

HOSPITAL WASTE MANAGEMENT

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Abstract

The study was carried out in a Central Govt. Hospital from September 1996 to January 1997. The objectives of study were to study the quantum of waste generated and actual waste handling practices adopted for collection, segregation, storage, transportation, treatment and disposal. The data was collected through interviews, observation and study of records, using interview schedules and observation checklists. The study reveals that hospital staff had no access to guidelines on hospital waste management. Though colored bags existed in one of the hospitals, infectious waste was not properly segregated. There were no separate wheelbarrows for infectious and general waste. Waste was stored in open ground in front of the incinerator. Incineration ash was not being disposed of as it was found to be lying down near the incinerator plant. Average quantum of waste generated was 1.45 kg per bed per day.

"Anything which is not intended for further use is termed as waste". "Hospital waste or healthcare waste should include any type of material generated in healthcare establishment including aqueous and other liquid waste". Hospital waste includes garbage, refuse and biomedical waste¹. **Biomedical waste** means any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals and including categories mentioned in Schedule I of Biomedical Waste (Management and Handling) Rules, 1998².

Hospital waste management is a purposeful and systematic control of generation, collection, storage, transport, processing and disposal of hospital waste. The hospital waste like body parts, organs, tissues, blood and bodyfluids along with soiled linen, cotton, bandages, and plaster casts from infected and contaminated areas are very hazardous. This waste to be properly collected, segregated, stored, transport, treated and disposed of in a safe manner to prevent nosocomial or hospital acquired infections. Various communicable diseases, which spread through water, sewage, blood, and body fluids and contaminated organs, are to be prevented. Some land marks decisions to streamline hospital waste management have been made in the recent past.

- 1) Supreme Court (Judgement 1996) ordered that
 - i) All hospital with 50 beds and above should install either their own incinerator or an equally effective alternative method before 30th November 1996.
 - ii) The incinerator or alternative method should be installed with necessary pollution control mechanisms conforming to the standards laid down by Central Pollution Control Boare (CPCB).
 - iii) Hazardous medical waste should be segregated at source and disinfected before final disposal.
- 2) Biomedical waste (Management & Handling) Rules 1998 say that every hospital, nursing home and clinic must install

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incinerator or alternative method like autoclave or microwave either individually or collectively for treatment of the hospital waste.

Material and Methods

The study was carried out in Lady Hardinge Medical College (LHMC) and associated Hospital, New Delhi in 1996-1997. Main objectives of the study were to find out quantum and different kinds of hospital waste generated in the hospital and actual waste handling practices adopted for collection, segregation, storage, transportation, treatment and disposal.

The data was collected through interviews, observations and study of records related to hospital waste management using semi-structured interview schedules and observation checklists. The pre-testing of tools was done in All India Institute of Medical Sciences (AIIMS) Hospital. The study population comprised of hospital administrators, health care providers likes doctors, nurses, paraprofessionals and supportive staff, public health engineers and safai karamcharis (scavengers). Patients from OPD and indoor were also interviewed. Thus, the total number of people interviewed were 295 (140 hospital employees and 155 patients). The data were analyzed as per objectives of the study.

Findings and Discussion

A. **Magnitude of the problem and quantum of the hospital waste** : As there was no record available regarding actual quantum of waste generated in the hospital, only alternative available was to measure quantum of waste. The researcher maintained a record of number of wheelbarrows coming to incinerator plant and waste storage site during the period November 2, 1996 to November 26, 1996. It was not feasible to weight each and every wheelbarrow, 25 wheelbarrows were weighted randomly when both the safai karamcharis and the researcher were present at the spot. It was found that hospital waste generated per bed per day was 1.45 kg.

The quantity of hospital waste produced in India is estimated to be about 1 to 2 kg per bed per day³, whereas, in USA it is as high as 5 kg per bed per day. According to Basu⁴, the quantum of waste generated is 0.775 kg per patient per day in large teaching hospital. William⁵ found that U.S. Hospitals generated a median of 6.93 kg of hospital waste per patient per day. In an Italian hospital daily amount of sewage (liquid waste) generated was up to 100 liters per bed per day⁶.

In the current study, there was no record available for the liquid generated in these hospitals. If we take amount of liquid waste generated equal to that of water consumed in the hospital then liquid waste generated per bed per day comes to be 1470 liters. The higher amount of liquid waste generated in India can be attributed to warm climate also.

B) Classification of the hospital waste : WHO¹ has classified health care waste in 8 categories: general waste, pathological waste, radioactive waste, chemical waste, infectious and potentially infectious waste, sharps, pharmaceutical waste and pressurized containers.

Biomedical waste (Management & Handling) Rules 1998² has classified Biomedical waste in 10 categories. These are - Human Anatomical Waste, Animal Waste, Microbiology and Biotechnology Waste. Waste sharps, Discarded Medicines and Cytotoxic Drugs, Solid Waste (Contaminated with blood), Solid Waste (generated from disposable items), Liquid Waste, Incineration Ash, and Chemical Waste.

In management context, hospital waste can be classified as :

a) General waste : This waste needs no special treatment. It is non-infectious, non-hazardous (household type of waste) & it can be disposed of by land filling.

b) Infectious and hazardous waste : This kind of waste needs disinfection/incineration. This consists of 1) microbiological waste, 2) pathological waste, 3) animal waste, 4) blood and body fluids, & 5) sharps. In addition, sharps and need physical destruction by shredders/crushers. The disinfection can be done by autoclaving, microwaving and chemical methods. Except Poly Vinyl Chloride (PVC) material, incineration is preferred method for this kind of waste.

c) Non infectious but Hazardous waste : This kind of waste needs special treatment according to its hazard. This kind of waste consists of - i) Chemical waste, ii) Pharmaceutical waste, iii) Radioactive waste, iv) Pressurized containers, v) Dry cell batteries containing heavy metals (Mercury, Lead and Cadmium), vi) Non-infectious glassware, and vii) Incineration ash.

Radioactive waste should be returned to Bhabha Atomic Research Centre, Trombay, Mumbai or it should be safely stored pending decay (for ten half-life periods). Non-infectious

glassware can be put to use after decontamination or physical destruction and disposal in a secured landfill. The liquid chemical and pharmaceutical waste can be put in drain with copious amount of water, whereas, solid part along with waste like Pressurized containers, Dry cell batteries containing Lead, Mercury and Cadmium and Incinerator ash should be disposed of by secured land filling.

Management of hospital waste

1. **Collection and Segregation :** Lady Harding Medical College and associated hospital are using two kinds of coloured bags black bags were used for general waste and yellow bags for infectious waste. It can be seen in Table-1 that sixty percent of hospital employees and patients indicated that some kind of coloured bags were used in the hospital but only one third (45.7% employees and 21.9% patients) were aware about actual (black and yellow) colour of the bags. The size of colored bags was uniform and found to be 25"x32" at Lady Harding Medical College (LHMC) & associated hospitals.

British Health Service Advisory Committee⁷ guidelines mention that plastic bags used for storage of clinical waste should be of minimum gauge 800 (200 microns) if of low density and 400(100 microns) if high density. Biomedical waste (Management & Handling) Rules 1998² specify that sturdy plastic/metallic containers should be used for segregation of sharps.

2. **Packaging and labelling :** The bags used for segregation should not be recycled. Every bag should be labelled to which department it belongs to, the date of packaging, type of waste it contains, sender's name and address and receiver's name and address. The label should be in RED color on yellow background the label should be of non-washable material. It was found in the current study that LHMC and associated hospitals are not doing any packaging and labeling for hospital waste.

Table 1 : Usage of Coloured Bags at LHMC.

Category	Employees n=140	Patients n=155	Total n=295	
Usage of Coloured Bags	1 No	56(40)	61(39.3)	117(39.6)
	2 Yes	84(60)	94(60.6)	178(60.3)
Colour of the bags				
1. Black	17(12.1)	47(30.3)	64(21.6)	
2. Black and Yellow	64(45.7)	34(21.9)	98(33.2)	
3. Yellow	1(0.7)	10(6.4)	11(3.7)	
4. No Idea	2(1.4)	3(1.9)	5(1.5)	
Total	140(100)	155(100)	295(100)	

3. **Transportation and Storage :** It was observed that LHMC and associated hospitals are using wheelbarrows (two wheeled), whereas, AIIMS hospital was using trolleys (four wheeled) for transportation of hospital waste. The waste was stored in open ground in front of incinerator in LHMC and associated hospitals. No untreated biomedical waste shall by

stored in any place beyond a period of two days. All hospitals, nursing homes and clinical laboratories including blood banks shall earmark specific areas for the purpose of storing biomedical waste⁷.

4. **Treatment and Disposal** : It was observed in LHMC and associated hospitals that there was use of needle destroyer for needles, especially in pediatric casualty. There was also use of 1% bleach for sharps and infected linen at about one third places; occasional bleaching of waste at waste storage site; autoclaving of culture plates in department of microbiology and incineration of infectious and hazardous waste. According to the Biomedical waste (Management & Handling) Rules 1998, all hospital waste needs to be disinfected before disposal. No. persons shall dump, discharge or dispose or caused to be dumped, discharged or disposed, any biomedical waste in any place other than a site identified for the said purpose by the appropriate authority. Every authorized persons shall take all precautions and safety measures including the provision of protective clothing, masks, gloves and such other gears as may be necessary for affording protection to all the persons engaged in handling bio-medical waste, or having exposure to bio-medical waste. No person shall recycle or reuse or cause to reuse any biomedical waste. Regarding use of protective material worn by waste handlers, only on 55% occasions, Safai Karamcharis were found wearing gloves in wards and departments whereas, gloves and face masks were found at 5% places. Goggles and plastic aprons were not seen at all with the waste handlers.

As regards incineration in LHMC and associated hospitals, all waste from areas of clinical activities was incinerated and general waste from kitchen etc. was put into waste storage site to be lifted by NDMC. The Incinerator was installed in 1986 and has a capacity to incinerate 165kg waste per hour. On an average, the incinerator was working for 8 hours daily. Taylor⁸ stated that incineration capacity is a major difficulty. In most hospitals, the incinerators operate for 4-6 hours per day for five days during the week.

Increased use of plastics requires more stringent control over gaseous emissions. In Smt. Sucheta Kriplani Hospital, emissions were black. It was found that there was no meter/gauge to measure the temperature of primary and secondary chambers. No instrument was available to measure pollution level of incinerator effluents. Two burners in the secondary

chamber were non-functional. Ideally, temperature in primary chamber should be 800+ -50 degree centigrade and in secondary chamber 1050+ -50 degree centigrade⁹.

As per guidelines for management of solid waste by Bureau of Indian Standards (IS:9622, 1980), after incineation the mass of ash is usually about one fourth (25%) that of incoming refuse and volume as little as one-tenth (10%). Here in the study at LHMC and associated hospitals in New Delhi the weight and volume of ash as compared to the hospital waste incinerated was found to be 16.25% and 12%, respectively. Almost 3/4th of hospital waste, mainly infectious were incinerated in oil-fired incinerator and rest 1/4th of hospital waste, mainly general waste, lifted by New Delhi Municipal Council (NDMC) for land filling. Incineration ash in LHMC and associated hospital was lying near the incinerator plant spoiling the aesthetics of the area.

5. **Recording and Reporting** : LHMC and associated hospitals are not maintaining records for waste generated, methods used for transportation, storage, treatment and disposal of hospital waste.

D) **Hazards of hospital waste** : As regards accidental needle stick injuries in the last one-year (Table-2), fifty-percent hospital

Table 2 : Incidence of Accidental Needle Stick Injuries in One Year.

Category	Employees			Patients		Emp. + Pt.	
	Para/ Supp. n=20	Safai K. n=40	Total Emp. n=60	Indoor n=125	Outdoor n=30		Total 155
1. Less than 5 times	3(15)	10(25)	129(1.6)	19(15.2)	4(13.3)	23(14.8)	36(16.7)
2. 5 to 10	1(5)	11(27.5)	12(20)	-	-	-	12(5.5)
3. More than 10 times	1(5)	4(10)	5(8.3)	-	-	-	5(2.3)
4. No injury	15(75)	15(37.5)	30(50)	106(84.8)	26(86.6)	132(85.1)	162(75.3)
5. Total	20(100)	40(100)	60(100)	125(100)	30(100)	155(100)	215(100)

employees (62.5% of safai karamcharis, 25% of paraprofessionals/ supportive staff) and fifteen-percent patients had needle stick injuries while handling hospital waste (Table 2).

Jackson MM¹⁰ based on responses of 448 nursing and medical personnel found that a total of 164 (33.6%) respondents reported receiving one or more needle stick injuries during 1983.

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