, 2011; Perry, Jagger, Parker, Phillips, & Gomaa, 2012). If medical wastes are simply disposed of it can be very hazardous particularly when the infectious waste gets mixed with municipal waste (Akter, 2000; Asase, Yanful, Mensah, Stanford, & Amponsah, 2009; Coutinho, Pereira, Rodrigues, & Borrego, 2006; Silva CE, 2005; Singh, Kumari, Srivastava, & Wakhlu, 2014; Sundell-Bergman, De la Cruz, Avila, & Hasselblad, 2008). Commonly in Bangladesh all (medical, household and industrial) wastes are disposed of by open dumping in either low depressions or high areas for natural degradation and safe disposal of medical waste has been ignored till today (Akter, Chowdhury, & Kazi, 1999).Therefore, appropriate medical waste management is essential for not only human health concerns but also for environmental threats (Jang et al., 2006).

Medical waste management has two parts in-house[1] and out house[2] waste management. Hospitals, clinics and diagnostic centers are responsible for in house management or waste handling. City corporations/municipalities are responsible for outhouse management of medical waste. Different NGOs like PRISM Bangladesh and Prodipon have intervened in Dhaka, Khulna, Jessore, Barisal, Chittagong, Rajshahi and Sylhet, six administrative district of Bangladesh (DOE, 2010; UNDP, 2012). Prodipon collects waste from 42 out of 110 medical hospitals in Khulna city and in Dhaka city around 127 hospitals are provided with final disposal including in-house management by PRISM (M. Rahman, Rahman, & Patwary, 2008). To ensure appropriate medical waste management, government is trying to adopt different modern approaches. Government of Bangladesh also prepared a hospital waste rule in 2008.

Majority healthcare facilities don't have any in-house waste management site where waste can be segregated and treated before disposal. Untrained, unprotected and unaware cleaners of the

1. In house medical waste management-segregation and temporary storage of medical waste in the uniform color code within the medical hospitals premises.

2. Out house medical waste management means collection of medical waste from the hospitals premises to the disposal site for treatment.

healthcare facilities usually collect the waste from different sources and store it together before disposing offsite or burning it within the healthcare facilities.The medical waste is disposed of in municipal bin/city corporation dustbin, pit in the hospitals premises or in the open field or in the road side (MOHFW, (2011); Syed, Mutahara, & Rahman, 2012).Improved medical waste management system will minimize the health risk that will have a significant long term impact on the spread of infectious diseases. Still, exploration on this critical issue has been limited and there is a serious lack of information for planning. There had been several studies conducted on the impacts of improper medical waste management (MWM) especially in Dhaka city. However, the scenario of the waste management system outside of Dhaka is very serious. In this context, this study is an attempt to find out existing scenario of medical waste management practices in different healthcare facilities in Bangladesh.

Methodology

Data

This is a descriptive study based on Bangladesh Health Facilities Survey (BHFS) 2014 a national survey data. The data is publicly available and nationally representative survey of 1596 healthcare facilities in Bangladesh. The BHFS survey provides information on the availability of basic and essential healthcare services and the readiness of health facilities to provide quality services to clients. The sample for the 2014 BFHS was drawn to allow for separate estimates of key indicators were general facility readiness (i.e., sources of water and electricity), staffing, health management information systems, health statistics, processing of instruments for re-use, health care waste management, availability of basic supplies and equipment, laboratory diagnostic capacity, and medicines and commodities. Service-specific readiness (child vaccination, growth monitoring, and curative care), FP, antenatal care (ANC), delivery and newborn care, tuberculosis, NCDs, caesarean delivery, blood typing and compatibility, blood transfusion services, and general facility cleanliness. Health service providers (i.e., qualifications). Give information of the divisions and for urban and rural areas separately. The survey used cross-sectional study with a stratified random sampling technique.

Dependent variable

This study used only a single dependent variable related to disposal of medical waste management.

Independent variables

The independent variables were (a) Facility types (District and Upazila Public Facilities; Union Level Public Facilities; Public Community Clinic; NGO Clinic/Hospital and Private Hospital (b) Location (urban/rural) (c) Administrative divisions and (d) Ownership (government ownership and private ownership).

Analytical approach

Combinations of univariate and bivariate analyses have been applied to explore the medical waste management scenario in the healthcare facilities in Bangladesh. Bivariate association

between dependent and independent variables have been performed to assess the significance of these relationships. As a part of univariate analysis percentage and ratio have been used to describe the data.

Ethical Considerations

This study used the data from BFHS. Thus, the ethical approval is not required because the full report of BFHS is already published and publicly available.

Results

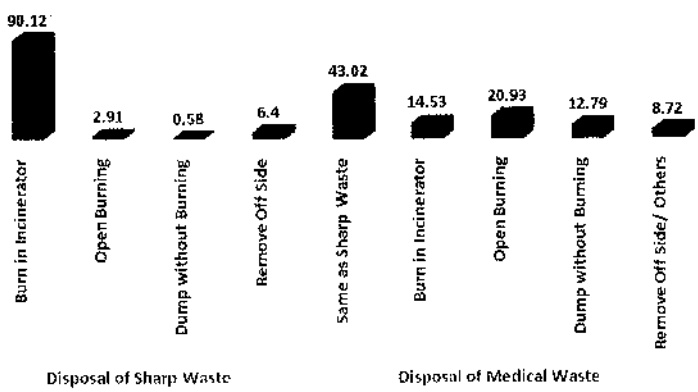
Background Characteristics of Healthcare Facilities

Among the facility types 37.78 percent healthcare facilities were at union level, 21.01 percent are public community clinic, 18.48 percent are district and upazila level. A vast majority of the healthcare facilities were authorized by the government (84.71%) and only 16.73 percent were authorized by NGO clinic /hospitals and private hospitals. The majority (24.06%) of healthcare facilities were in Chittagong division, followed by Dhaka, Barisal, Sylhet, Rajshahi, Khulna and Rangpur divisions. Majority healthcare facilities were in rural areas (72.12%).

Overall Waste Management by the Healthcare Facilities

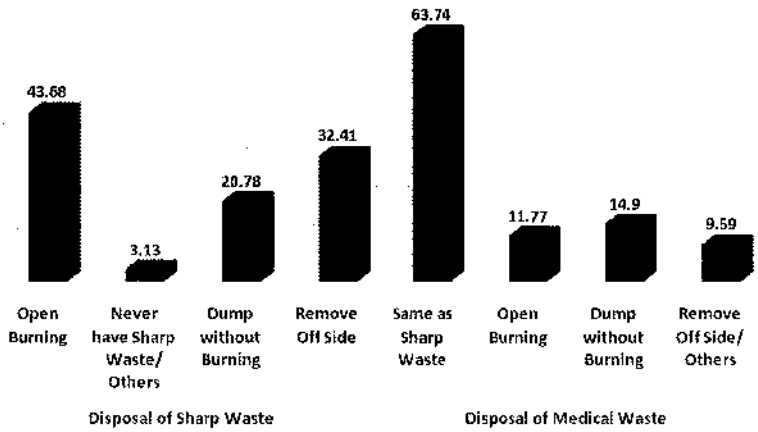
Healthcare waste management has two parts in-house and outhouse waste management. Hospitals, clinics and diagnostic centers are responsible for in house management or waste handling. City corporations/municipalities are responsible for outhouse management of medical waste. Different methods were used by healthcare facilities to dispose of waste sharp and other medical wastes. There were about 1596 healthcare facilities of which only 286 healthcare facilities had incinerators and only 172 incinerators were functioning (table not shown). Around 90.12 percent health facilities with having functioning incinerator burned out their sharp and other medical wastes in incinerator followed by remove offsite (6.4%), open burning (2.91%) and dumping without burning (0.58%) (see figure 1).

Figure 1: Overall Waste Management by the Healthcare Facilities that have Functional Incinerator



The healthcare facilities with having no incinerator usually practice open burning of all type wastes (sharp and other medical waste). Dump without burning was another common practice by the healthcare facilities for all sorts of waste including sharp waste. About 32.41 percent and 9.59 percent of facilities used to remove their sharp and other medical wastes offside without any treatment (see figure 2). Only few (3.13%) healthcare facilities did not generate any sharp wastes.

Figure 2: Overall Waste Management by the Healthcare Facilities that don't have Incinerator



Disaggregated analyses have been performed to observe the variation of disposal of sharp wastes by different background variables such as: 'Facility type', 'location', 'administrative divisions' and 'ownership (management authority)' (Table 1). The district and Upazilla (45.11 %) and Union level (51.75 %) public facilities generally disposed their sharp waste by open burning. Whereas public community clinics (35.80 %), NGO Clinic/Hospitals (53 %) and Private hospitals (63.29 %) removed sharp waste offsite. In urban areas, 48.32 percent sharp wastes were removed offsite and whereas in rural areas 47.38 percent sharp wastes were burned in open places. The practice of open burning of sharp wastes was common across all administrative divisions. However, about 45.69 percent government authorized facilities openly burned the sharp wastes whereas, the practice of open burning of sharp wastes was much higher among the private ownership healthcare facilities (55.35%). Significant differences were found in terms of sharp waste management by all explanatory variables at 5 percent level of significance.

Table 1: Final Disposal of Sharp Wastes by Selected Background Characteristics

Background Characteristics	Open Burning (%)	Dump Without Burning(%)	Remove offsite(%)	Never Have Sharp Wastes /Others (%)	Total
Facility Types					**p=0.000**
District and Upazila Public Facilities	45.11	23.40	30.64	0.85	235
Union Level Public Facilities	51.75	22.84	22.28	3.13	543
Public Community Clinic	39.62	19.33	35.80	5.25	419
NGO Clinic/Hospital	33.00	13.00	53.00	1.00	100
Private Hospital	18.99	16.46	63.29	1.27	79
Location					**p=0.000**
Urban	31.80	18.96	48.32	0.92	327
Rural	47.38	21.35	27.45	3.81	1049
Division					**p=0.000**
Barisal	55.16	21.03	20.24	3.57	252
Chittagong	36.65	22.98	36.34	4.04	322
Dhaka	36.97	20.17	39.92	2.94	238
Khulna	38.52	20.74	33.33	7.41	135
Rajshahi	53.24	36.00	25.90	0.72	139
Rangpur	40.00	25.00	32.86	2.14	140
Sylhet	49.33	13.33	37.33	0.00	150
Ownership (Managing Authority)					**p=0.000**
Government Ownership	45.69	21.45	29.42	3.45	1217
Private Ownership	28.30	15.72	55.35	0.63	159

Bivariate analysis of final disposal of medical waste by selected background characteristics showed that majority of private hospitals (75.95%) still used to dispose their waste same as sharp waste which was followed by open burning, dump without burning and remove offsite. Majority of urban and rural health facilities disposed their medical wastes in the similar way in which sharp wastes were disposed and the different approaches of medical waste disposal are significantly different in terms of location of health facilities at 5% level of significance. On the other hand, Barisal and Sylhet divisions had higher percentages of disposal of medical waste was same as sharp waste (70.24% and 72.67%, respectively). It was also found that privately ownership facilities practiced same as sharp waste (65.41%), open burning (11.32%), dump without burning (8.81%) and remove offsite/other (14.47%). In addition, significant differences (at 5% level) were found in terms of medical waste management by all explanatory variables (Table 2).

Table 2: Final Disposal of Medical Wastes by Selected Background Characteristics

Background Characteristics	Same as Sharp Wastes (%)	Open Burning(%)	Dump Without Burning (%)	Remove offsite /Others (%)	Total
Facility Types					**p=0.000**
District and Upazila Public Facilities	60.00	16.60	10.64	12.77	235
Union Level Public Facilities	65.38	11.97	15.84	6.81	534
Public Community Clinic	63.25	9.31	18.62	8.83	419
NGO Clinic/Hospital	56.00	15.00	12.00	17.00	100
Private Hospital	75.95	5.06	5.06	13.92	79
Location					**p=0.000**
Urban	61.16	13.15	9.48	16.21	327
Rural	64.54	11.34	16.59	7.53	1049
Division					**p=0.000**
Barisal	70.24	9.52	12.70	7.54	252
Chittagong	66.15	8.70	15.22	9.94	322
Dhaka	56.30	18.49	9.66	15.55	238
Khulna	51.11	14.81	17.04	17.04	135
Rajshahi	65.47	14.39	12.95	7.19	139
Rangpur	60.00	5.71	30.71	3.57	140
Sylhet	72.67	12.00	11.33	4.00	150
Ownership (Managing Authority)					**p=0.029**
Government Ownership	63.52	15.69	15.69	8.96	1217
Private Ownership	65.41	11.32	8.81	14.47	159

Discussion and Conclusion

The purpose of the study was to view the existing scenario of medical waste management of healthcare facilities of Bangladesh. Consistent with previous research conducted elsewhere, the findings of this research indicate that sharp and medical waste management system in healthcare facilities of Bangladesh was very poor. This finding was consistent with earlier research conducted (Alam, Islam & Islam, 2015; Asante, Yanful & Yaokumah, 2013; Hossain & Uddin, 2014; Ola-Adisa, Mangden, Sati, & Adisa, 2015; Rahman, Tanu, & Patwary, 2015). Both privately or government owned healthcare facilities have improper waste management system, where open dumping and open burning is higher. Part of the reason behind inappropriate management was that they have cleaners who were less educated and untrained. In addition, they have less awareness which essentially contributes to the mishandling. In connection with this, other studies showed that "types of healthcare facilities effects medical waste management that operate through the direct associations between facility types and managing authority" (Dana, 2011; Hossain & Uddin, 2014; Hossain, Santhanam, Norulaini, & Omar, 2011; Patwary et al., 2011; Rashid, 1996; Rumi, 2016)

The bivariate analysis of medical waste management showed that there were differences among the three categories of disposal (open burning, dump without burning and remove offsite/other) in all administrative divisions, facility types and location. However, having same as sharp waste disposal system for general waste management suggests that they have higher inappropriate waste management system in the healthcare facilities of Bangladesh. This can be explained by the group effect of awareness and excess to information on proper waste management. More specifically, some other factors might exert positive influence on

waste management for healthcare facilities in rural areas. For instance, negative attitude towards less awareness, waste segregation training, low budget for waste management could be most probable factors in this case (T Dana, 1999; Tarannum Dana, 2011; Jang et al., 2006; Karamouz et al., 2007; Manga, Forton, Mofor, & Woodard, 2011; Ola-Adisa et al., 2015; Park et al., 2009; Uddin, Islam, & Yesmin, 2014).

One of the limitation of this study is that management of sharp waste and medical waste are different in nature and volume but the data set didn't have breakdown. Another limitation of this study was the use of cross-sectional data in this analysis. The disadvantage of using cross-sectional data is that facility type, divisions and management authority did not truly reflect the real situation of final disposal of medical waste management. As a result, the facility type, divisions and management authority used in this study were not the exact representative of their final disposal of medical waste management. However, one strength of this study is that regional variations (e.g., rural urban or divisional variation), different types of healthcare facilities and managing authority in waste management were taken into account in the analysis as its main focus was examining existing scenario of the waste management of healthcare facilities in Bangladesh. Thus, based on the findings of this study, it was possible to see that management of medical waste was identical across region. Earlier research focused only on Dhaka, Rajshahi and Khulna where substantial variations in waste management by region were not focused, along with different types of healthcare facilities and managing authority(Akter & Tränkler, 2003; Alam, Sujauddin, Iqbal, & Huda, 2008; Almuneef & Memish, 2003; Biswas, 2009; Hossain & Uddin, 2014; Patwary et al., 2011).

Despite these limitations, this study provided important contributions to the literature through incorporating regional variation analysis for Bangladesh in particular. One possible extension of this study could be to examine the in-house medical waste management in Bangladesh disaggregated by waste segregation. This is particularly important because the effect of in-house medical waste management may not be identical across various categories of health facilities, divisions and management authority. Therefore, future research should focus on this aspect as well as out-house medical waste management. It is evident from this study that even after adjusting for the selected background variables final disposal of medical waste management have lower open burning and lower remove offsite. This suggests that there are some unobserved factors (not included in the data) that might improve the medical waste management scenario for healthcare facilities. In future research, it is worthwhile to take unobserved heterogeneity into account in the analysis in order to avoid the risk of either underestimating or overestimating the proper medical waste management.

The findings of this study suggest that government should take necessary initiatives to ensure the implementation medical waste management rule 2008 in all types of healthcare facilities of Bangladesh with a view to reduce the volume of medical waste in Bangladesh. Findings based on bi-variate analysis the substantial variations were found in managing hospital wastes by managing authority and facility types. Therefore, Ministry of Health and Family Welfare should pay more attention towards implementation of medical waste management rule 2008 for disposal of wastes and proper management to ensure

improvement and adequacy in the medical waste management practices. Every healthcare facilities should have a waste management unit to handle the waste management practice along with regular worker training and management assessment processes. These type awareness program should be launched to aware Cleaners, Nurses and sanitary workers to understand the problems of mismanagement of medical waste and to concentrate more on establishing segregation of waste management prior to disposal. To fulfill these objectives, both the government and non-government sectors should come forward to ensure proper medical waste management. The social awareness program should also focus on motivating common people to follow the rules of medical waste management for having clean healthcare facilities and for ensuring good health to all. Furthermore, government should ensure that hospital facilities have good and functioning incinerators or provide a central incinerating facility where these waste could be taking to and treated before final disposal. Further future studies can be carried out with the objective to see those will be conducted based on storage issues and transport of medical waste that is also part of medical waste management.Therefore, an integrated approach is needed to bring desired change in medical waste management of the healthcare facilities in Bangladesh.

Competing Interest

The authors declare that they have no competing interests.

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