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INTEGRATED DEVELOPMENT FOR WATER SUPPLY AND SANITATION

A study on hospital waste management in Dhaka City

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A HOSPITAL IS a service-oriented residential establishment that provides medical care facilities comprising of observational, diagnostic, therapeutic and rehabilitative services for persons suffering from or suspected to be suffering from any kind of disease or injury. The basic concepts of waste management in a hospital do not differ basically from that in hotels, schools and catering establishments since certain areas of the hospital render the same type of basic services. But some wastes generated in a hospital are too hazardous to be treated negligently, and any carelessness in the management of these wastes in a hospital tend to spread infections and contaminate the entire living environment prevailing in a hospital. The delay in the recovery and overburden of weak patients, endanger the patients' survival and may also generate health hazards to personnel working in and around the hospital environment. Although some degree of attention is given on the cleanliness of patients' hospital wards, premises, laboratories, operation theaters, closets etc. and on the supply of safe drinking water in some hospitals/clinics in Dhaka but adequate emphasis is not given in most cases for the proper management of generated wastes and particularly the disposal of hazardous solid wastes. It is observed that the solid clinical wastes are being disposed off in the City Corporation's collection bins in and around the hospital premises. The waste is then collected by the City Corporation's Vehicles and then transported to the open municipal dumping sites. The management of hospital waste requires its removal and disposal from the health care establishments as hygienically and economically as possible, by methods that all stages minimizes the risk to public health and to the environment. This study encompasses on an in-depth analysis of the present conditions of waste management systems of selected hospitals in Dhaka city and an assessment of different cost-effective options for proper management of hospital waste in the prevailing condition in Dhaka city.

Present status of waste management

Dhaka, the capital of Bangladesh, is expanding very rapidly. The present population of Dhaka city is estimated at around 8 million with a very high annual growth rate of about 5.6 per cent as compared to the countries overall growth rate of 2.17 per cent per year. Compared to demand of this huge population, health care facilities in Dhaka are quit inadequate. In recent years rapid and mushrooming growth of private clinics/ hospitals have tended to alleviate this problem to some extent. There are about 250 healthcare centres in Dhaka city that includes hospitals, clinics, nursing homes, dental hospitals etc. But inadequate waste management systems in these healthcare facilities are posing a serious threat to public health as well as to the environment. It is being observed that a large number of private clinics are housed in renovated residential buildings and most of them do not have the facilities for adequate waste management. More than 98 per cent of the health care establishments in Dhaka simply dispose off their waste into the dustbins of city corporation.

Categories of hospital waste

In this study, attempts have been made to classify the wastes into two general categories because personnel associated with waste manage of hospital can identify these waste more easily:

Non-hazardous (general) waste – domestic type waste; packing materials, non-infectious materials, that do not pose special handling problems to human health or the environment.

Hazardous waste - which includes infectious waste (contains pathogens in sufficient concentrations that exposure to it could result in disease), pathological waste (include blood, body fluids, tissues, organs, body parts, etc.), sharps (needles, blades, syringes, scalpels, saws, broken glass, nails and any items that could cause a cut or puncture), and very small amount of pharmaceutical and chemical wastes.

Quantity of hospital waste

The quantities of different categories of hospital wastes in Dhaka city are estimated on the basis of the data collected from selected hospitals/clinics from an intensive survey extending over 7 to 10 days during the March to May 1998 period are shown in Tables 1 and 2. These wastes were collected 3 times a day. The average generation rate (kg/bed/day) of total hospital waste was about 1.2 which is much lower than that of 4.5 in USA, 2.7 in Netherlands and 2.5 in France. However, the average hospital waste generation rates are in the range of 1 – 4.5 kg/bed/day in Latin American countries like Chile, Brazil, Argentina, Venezuela (Monreal, 1991). But the percentage of hazardous waste in Dhaka city (15.5 per cent) is much higher than that of Netherlands (5 per cent) and Sweden (9 per cent), and is lower than that of Denmark (25 per cent) and USA (28 per cent), and is very close to the rate of generated in Germany(14 per cent). The indicated difference may be due to geographical location, living habits and standards, avail-

ability of different treatment facilities, and perhaps to the ways in which solid wastes are categorized in different countries.

Discussion

Hospital waste management is one of the most neglected part of the managerial process in Bangladesh. Neither the government nor hospital authorities pay proper attention to this matter. Unhygienic waste disposal by many hospitals, clinics and healthcare centres in Dhaka are posed serious health hazard to the city dwellers in general and to the people living within and in the vicinity of the hospitals in particular. Almost all of these hospitals are disposing every kind of wastes (hazardous, non-hazardous, infections, sharps etc.) in nearby municipal dust bins without any pretreatment whatsoever. An unhealthy and hazardous environment exists in and around these hospitals, affecting patients, hospitals staff and other people. Scavengers who collect waste from dust bins are at risk from sharps, pharmaceuticals and chemicals and from direct contact with infectious materials. Also, recycling of infectious objects may pose serious health hazard to their users. Liquid hospitals wastes are disposed directly to the municipal sewer system in most of the hospitals in Dhaka city. Chemicals used in hospitals is a potential source of water pollution (WHO, 1983). Direct disposal of faces and urine of infectious patients in municipal sewer system may cause outbreak of epidemic diseases. It is evident from the field survey that the hospital authority of SSMCH, commonly known as Mitford Hospital, in the old part of the Dhaka city takes full advantage of the hospital's location by dumping refuse in the river Buriganga. DMCH garbage is seen to be dumped at various corners of its premises. Sweepers of the hospital collect garbage from these spots inside the hospital premises and then throw them in the roadside dustbins. Disposable syringe, needles, blood-soaked pads, used blood bags and such other materials are simply thrown in the open dustbins. The disposal of such hazardous portion of wastes from hospitals into public waste disposal system expose the people to serious health risk.

In Bangladesh a huge amount of waste material is recycled and reused in solid waste management system. It is being reported by Tieszen and Gruenberg (1992) that substitution of reusable products for disposable and recycling of paper would result in a 93 per cent reduction in surgical waste. Reliance on reusable is reported to lower costs significantly since costs to wash or disinfect items for reuse is less than that of purchasing new disposable items (Tieszen and Gruenberg, 1992 and DiGiacomo et al, 1992). DiGiacomo et al (1992) also reported that a single teaching hospital saved over $100, 000 a year by returning to reusable scrub suits and gowns in the operating room. The recycling operation has become a trade on which a large number of people (or scavengers) are dependent in Dhaka. The scavengers engaged in recycling operation are extremely poor, do not have education, and unaware of harmful consequences of exposure of contaminated and hazardous waste (Rahman,1996). From field observations it was concluded that there had been injuries from sharps, broken glasses, etc. In case of recycling operation, suffering from worm infections, skin disease, diarrhoea, chronic dysentery, viral hepatitis, etc. have been reported.

Recycling operations in Dhaka city are quite satisfactory. However, measures should be taken to minimize these health hazards. The health professionals involved in hospi-

Table 1. Solid waste from different hospitals/clinics in Dhaka city

Hospital / Clinic	Generation hospital waste, kg/bed/day (% of total waste)		
	Total	Non-hazardous	Hazardous
DMCH*	1.19	1.07 (90)	0.12 (10)
SSMCH*	1.23	1.09 (89)	0.14 (11)
RIHD*	1.20	0.91 (76)	0.29 (24)
HFRCH*	1.59	1.29 (81)	0.30 (19)
SGHL*	1.67	1.52 (91)	0.15 (9)
RGH*	0.80	0.66 (83)	0.14 (17)
DNMCH*	0.80	0.70 (88)	0.10 (12)
SAHL*	0.83	0.72 (87)	0.11 (13)

*Note: DMCH = Dhaka Medical College Hospital
SSMCH = Sir Salimullah Medical College Hospital
RIHD = Rehabilitation Institute & Hospital for Disabled
HFRC = Holly Family Red Cressent Hospital
SGHL = Samarita General Hospital Ltd.
RGH = Rushmono General Hospital
DNMCH = Dhaka National Medical College Hospital
SAHL = South Asia Hospital Ltd.

Table 2. Different categories of hospital waste

Waste categories	Range, %	Mean, %	Standard deviation
Non-hazardous	76 – 90	84.50	5.29
Infectious	5 – 16	10.5	3.88
Sharps	2 – 6	3.5	1.53
Pathological	1 – 3	1.50	0.93

tal or in different authorities, monitoring and controlling the city environment have societal responsibility to address these critical issues more carefully. Again, different voluntary organizations could also participate to provide hygiene education to hospital staffs involved in waste management and also to the poor scavengers. This type of education can be provided through posters and mass media, to which every person now has access. This would enable them to handle the waste materials in an scientific way.

This study reveals that only about 15 per cent hazardous portion (Tables 1 and 2) of total wastes from hospitals require special attention for their proper disposal. The remaining portion of wastes can be easily disposed off into the municipal dust bins if they are carefully segregated. Thus a few changes in material procurement process in hospitals, mandatory staff education in waste segregation, proper hygiene education to the scavengers, treatment of selected hazardous materials, and such other few efforts can get healthcare establishments off the list of major hazardous materials to be disposed off to the municipal dust bins. Once these are properly segregated, the hazardous portion can be treated by different treatment options (e.g. chemical disinfection, autoclaving, microwaving, incineration, etc.). Any one of them or a combination of one or more of these options can be employed by different hospitals. Again a commercial combined waste treatment system can be maintained in each city for the disposal of hazardous portion of hospital wastes. It can be mentioned that the use of commercial incinerators is expected to increase as more stringent regulations lead to shutdown of many uncontrolled on-site medical waste incinerators in USA. An assessment of cost effectiveness of different treatment options (autoclaving, microwaving and incineration) indicates that the treatment of hazardous waste in a centralized incinerator appears to be one of the best treatment options (Ullah, 1999). However, the system has to be maintained properly with appropriate air pollution control apparatus/device. Thus the health care waste management requires a systems approach, the handling, storage, transport, treatment and disposal of waste by methods that at all stages minimize the risk to public health and to the environment. However, the transport of these wastes to the treatment sites should be the responsibility of competent waste management authorities. To improve overall hospital waste management system in Bangladesh, it is essential that different authorities (both government and private) involved in hospital and private clinic development and in monitoring and controlling the Bangladesh environment should recognize the nature of the problem for the development of legislation to regulate hospital sanitation.

Conclusion

Unhygienic disposal of hospital waste in Dhaka City poses a serious health hazard to the city dwellers in general and the scavengers in particular. The hospitals require hygienic system approach in handling, storage, transport, treatment, and disposal of their wastes by the methods that at all stages minimize the risk to public health and to the environment. Public awareness through mass media, proper hygiene education to the scavengers, mandatory staff education in waste segregation, and legislation to regulate hospital waste management systems will change the traditional habits of different group of people involved in this sector.

The waste generation rates in Dhaka city ranges between 0.8 kg/bed/day to 1.67 kg/bed/day and these include about 15 per cent of hazardous waste. An assessment of cost effectiveness of different treatment options indicates that the treatment of hazardous waste in a centralized incinerator is perhaps the best treatment option in Dhaka city. However, the system has to be maintained properly with appropriate air pollution control apparatus.

References

DIGIACOMO, J.C., ODOM, J.W., RITOTA, P.C.AND SWAN, K.G., 1992, *Cost containment in the operating room: use of reusable versus disposable clothing*; Am. Surg.1992, *5*.

MONREAL, J.,1991, *Considerations on the Management of Hospital Wastes in Latin America*; Environmental Health Program, PAHO/WHO.

RAHMAN, M.H.,1996, *Hospital Sanitation in Bangladesh*; Proc. of 12th Int. Conf. on Solid Waste Manag. & Secon. Mats., USA.

TIESZEN, M.E. AND GRUENBERG, J.C.,1992, *A quantitative, qualitative and critical assessment of surgical waste*; JAMA,1992, 267.

ULLAH, M.S.,1999, *A study on hospital waste management in Dhaka City*; M.Eng. Thesis, Dept. of Civil Eng., BUET, Dhaka.

WORLD HEALTH ORGANIZATION (WHO),1983, *Management of wastes from hospitals*; World Health Organization, Regional Office for Europe, Copenhagen.

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