



Bio-Medical Waste Management – A Case Study of Bhopal City

Vandana Jain, V. K. Sharma*, Arvind Kumar** and Sanjeev Jain***

BSSS College, Bhopal, M. P., India

*Department of Commerce, Govt. Geetanjali Girls P.G. College, Bhopal, M. P., India

**M.P. Pollution Control Board, Bhopal, M. P., India

***Govt. Raja Bhoj Higher Secondary School, Bhopal, M. P., India

Nat. Env. & Poll. Tech.
Website: www.neptjournal.com

Received: 9-9-2010
Accepted: 27-10-2010

Key Words:

Bio-medical waste
Healthcare workers
Bio-medical waste
management

ABSTRACT

The waste produced in the course of healthcare activities carries a higher potential of infection and injury than any other type of waste. The present scenario of bio-medical waste (BMW) management in Indian hospitals is grim. However, there is an emerging concern regarding bio-medical waste management, particularly as a result of notification of Bio-medical Waste (Management and Handling) Rules, 1998 which makes it mandatory for the healthcare establishments to ensure that such waste is handled without any adverse effect to human health and environment. Proper handling, treatment and disposal of bio-medical wastes are important elements of healthcare office infection control programme. Correct procedure will help protect healthcare workers, patients and the local community. This article also discusses about various types of wastes, their management and the status of bio-medical waste generated in Bhopal city.

INTRODUCTION

Bio-medical waste is any waste, which is generated during diagnosis, treatment or immunization of human beings or animals or in research activities pertaining to or in the production or testing of biologicals and categories mentioned in schedule I of Bio-medical Waste (Management and Handling 1998) Rules.

Biologicals is any preparation made from organisms or microorganisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunization or the treatment of human beings or animals or in research activities pertaining thereto.

SOURCES OF BIO-MEDICAL WASTE

Bio-medical waste is generated in hospitals, nursing homes, clinics, medical laboratories, blood banks, animal houses, etc. Such a waste can also be generated in home if healthcare is being provided there to a patient, e.g., injection, dressing material, etc.

Approximately 75-90% of the bio-medical waste is non-hazardous and as harmless as any other municipal waste. The remaining 10-25% is hazardous and can be injurious to humans or animals and deleterious to environment. It is important to realize that if both these types are mixed together then the whole waste becomes harmful.

OBJECTIVES OF THE BIO-MEDICAL WASTE (BMW) MANAGEMENT

Objectives of the BMW management are:

- To prevent transmission of diseases from patient to patient, from patient to health worker and vice versa.
- To prevent injury to the healthcare workers and workers in support services, while handling bio-medical waste.
- To prevent general exposure to the harmful effects of cytotoxic, genotoxic and chemical bio-medical waste.

STEPS IN BIO-MEDICAL WASTE MANAGEMENT

Medical waste should be managed according to its type and characteristics. For waste management to be effective, the waste should be managed at every step, from acquisition to disposal. The elements of comprehensive waste management system are waste survey, segregation, accumulation and storage, transportation, treatment, disposal and the waste minimization.

Waste survey: The survey should differentiate and quantify the waste generated. It should determine the points of generation, the type of waste at each point and the level of generation and disinfection within the hospital. This helps to determine the method of disposal.

Waste segregation: This consists of placing different kinds of wastes in different containers or coded bags at the point of generation (Table 1). It helps to reduce the bulk of infectious waste as well as treatment costs. Segregation also helps to contain the spread of infection and reduces the chances of infecting to other healthcare workers.

Waste accumulation and storage: Waste accumulation and storage occurs between the point of waste generation and site of waste treatment and disposal. While accumulation

refers to the temporary holding of small quantities of waste near the point of generation, storage of waste is characterized by longer holding periods and large waste quantity. Storage areas are usually located near where the waste is treated. Any offsite holding of waste is also considered storage. To contain spills, storage areas should not have floor drains and should be recessed to hold liquids. Floor and walls should be impervious to liquid and easy to clean. They should be disinfected regularly. Refrigeration may be required for prolonged storage of putrifiable and other wastes. Storage area should be posted with 'EXPLICIT' signs.

Waste transportation: When bio-medical waste is not treated on site, untreated waste must be transported from the generation facility to another site for treatment and disposal.

Waste treatment: The term treatment refers to the process that modifies the waste in some way before it is taken to its final resting place. Treatment is mainly required to disinfect or decontaminate the waste, right at source so that it is no longer the source of pathogenic organisms. After such treatment, the residue can be handled safely, transported and stored.

Waste disposal: The waste disposal methods vary in their capabilities, cost, availability to generation and impacts on the environment. The various disposal methods include incineration, autoclaving, chemical methods, thermal methods (low and high), ionizing radiation process, deep burial and microwaving. Incineration and autoclaving are considered traditional methods which have devised a solar heating

system for disinfecting infectious waste in economically less developed countries. They obtain a considerable reduction in the amount of viable bacteria by this method. However, considerable reduction in viable number of bacteria seems to be misleading term. The medical waste should be completely free of pathogenic bacteria before disposal. This would ensure maximum public hygiene quality. Untreated medical waste can be disposed off in sanitary landfills. Disposal without treatment is not recommended for human tissues, sharps and culture from clinical laboratories.

Waste minimization: Whereas ordinary solid or liquid waste requires no treatment before disposal, practically all infectious waste must first be treated. The cost for disposal of infectious waste may be ten times the cost for disposal of ordinary solid waste. Any measures that decrease the amount of infectious waste generated will simultaneously decrease the cost of infectious waste disposal (Seymour Block 2001).

Cost of bio-medical waste management: The cost of construction, operation and maintenance of system for managing waste represents a significant part of overall budget of a hospital if the BMW handling rules have to be implemented in their true spirit. Self-contained on-site treatment methods may be desirable and feasible for large healthcare facilities. They will not be practical or economical for smaller institutes. An acceptable common system should be in place which will provide regular supply of colour coded bags, daily collection of infectious waste, safe transportation of waste to off site treatment facility and final disposal with suitable technology (Rao et al. 2004, Chitnis et al. 2003).

Table 1: Categorisation and colour coding of the container.

Substances/Waste material	Category	Colour coded bags
Human tissues organs, animal waste, blood and body fluids	1	Red
Animal and slaughter house waste	2	Orange
Microbiological and biotechnological waste	3	Yellow
Waste sharps	4	Blue
Discarded medicines	5	Blue
Solid wastes	6	Yellow/Black
Disposables	7	Yellow/Black
Liquid waste (generated from laboratory washing, cleaning, housekeeping and disinfecting activity)	8	Black
Chemicals	9	Yellow/Black

Table 2: Biomedical waste generating from the hospitals of Bhopal city.

Sr. No.	Type of Hospital	No. of Hospitals	No. of Beds	Category of Waste (kg/month)										Total
				1	2	3	4	5	6	7	8	9	10	
1	State Govt. Hospitals	32	2559	1928	-	248	474	169	3659	623	808	-	28	7937
2	Central Govt. hospitals	4	580	46	-	-	106	3	278	123	150	-	13	556
3	Private hospitals	209	4804	1628	-	78	2412	50	6056	1812	4850	191	335	12224

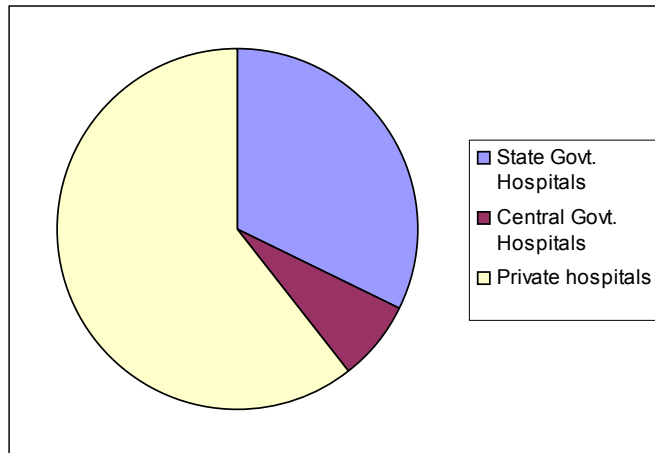


Fig. 1: Availability of beds in hospitals in Bhopal city.

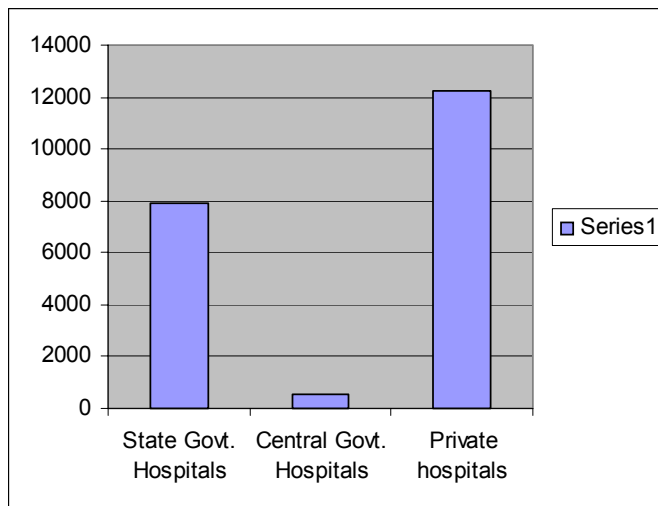


Fig. 2: Biomedical waste generating from the hospitals of Bhopal city.

MATERIALS AND METHODS

Both primary and secondary data are collected and used for the research work in the following manner.

Questionnaire for nursing homes: In this questionnaire for nursing homes parameters like number of beds, total waste generated per day, types of waste, collection method, segregation method, storage process, transportation method, precautions and expenses occurred by hospital were used.

Questionnaire for incinerator operators: In this questionnaire for incinerator operator parameters like capacity of incinerator, hospitals covered, number of vehicles used, implementing method, transportation, storage and disposal were used.

After the required data are collected, process and analysis of the same is most important so that proper, accurate

and independent result comes forward. For this, we have examined and edited the data from raw data. This will be a scrutinizing function, so that the data are consistent and uniform. After editing, data were classified in groups on the basis of common characteristics, which is represented in the graphical form. Under analysis, costing methods and graphical methods are used. Under costing method cost benefit analyses is made by taking in-house facilities and outsourcing of bio-medical waste.

PRESENT SCENARIO OF BIO-MEDICAL WASTE GENERATED IN BHOPAL CITY

The finding of the present case study are as follows.

Number of hospitals: Out of total approximately 245 hospitals in Bhopal city, 32 hospitals are governed by the State Govt., 4 by Central Govt., while the rest 209 are private hospitals.

Number of beds: Capacity under State Govt. is 2559 beds, whereas in Central Govt. there are 580 beds, and in private hospitals the number is 4804 beds (Fig. 1).

Waste generated: Bio-medical waste generated in kg/month in various categories in State Govt. hospitals is 7937, in Central Govt. hospitals it is 556, and in private hospitals it is 12224 (Fig. 2).

Waste per bed per month: According to Table 2, bio-medical waste generated per bed per month in State Govt. hospitals is calculated as 3.101, in Central Govt. as 0.958, and in private hospitals as 2.544 kg/bed/month.

DISCUSSION

Safe and effective management of waste is not only a legal necessity but also a social responsibility. Lack of concern, motivation, awareness and cost factors are some of the problems faced in the proper hospital waste management. Proper surveys of waste management procedures are needed. Clearly, there is a need for education as to the hazards associated with improper waste disposal. Lack of apathy to the concept of waste management is a major stymie to the practice of waste disposal. An effective communication strategy is imperative

keeping in view the low awareness level among different categories of staff in healthcare establishments regarding bio-medical waste management. Proper collection and segregation of bio-medical waste are important. At the same time, the quantity of waste generated is equally important. A lesser amount of bio-medical waste means a lesser burden on waste disposal work, cost-saving and a more efficient waste disposal system. Hence, healthcare providers should always try to reduce the waste generation in day-to-day work in the clinic or at the hospital.

REFERENCES

- Park, K. 2005. Hospital Waste Management. Park's Textbook of Preventive and Social Medicine. Banarasidas Bhanot Publications, New Delhi. 18th Edn., pp. 595-598.
- Bio-medical Waste (Management and Handling) Rules, 1998. MoEF, New Delhi
- Seymour Block, S. 2001. Disinfection, sterilization and preservation. 5th ed., Lippincott Williams and Wilkins Publication.
- Rao, S.K., Ranyal, R.K., Bhatia, S.S. and Sharma, V.R. 2004. Biomedical waste management: An infrastructural survey of hospitals. MJAFI, 60(4).
- Chitnis, V., Chitnis, S., Patil, S. and Chitnis, D. 2003. Solar disinfection of infectious biomedical waste: A new approach for developing countries, Lancet, 362: 1285-1286.