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General Research Paper

Biomedical Waste Management in Jodhpur City: A Case Study

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ABSTRACT

Biomedical waste management in Jodhpur city was studied during August 2011 to January 2012. In Jodhpur city there are about 162 Govt. and private hospitals, labs and clinics. They generate an average of 600-650 kg/day of hazardous biomedical waste. The biomedical waste is dumped with municipal solid waste, which can be harmful for the environment. Biomedical waste is a serious problem to be solved as early as possible and this study will give a database of average per day biomedical waste generation with yellow bags 325-350 kg/day, red bags 5-10 kg/day, blue bags 30-35kg/day and black bags 225-250 kg/day. The total number of beds connected to common biomedical treatment facility centre is 4886. In this study we also found problems in collection and segregation of biomedical waste at hospital level and common biomedical treatment facility centre.

INTRODUCTION

The working group on hospital waste management contributed by WHO in 1983, was unanimously agreed upon that health care establishments should be held legally accountable for their waste management practices based on the universal principle that the "generator is responsible". As far as possible the "cradle to grave" system of notification should be followed, which implies that all stages of waste disposal are systematically controlled. The need for and nature of the central measures must be an integral part of overall hazardous waste management policy.

The issue of improper hospital waste management in India was first highlighted in a writ petition in the Hon'ble Supreme Court; and subsequently pursuant to the directives of the Court, the Ministry of Environment and Forests, Govt. of India notified the Biomedical Waste (Management and Handlings) Rules on 27th July 1998 under the provisions of the Environment Protection Act, 1986. These rules have been framed to regulate the disposal of various categories of biomedical waste as envisaged therein; so as to ensure the safety of the staff, patients, public and the environment as also reported by Rao et al. (1995).

In Jodhpur city there are about 162 Govt. and private hospitals, labs and clinics. They generate biomedical hazardous waste every day and there are several photographs published in local news papers showing that the biomedical waste is dumped with the municipal solid waste, which can be harmful for the environment. Biomedical waste (BMW) is an urgent problem to be solved to safeguard the environment (Ray et al. (2001). This study will give a base to start a new research in this field and also provide a guideline for hospitals and BMW handling authority.

MATERIALS AND METHODS

The study is based on the secondary data. First we studied BMW management at hospital level, and second, disposal of BMW at common facility centre (Sales Promoters, Barli), Jodhpur. The total biomedical waste generated from hospitals, and clinics was collected and weighed regularly at collection site, and disposed at common facility centre.

RESULTS AND DISCUSSION

The key components of biomedical waste management are given in Fig. 1. Most of the hospitals of Jodhpur city in and around are not serious about biomedical waste management. Mostly nursing staff, ward boys and sweepers are not serious for the segregation of BMW in different colour coded bags, which creates problem at disposal system as also reported earlier by Gupta (2006).

The disposal site faces the problems of segregation because waste is in complex mixture of different types of waste. There is an alkali ventury scrubber installed. The disposal site has an effluent treatment plant of capacity of 4.5 KLD having only sedimentation and using lime and disinfection.

The results show that total number of beds connected and average quantity of waste collected in Jodhpur per day is: Total beds (4886), Total waste collected (600-650 kg/day), Yellow Bags (325-350 kg/day), Red bags (5-10

Table 1: Number of hospitals and clinics along with the number of beds in Jodhpur and Pali.

Hospitals/clinics	No. of Units	No. of Units
Govt. Hospitals, Jodhpur	24	2682
Private Hospitals, Jodhpur	70	1417
Labs and Clinics, Jodhpur	68	-
Govt. Hospitals, Pali	9	680
Private Hospitals, Pali	9	107
Labs and Clinics, Pali	8	-
Total	188	4886

Source: Sales Promoters Jaiselmer Road, Barli, Jodhpur.

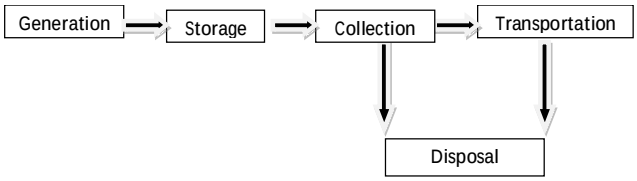

Fig. 1: Key components of biomedical waste management.

kg/day), Blue bags (30-35 kg/day), and Black bags (225-250 kg/day) (Table 1, Fig. 2).

The need of biomedical waste management is very important because there are several types of harmful microbial active agents present in it. This waste is very hazardous, and sensitive and harmful to the environment. People coming to hospitals if come in contact with this waste, will get infected as also reported by Sudhir et al. (2009).

The Ministry of Environment and Forests, Govt. of India has notified the Bio-Medical Waste (Management and Handlings) Rules on 27th July, 1998 under the provisions of Environmental Protection Act, 1986. Amendment of rules was made in 2003. These rules have been framed to regulate the disposal of various categories of biomedical waste as envisaged therein so as to ensure the safety of the staff, patients, public and the environment.

Categories of BMW generated at hospital level and their collection bags, colour-coding types of container and waste categories are given in Table 2 and Fig. 3.

Collection of Bio-Medical Waste

Collection of biomedical waste should be done as per Bio medical Waste (Management and Handling) Rule, 1998 (Rule 6-Schedule II). The collection of bags, and the containers should be labelled as per guidance of schedule III, i.e. symbols for biohazards and cytotoxic according to Gazette of India (1998). A separate container should be placed at every point of generation. The general waste to can disposed off through municipal authority.

Categorisation of Biomedical Wastes and Treatment Process

The process and function of biomedical waste management and handling at hospitals level was studied. Use of yellow, red, blue and black bags in hospitals for collection of different type of waste was observed and same condition also reported by Jain et al. (1998). Most of the hospitals are not serious about BMW, which is also reported earlier by Daniel et al.

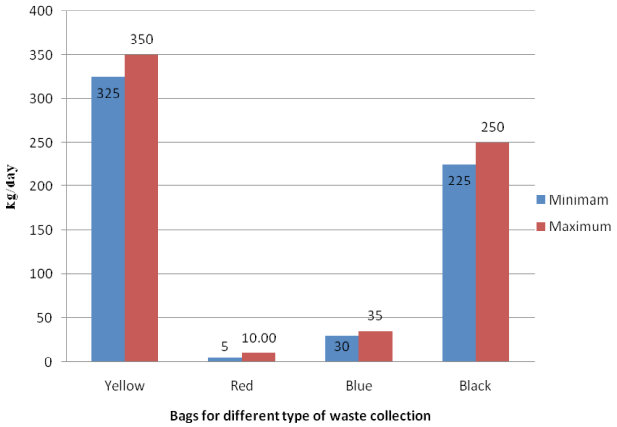

Fig. 2: Average per day biomedical waste generation in Jodhpur.

Table 2: Color-coding types of container and waste categories

Colour-Coding	Types of Container	Waste-Categories
Yellow	Plastic bags	Cat-1 Human anatomical waste, Cat-2 Animal waste Cat-3 Microbiology waste Cat-6 Solid Waste
Red	Disinfected container, Plastic bags	Cat-3 Microbiological Cat-6 Solid Waste Cat-7 Solid Waste (waste IV tubes, catheters, etc)
Blue/white	Plastic bag/puncture proof containers	Cat-4 Waste sharps Cat-7 Plastic disposal tubing
Black	Plastic bag/puncture proof containers	Cat-5 Discarded medicines Cat-9 Incineration ash Cat-10 Chemical waste

Table 3: Waste category, its contents and treatment and disposal methods.

Category	Waste Type	Waste Content	Treatment and Disposal Option
Category No. 1	Human anatomical	Human tissues, organs, body waste parts	Incineration deep burial
Category No. 2	Animal waste	Animal tissues, organs, body parts, bleeding parts, fluid, blood and experimental animals used in research, waste generated by veterinary hospitals, discharge from hospitals, animals, houses	Incineration/deep burial
Category No. 3	Microbiology & Biotechnology waste	Waste from laboratory culture, stocks or specimens of microorganisms, live or attenuated vaccines, human and animal cell culture used in research, infectious agents from research and industrial laboratories, waste from production of biologicals, toxins, dishes and devices used for transfer of culture	Autoclaving/Microwaving
Category No. 4	Waste sharps	Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps.	Chemical/disinfection autoclave/ microwaving mutilation/shredding
Category No. 5	Discarded medicines	Waste comprising of outdated contaminated and discarded medicines.	Incineration destruct and drugs disposed in secured land fills.
Category No. 6	Solid waste	Items contaminated with blood and body fluids including cotton, dressings, solids, linen, plaster casts, beddings, other material contaminated with blood	Incineration autoclave/ microwave
Category No. 7	Solid waste	Waste generated from disposable items, other than the waste sharps such as tubings, catheters, intravenous sets etc.	Chemical disinfection autoclave/ microwaving and mutilation/shredding
Category No. 8	Liquid waste	Waste generated from laboratory and washing, cleaning houses-keeping and disinfecting activities	Disinfect chemically and discharge into drains
Category No. 9	Incineration ash	Ash from incineration of any biomedical waste	Disposal in municipal landfill
Category No.10	Chemical waste	Chemicals used in production of biologicals, chemicals used in disinfection, as insecticides, etc.	Chemically treatment disinfection and discharge of drains for liquid and secured landfill for solid

Note:

1. Chemical treatment using at least 1% hypochlorite or any other chemical reagent should ensure disinfection.
2. Mutilation / shredding must be such so as to prevent unauthorized reuse.
3. There will be no chemical pretreatment before incineration. PVC shall not be incinerated.

(1995) at various places. For disinfection of disposable infectious waste such as sharps, blood vials, etc. freshly prepared 1% NaOCl (sodium hypochlorite) solution is used. The disinfection is carried out for at least 24 hours by immersion of sharps in NaOCl solution. The segregated waste after disinfection is transported in respective colour coded bags for further treatment. Needles are cut by needle cutter and then treated with 1 % NaOCl solution. Hospital management directs to all the nursing staff to collect food waste into green bags, not to combine it in other bags. Segregation of waste at the source of generation was observed on the basis of the nature and origin of waste. Following methods are used for their treatment at common biomedical waste treatment and disposal facility centre.

1. Plastic waste is autoclaved, cut into pieces by cutter and then used for recycling.
2. Pathological waste like swabs, body parts, etc. are burnt in incinerator.
3. Sharps are disinfected and then buried under soil at MSW site.

The category-wise waste contents, and treatment and disposal of biomedical waste is given in Table 3. The waste segregated at source of generation by waste generator, and finally managed and treated is outlined below.

Non infection → Cartons, Packing food, etc.→ Box bags → Municipal waste, etc.

Pathological → Swabs, body parts → yellow bags → yellow (closed) trolley → incineration

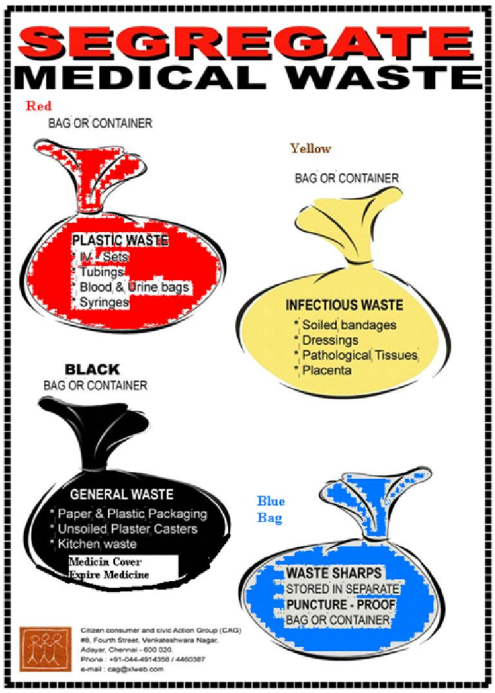

Fig. 3: Segregation of biomedical waste in colour coded bags.

Plastic, rubber → Syringes, catheters, etc. → mutilated, dipped in 1% NaOCI solution → shredded → recycling

Sharps → Blade, needles, etc. → disinfected in 1% NaOCI solution → puncture proof blue bags → landfills

All the waste must be transported in properly coded coloured bags/trolleys. Those plastic bags, which contain liquid like blood, urine, pus, etc. should be put into red coloured bags for microwaving and autoclaving and then other items should be put in blue or white bags after chemical treatment and mutilation/shredding. All items sent for incineration/deep burial (Cat. 1, 2, 3, 6) should be placed in yellow coloured bags. All the biomedical waste to be sent for microwave/autoclave treatment should be placed in red coloured bags (Cat. 3, 6, 7). Any waste sent to shredder after autoclaving/microwaving/chemical treatment is to be packed into blue/white, translucent bags.

RECOMMENDATIONS

Segregation of waste: Segregation of BMW at hospital level was observed to be very poor. It is the most important step in the entire process of biomedical waste management. As it needs special attention to be given to the relatively small quantities of infectious and hazardous waste, thus reducing not only the risks but also the cost of handling, treatment and disposal. For example, if general waste gets mixed with infectious waste, the whole waste has to be incinerated which may prove to be costly. It causes problem in treatment at common facility centre. It also increases cost of treatment.

1. Segregation should be done at the site of generation of biomedical waste, e.g., all patient care activity areas, diagnostic areas, operation theatres.
2. The responsibility of segregation should be with the generator of biomedical waste, i.e., doctors, technicians and nurses, etc.
3. The biomedical waste should be segregated as per categories applicable.
4. It shall be ensured that the total time taken from generation of biomedical waste to its treatment should not exceed 48 hours.

Disposal of treated biomedical waste: The treated biomedical waste should be disposed as follows.

S.No.	*Waste Category*	*Disposal Method*
1.	Plastic waste after disinfection and shredding	Recycling or municipal landfill
2.	Disinfected sharps (except syringes	
	(i) If encapsulated	Municipal landfill
	(ii) If non-encapsulated	Municipal landfill/ possibility of recycling shall be explored
3.	Incineration ash	Secured landfill
4.	Other treated solid waste	Municipal landfill
5.	Oil and grease	Incineration
6.	Treated wastewater	Sever/drain or recycling.

Source: Citizen Consumer and Civic Action Group (CAG)

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REFERENCES

Daniel, T., Boatright, Alicia, J., Edward, Ashaver, K. 1995. A comprehensive bio-medical waste survey. Journal of Environment Health, 57.

Draft Bio-Medical Waste (Management & Handling) Rules 1998. Gazette of India, Extraordinary, Part II, Section 3, Sub-Section (ii) dated 27 July.

Gupta, S. 2006. Report: Bio-medical waste management practices at Balrampur hospital, Lucknow, Journal of Waste Management & Research, India, 24(6); 584-591.

Jain, T.P. and Aggarwal, R. 1998. Hospital waste management; A holistic view. Proceedings of National Workshop of Management of Hospital Waste. Apr. 16-18, Jaipur, IIRD and Shristi.

Rao, H.V.N. 1995. Disposal of hospital wastes in Bangalore and their impact on environment. In: Third International Conference on Appropriate Waste Management Technology for Developing Countries, Nagpur, India, 839-842.

Ray, C.N., Basheer, A. and Singh, A.K. 2001. Neglect of hospital waste control: A case study of Ahmadabad. Economic and Political Weekly, January 13, 36(2); 102-105.

Sudhir et. al. 2009. Biomedical waste management at SMS Hospital Jaipur Rajasthan; A case study, M.Phil. Thesis, Rajasthan University.