

**ORIGINAL ARTICLE**

**A STUDY ON BIOMEDICAL WASTE MANAGEMENT IN SELECTED  
HOSPITALS OF DELHI**

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**SUMMARY**

A study on Biomedical Waste Management in 20 Selected (10 Govt. and ten private) Hospitals of Delhi was carried out with the objectives to i) ascertain status of implementation of Biomedical Waste (Management and Handling) Rules 1998; ii) to find out practices adopted for biomedical waste management in the hospitals and iii) to recommend strategies for effective biomedical waste management in the hospitals. The average biomedical waste generated in Delhi Hospitals is 290gms per bed per day (Govt. hospitals 200 gms. per bed per day whereas private hospitals 420 gms. per bed per day). All hospitals have obtained authorization from prescribed authority. They are using colour coded bags for segregation and maintaining records. It was found that Delhi hospitals are meeting over 90 percent criteria for collection, segregation, transportation, treatment and disposal of biomedical waste. One needle destroyer/sharp container is catering to almost 9 beds on an average. There is a performance decline on the criteria like awareness activities, waste audit, injury register, containment of mercury, spill management and SOP/guidelines are concerned. There lot of scope for improvement in biomedical waste management in Delhi.

**INTRODUCTION**

Delhi is national capital territory. Its healthcare institutions cater to neighbouring states in addition to Delhi's population. In the scientific and industrial era, turnover of the products is very high. With industrialization and increasing urbanization the quantum of urban solid waste is also increasing. With increasing need of Health Care in fast changing society, the role of hospitals/nursing homes comes to the forefront. Anything which is not intended for further use is termed as waste. In Delhi, there are 137 healthcare units with indoor facilities under govt. sector, 613 registered nursing homes and 1225 dispensaries. In addition to this there are about 1550 unregistered establishments with different names like Nursing Homes, Medical Centres, Dental Hospitals, MTP centres etc. About 44000 hospital beds are available in the public and private sector in Delhi. With increasing number of hospitals and nursing homes in Delhi, this number may go up even higher. All these establishments

in the process of providing healthcare generate health care waste. Hospital Waste or Health care waste should include any type of material generated in Health Care Establishments including aqueous and other liquid waste.

With increasing awareness in general population regarding hazards of hospital waste, public interest litigations were filed against erring officials. Some landmark decisions/guidelines to streamline hospital waste management have been made in the recent past. These are:

1. Supreme Court judgment dated 1st March 1996 in connection with safe disposal of hospital waste, it ordered that

a. All hospitals with 50 beds and above should install either their own incinerator or an equally effective alternative method before 30th November 1996.

b. The incinerator or the alternative method should be installed with a necessary pollution control mechanism conforming to the standard laid down by Central Pollution Control Board (CPCB).

c. Hazardous medical waste should be segregated at source of generation and disinfected before final disposal.

2. Ministry of Environment & Forest, Govt. of India issued a notification for Biomedical Waste (Management & Handling) Rules 1998 in exercise of powers conferred by Section 6, 8 & 25 of the Environment (Protection) Act, 1986 that was published in "The Gazette of India Extraordinary, Part-II, Section 3-Sub-section (ii) New Delhi, July 27, 1998". These rules were further amended in 2000 and 2003.

## **AIMS AND OBJECTIVES**

The aim of the study is to find out the status of biomedical waste management in National capital Territory of Delhi

### **General Objective:**

To study the biomedical waste management in selected major hospitals of Delhi

### **Specific Objectives:**

1. To ascertain status of implementation of biomedical waste (management and handling) rules 1998
2. To find out practices adopted for biomedical waste management in the hospitals

3. To recommend strategies for effective biomedical waste management in the hospitals

## **METHODOLOGY**

The study was conducted in twenty (20) selected major hospitals of Delhi. Keeping in view the feasibility, the data was collected by Questionnaire. Hospital administrators and nodal officer's biomedical waste management were contacted for clarification for missing points asked in the questionnaire. The observation was also made using checklist for practices adopted by hospitals.

Twenty major hospitals were selected randomly (ten from Govt. of NCT of Delhi and Ten from private sector). Records related to hospitals were also seen were ever available from August 2010 to October 2010.

## **DATA COLLECTION TECHNIQUES AND TOOLS**

Keeping in view the feasibility, a structured questionnaire was sent to Medical Superintendents of the concerned hospitals. The secondary data was collected through study of record. The personal interview was also held for missing data in the questionnaire during August to October 2010

**Data analysis:** The collected data was analyzed as per objectives and suitable tests were used as per norms.

### **Data Analysis and Interpretation /Research Findings:**

The collected data was analyzed as per objectives. All medical superintendents provided the basic information like name, phone/Mobile number, fax /email address. However, half of the hospitals only provided email address (four Govt. and six private hospitals). It was found that all hospitals have obtained authorization from Delhi Pollution Control Committee. Hospitals have provided the authorization number, date of issue and its validity.

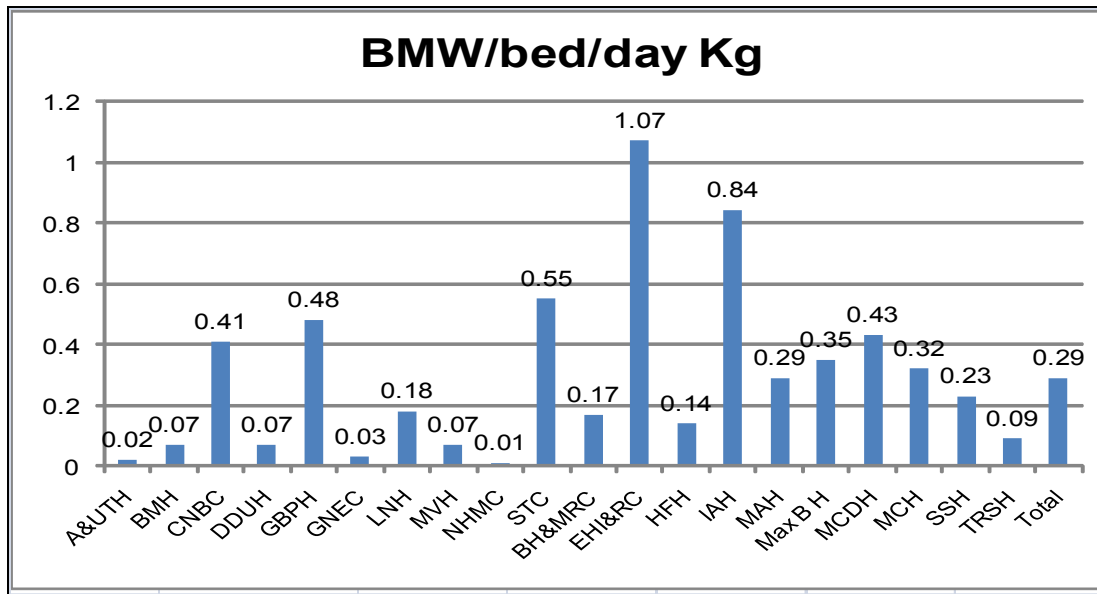
- A. **Quantum of waste generated:** The quantum of waste generated in hospitals varies from hospital to hospital.

**Table 1: Quantum of waste Generated in Hospitals**

SI No.	Quantum of waste	No. of Hospitals under study		
		Government (10)	Private (10)	Total (20)
1	Quantum of waste generated Monthly (Kg)	24911	42739	67650
2	Quantum of waste generated daily (Kg)	804	1379	2182
3	No. of Beds	4100	3303	7403
4	Waste generated per bed per day (Kg)	0.200	0.420	0.290

Table 1 explains the total quantum of waste generated in the hospitals under study. The total quantum of waste generated monthly is 67.6 tons. The total number of beds in these hospitals is 7403. The BMW generated by govt. hospitals is 200 gms. per bed per day whereas BMW generated by Private hospitals is 420 gms. per bed per day. Hospital wise waste generated is shown in Figure 1.

**Figure 1: Biomedical Waste Generated per Bed per Day (Kg)**



As revealed by figure 1, BMW generation varies from 10 gms. per bed per day in Nehru Homeopathy Medical College to 1.07 kg. in Escort Heart Institute & Research Centre with an average of 290 gms per bed per day.

**B. BMW Handling Practices:**

**Segregated collection:** All hospitals are using segregation bags. It is mandatory to use colour coded containers for segregation in hospitals.

**Table 2: Practice of Segregation of Biomedical Waste in the Hospitals:**

Sl No.	Use of Segregation containers/ bags/ Puncture proof	No. of Hospitals having Segregation containers		
		Government (10)	Private (10)	Total (20)
1	Segregation containers	10	8	18 (90)
2	Segregation bags	10	10	20 (100)
3	Puncture Proof containers	10	9	19 (95)

However only 90% hospitals are using colour coded containers. Puncture proof containers were also found in 95% hospitals. The segregation containers used by different hospitals are as follows:

The use of colour coded containers in Guru Nanak eye centre but their placement near the air cooler makes the staff and patients more vulnerable to spread of infection. Containers used by DDU hospital do not show any use of biohazard symbols. Ninety percent hospitals under study were using red, yellow and black coloured containers. Yellow bags for incinerable waste, red for autoclavable and black for general waste are used. Containers in GB pant Hospital are having foot operated lids, with biohazard symbols. They are also having labels.

**Table 3: Provision of Needle Destroyers for Sharps:**

Sl. No.	Availability and use of Needle destroyers	No. of Hospitals having Needle destroyers		
		Government (10)	Private (10)	Total (20)
1	Availability in hospitals	10	9	19 (95)
2	Total No. of Needle destroyers	463	345	789
3	Total No. of Beds	4100	3303	7403
4	Beds served per Needle	8.9	9.6	9.4

All hospitals except Apollo hospital are using needle destroyers. Apollo hospital is directly putting sharps in sharps containers. Each needle destroyer is catering to 8.9 beds in Govt. hospitals whereas 9.6 beds in private hospitals.

Beds catered by each needle destroyer vary from 4 beds in Chacha Nehru Bal Chikitsalya to 100 beds in Nehru Homeopathic Medical College and hospital with an average of 9 beds per needle destroyer. Sharp containers are used in the hospital to prevent needle stick injuries and cuts from sharp instruments.

**Transportation:** Ninety five percent hospitals are having wheelbarrows/wheeled trolleys.

**Table 4: Provision of Transportation of biomedical waste in the hospital:**

Sl No.	Availability and use of Trolley/Wheel barrow	No. of Hospitals having trolley/Wheelbarrow		
		Government (10)	Private (10)	Total (20)
1	Availability in hospitals	9	10	19 (95)
2	Separate washing facility	6	6	12 (60)

Provision of separate washing facility was communicated by 60 % hospital. Forty percent hospitals are still using bathrooms for washing of containers/wheelbarrows. Isolated facility for washing containers was not found in any of the hospital.

**Storage:** Provision of internal storage was found in 95% hospitals. Eighty five percent hospitals are also having centralized storage. Provision of lock and key is there in 90% storage sites

**Table 5: Practice of Storage of Biomedical Waste:**

SI No.	Availability and use of Storage site	No. of Hospitals having storage Site		
		Government (10)	Private (10)	Total (20)
1	Internal storage	10	9	19 (95)
2	Centralized storage	8	9	17 (85)
3	Provision of Lock and Key	8	10	18 (90)

**Treatment and Disposal:** Onsite treatment facility for Incineration was not available in any of the hospitals. They are using the facility of centralized BMW treatment facility of Synergy Waste Management Private Limited 15 (75%) hospitals and Metro Biocare Services (25%) hospitals. Incineration Ash is disposed of by centralized BME treatment facility operator.

**Table 6: Availability of onsite treatment facility in hospitals under study**

SI No.	Name of the Functional Equipment	No. of Hospitals having onsite equipment		
		Government (10)	Private (10)	Total (20)
1	Incinerator	0	0	0
2	Autoclave	4	1	5 (25)
3	Microwave	1	0	1 (5)
4	Shredder	4	3	7 (35)

It can be seen from table 6 that 5 (25%) hospitals were having autoclave and only one (5%) was having onsite Microwave facility. Shredding facility is available in 7 (35%) hospitals four (20%) in Government sector and 3 (15%) in private sector.

Sharp blasters work at high temperature and specially used for needles. The containers are encapsulated but their disposal becomes a challenge. The waste after autoclaving/ microwaving is shredded and disposed of. Some hospitals are also generating revenue for plastic waste by selling it to junk dealers.

#### **Centralized BMW Treatment Facility at Okhla**

The incinerator installed at centralized waste treatment facility at Okhla is one of the largest incinerators in India with capacity of 300kg/hour.

The liquid waste generated in hospitals is treated in effluent treatment plant and water purified from this plant is used for gardening purpose

**Monitoring and Supervision:** Monitoring and supervision is not possible unless the job responsibilities are properly defined and regular checks are there. There comes the role of nodal officer BMW management and biomedical waste management committee.

#### **Nodal officer BMW and BMW Management Committee**

Sl.No.	Nodal Officer/BMW Mgmt. Committee	No. of Hospitals having Nodal Officer ( BMW)/ Committee		
		Government (10)	Private (10)	Total (20)
1	Nodal Officer	8	9	17 (85)
2	BMW Mgmt. Committee	7	8	15 (75)
3	Average No. of Members in the committee	4.3	5	6.2
4	Whether Regular Meeting held	7	6	13 (65)



Nodal officers have been designated by 17(85%) hospitals whereas only 15 (75%) hospitals under study have constituted biomedical waste management committee. No. of members varied from 4 to 11 with an average of 6 members in the committee. Thirteen (65) percent hospitals have reported the regular meetings of biomedical waste management committee.

Maintenance of registers and records for biomedical waste is an important are in monitoring and supervision. All hospitals under study were maintaining the records and registers. Daily supervision is reported in 90 % hospitals. Regular inspection was also reported in 95 % hospitals.

**Provision of recording and reporting of biomedical waste:**

SI No.	Special Provisions for	No. of Hospitals having Provision		
		Government (10)	Private (10)	Total (20)
1	Maintenance of Records	10	10	20 (100)
2	Daily supervision	8	10	18 (90)
3	Regular Inspections	10	9	19 (95)
4	Monthly report to DHS	9	0	9 (45)
5	Annual returns to DPCC	9	10	19 (95)
6	Separate Budget Head for BMW management	5	5	10 (50)

Only government hospitals were reporting to directorate of health services. Annual report to Delhi Pollution Control Committee (prescribed authority under the rules) is submitted by 95% hospitals. Fifty percent of hospitals are having separate budget head for biomedical waste management.

**Special Provision for Infection control and Hazards Management:**

SI No.	Special Provisions for	No. of Hospitals having Provision		
		Government (10)	Private (10)	Total (20)
1	Spill Management	9	9	18 (90)
2	Heavy Metal Containment	5	8	13 (65)
3	Injury Register	6	8	14 (70)
4	Separate Weighing Machine	8	7	15 (75)
5	Acoustic enclosure	9	9	18 (90)

It is clear from Table 9 that spill management protocol is available in 90% hospitals. Provision for mercury containment is available in 65% hospitals. Separate weighing machine for biomedical waste is available in 75% hospitals. Acoustic enclosures for generators were reported in 90% hospitals.

**Provision for quality waste Management in hospitals:**

SI No.	Special Provisions for	No. of Hospitals having Provision		
		Government (10)	Private (10)	Total (20)
1	SOPs/Guidelines	9	8	17 (85)
2	Regular trainings	9	10	19 (95)
3	IEC material	7	4	11 (55)
4	Consent under air and water act	7	10	17 (85)
5	Waste audit	5	8	13 (65)

## **IEC MATERIAL DISPLAYED IN BATRA HOSPITAL**

To improve the quality of biomedical waste management there is provision of standard operating procedures/ guidelines in 85% hospitals under study. Almost 95% hospitals are conducting training programmes for their staff. Only 11(55%) hospitals are displaying awareness material for biomedical waste management. Consent under air and water act has been obtained by 855 institutions. Waste audit has been reported by 65% hospitals.

## **RECOMMENDATIONS AND CONCLUSION**

Recommending strategies is one of the objectives of the current study. These recommendations are based on the study findings of twenty selected major hospitals:

1. Each hospital should have designated nodal officer for biomedical waste management supported by Infection control nurse and data entry operator. The nodal officer should have adequate training in BMW management or certificate courses in healthcare waste management offered by recognized board/university e.g. Indira Gandhi National Open University.
2. In addition to infection control committee there should be a separate biomedical waste management committee under medical superintendent or additional medical superintendent. This committee should have members like microbiologist or pathologist, surgeon, nursing superintendent, sanitary supervisor, infection control nurse and nodal officer BMW management.
3. Medical superintendent should personally ensure the timely authorization from prescribed authority.
4. A separate budget head should be earmarked for biomedical waste management. One to two percent of hospital budget can be kept under this head.
5. Uniform policy of colour coded containers along with colour coded liner/bags should be adopted. The containers/liners used for biomedical waste should have biohazard symbol on them. These bags should be made of non PVC biodegradable material.
6. Colour coded properly labeled wheelbarrows/trolleys should be used for transportation of biomedical waste. The trolleys used for biomedical waste should not be used for any other purpose.

7. There should be separate isolated washing facility for containers/wheelbarrows. The containers used for biomedical waste should never be washed in bathrooms/toilets.
8. A separate biomedical waste storage site should be constructed with provision of gate with lock and key. It should be easily accessible to the vehicle operated by centralized biomedical waste facility operator.
9. Availing services of centralized facility operator for BMW management is advisable and cost effective. However, a contingent plan should always be kept in mind to meet any exigencies.
10. There should be protocol for spill management, mercury containment, provision for personal protective gears, immunization and injury register.
11. Training of staff and awareness activities for healthcare personnel and public visiting to the hospitals is very important. There should be compulsory induction training, refresher training and retaining of health care workers. The awareness messages should be displayed at multiple places along with messages on close circuit television.
12. Regular monitoring by nodal officer biomedical waste and inspections by regulatory authorities is very essential. Waste audit should be carried out by hospitals on regular intervals.

It is concluded that Delhi hospitals are meeting over 90 percent criteria for authorization, collection and segregation, transportation and treatment is concerned. There is a performance decline on criteria like awareness activities, waste audit, injury register, containment of mercury, spill management and SOP/guidelines are concerned. There lot of scope for improvement in biomedical waste management in Delhi.

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