



Original Research Article

Assessment of Bio-Medical Waste Management in a Government Healthcare Setting of North India

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ABSTRACT

Background: Biomedical waste is the by-product of healthcare that includes sharps, disposable items, bloods, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. The hazards of mismanagement of bio-medical waste can range from gastro-enteric, respiratory, and skin infections to more deadly diseases such as HIV/AIDS, and Hepatitis.

Objectives: The objectives of this study was an assessment of the current situation of bio-medical waste management (BMWM) and determine the quantity of infectious waste generated in the Dr Ram Manohar Lohia (Dr RML) Combined Hospital, Lucknow, Uttar Pradesh, India.

Methods: The present study was carried out by using interview and observation method. The study data were collected using a questionnaire, which includes the questions based on the vital steps of BMWM i.e. segregation, collection, transportation, storage, disposal and amount of waste generated.

Results: The results of this study revealed that waste was segregated, collected and stored according to the Bio-medical waste (management and handling) rules. Hospital had tie-up with the Common Bio-medical Waste Management Treatment Facility (CBWTF) for the treatment and final disposal of waste.

Conclusions: In the Dr RML hospital Infection Control Committee was formulated which deals with the issues related to bio-medical waste management. The healthcare staff was well aware regarding good bio-medical waste management practices, hazards caused due to improper handling and spill management.

Keywords: Bio-medical waste, Bio-medical waste management, Segregation, Collection, Transportation, Disposal.

INTRODUCTION

Bio-medical waste management is of great importance due to its hazardous and infectious nature that can cause detrimental effects on the environment and on human beings through direct or indirect contact.

Some of the health impacts arising from exposure to hazardous hospital wastes include mutagenic, teratogenic and carcinogenic effects, respiratory damage, central nervous system effects, reproductive system damage and others. ^[1] Biomedical

waste is referred as the by-product of healthcare that includes sharps, disposable items, bloods, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials.

According to a World Health Organization (WHO) report [2] large volume of hospital waste (around 85%) is non-infectious and 10% is infectious and the remaining 5% is hazardous-chemical, pharmaceutical or radioactive. [2] This 15% of waste generated from healthcare related activities needs special management and handling because it may include solid or liquid waste material that is potentially dangerous to those who come in contact with it. However, if the infectious waste gets mixed with the non-infectious (general) waste, the entire bulk of healthcare waste potentially becomes infectious. [3]

In the year 1998, Government of India (Ministry of Environment and Forests 1998) issued Bio-medical Waste (Management and Handling) Rules. This rule was based on the principle of waste segregation at source followed by collection, transportation, storage, treatment and disposal of wastes according to their different categories. [4] Despite this formal notification, Bio-medical waste management has been consistently ignored by most of the healthcare facilities across India. [5-9] It is estimated that 0.33 million tonnes of bio-medical waste is generated in India, rate of generation of which ranges from 0.5 to 2 kg per bed per day. [10]

The present study is being done with the objective to assess the current status of bio-medical waste management practices and to determine the quantity of infectious waste generated in the Dr Ram Manohar Lohia (Dr RML) Combined Hospital, Lucknow, Uttar Pradesh, North India.

MATERIALS AND METHODS

Study area: Dr Ram Manohar Lohia (Dr RML) Combined Hospital is one of the reputed and leading hospitals established by the State Govt of Uttar Pradesh. The foundation stone of the Dr RML Hospital was laid in the year 1998. The total numbers of registered beds are 325 (including 44 private wards), with a bed occupancy rate of 93-100%. Hospital has fully functioning round the clock Emergency Services; Cardiology Department with ICCU; Hi-Tech Modern Operation Theater for Laparoscopic Surgery; Radiology Department with USG, MRI and X Ray Machines; Pathology and Blood Bank Unit with auto-analyzer; Dermatology Unit with PUVA Chambers; Dentistry Department with ORVG; Orthopaedic Department with facility for total hip replacement, in addition to all routine specialties. These recently added facilities will thus go a long way in mitigating the sufferings of the sick people, especially the poorer sections of the society.

Study Period: The study was conducted for a period of 4 months (September-December, 2012).

Study Design: The present study was carried out by using observational and interview method.

Study Tool: Questionnaire was developed based on the vital steps of BMW i.e. segregation, collection, transportation, storage, disposal and amount of waste generated.

Respondents: In-charge of Bio-medical waste management, members of infection control committee and nursing staff.

RESULTS

1. Current situation of Bio-medical Waste Management:

Segregation: The waste was segregated separately, according to its characteristics, at the point of generation (Table 1). Posters were pasted on the walls near the bins depicting disposal of different category of

waste. All the bins were clean and covered. Blue, Red and yellow bins were labelled with a bio-hazardous symbol. Small bowls and bins have been provided at the bed-side of each patient for general waste disposal. All the plastic waste generated in the hospital were kept for a period of at least 30 min in a freshly prepared 1% hypochlorite solution before discarding them in the bins. Used syringes were first mutilated at source with the manual hub cutter and remaining part disposed in the red bucket having 1% hypo solution.

Collection, transportation and storage:

Hospital waste collected from each department twice a day and transported with the covered trolley by designated waste handler at temporary storage area. Complete personal protective equipment (apron, gloves, masks, and boots) were used by waste handler during collection. Storage area was divided into 4 rooms where all different color coded waste bags are kept separately. The bio-medical solid wastes were not stored for more than 24 hrs in the storage room.

Treatment and Final disposal: Dr. RML Hospital is sending its all type of infectious waste to the Synergy Pvt. Ltd, a Common Biomedical Waste Treatment Facility (CBWTF) for treatment and disposal and non-infectious waste to Nagar nigam for final disposal.

Common Biomedical Waste Treatment Facility: Synergy waste Management Private Limited

Synergy Pvt. Ltd. is an authorized CBWTF nearly 20 kms away from city where different treatment facilities like Incineration (capacity: 250 Kg/Hr), autoclave (capacity: 75 Kg/Hr), shredder (capacity: 50 Kg/Hr) and effluent treatment plant (capacity: 1000 ltrs. / batch) are available for bio-medical waste. The functioning of the CBWTF is as follows:

- ✓ Collection of segregated Bio-medical waste from different hospitals
- ✓ Transportation to CBWTF
- ✓ Unloading the Vehicle to the temporary storage room at site
- ✓ Fumigating / disinfecting / cleaning of vehicle
- ✓ Categories / batch wise treatment of collected waste by incineration, Autoclave & Shredder
- ✓ Effluent treatment of the water generated during treatment of Bio-Medical Waste & reuse of Treated waster for Plantation / cleaning purposes
- ✓ Storing the ash from Incinerator for Secured Land Fills / Municipal Land Fills
- ✓ Autoclaved & Shredded disinfected waste to be recycled

2. Quantity of infectious waste generated in the hospital:

All type of waste is collected but only infectious waste was weighed by the hospital staff. Total infectious waste generated in the hospital was 1123.2 Kg/month which includes 742.4 kg Human tissues and organ waste (yellow), 219 kg Infectious non- sharp waste (red) and 161.75 kg sharp waste (blue) (Table 2). Figure 1 is showing the percentage of infectious waste generated from hospital which includes 66.1% of Human tissues and organ waste, 19.5% of infectious non-sharp waste and 14.4% of sharp waste.

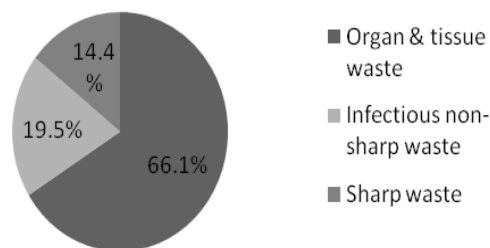


Figure 1: Average percentage of Infectious waste generated from the hospital.

Table 1: Waste segregation pattern followed in the hospital

Color	Container	Category
Blue (Sharp waste)	Blue plastic bag in plastic bin	Broken Glasses , Needles , Syringes, scalpels blades etc
Red (Infectious Non sharp waste)	Red plastic bag in plastic bin	Soiled Cotton , Gauzes , Catheters , IV tubing etc
Yellow (Organ and tissue waste)	Yellow plastic bag in plastic bin	Human tissues, organs, body parts, placenta, pathological and surgical waste, microbiology and biotechnology waste
Black (General Waste)	Black bag in plastic bin	General paper waste; and also kitchen waste, that is disposed separately.

Table: 2 Summary of infectious waste quantity from September to December, 2012

Month	Quantity of infectious waste (kg)	Yellow (Organ and tissue waste)	Red (Infectious non-sharp waste)	Blue (Sharp waste)
September	1070	707.27	208.65	154.08
October	1025	677.5	199.9	147.6
November	1030	680.83	200.85	148.32
December	1367.8	904.11	266.72	196.96
Average	1123.2	742.4 (66.1%)	219 (19.5%)	161.74 (14.4%)

DISCUSSION

RML hospital got the accreditation certificate from National Accreditation Board for Hospitals and Healthcare providers (NABH). Biomedical waste management policy was developed according to the Bio-medical Waste (Management and Handling) Rules, 1998.

Segregation is the key step for minimization and effective management of bio-medical waste. Improper waste segregation practices can have an adverse impact on environment and human health and also increase the cost of treatment. [11] In the present study waste segregation practices were according to the schedule II of Bio-medical Waste (Management and Handling) Rules, 1998. At some workstations gloves were reused only after complete sterilization process (chemical and then autoclave). A small autoclave at blood bank department was used for the sterilization of expired/unused blood bags and glass wares.

A WHO report shows that about 35 million Health care personnel every year face the injuries caused by contaminated sharp materials used during patient care. [12]

In the King George's Medical University, used syringes were mutilated at the point of generation with the help of a hub cutter that minimizes the re-use of syringes. [13] In our study, all the sharp material were collected separately and manual hub cutter was used for cutting needles remaining plastic part treated in 1% hypochlorite solution and disposed in red bin. A study conducted in Serbia revealed that Waste management performance in the hospitals was poor and there were problems in every stage of management. [14] Another study was conducted in Lucknow city revealed that infectious and non-infectious waste was being dumped together within the hospital premises. [15] All disposable plastic items were segregated by the rag pickers from the hospital as well as those at municipal bins and dumps.

Healthcare personnel play key role in the management of bio-medical waste so it is important to train them regarding their safety & harm associated with the improper management of bio-medical waste. [16,17] The hospital staff was well aware regarding the good bio-medical waste management

practices, hazards caused due to improper handling of the bio-medical waste and spill management process of blood and mercury.

A study conducted by Kumari et al. revealed that a dedicated bio-medical waste management committee was formulated in the hospital where as in the Dr RML hospital Infection Control Committee deals with the issues related to bio-medical waste management. [18]

CONCLUSION

The management of bio-medical waste has been of major concern due to potentially high risks to human health and the environment. In the Dr RML hospital Infection Control Committee was formulated which deals with the issues related to bio-medical waste management. The healthcare staff was well aware regarding good bio-medical waste management practices, hazards caused due to improper handling and spill management. The hospital sending its all type of infectious waste to the Synergy Pvt. Ltd, a Common Biomedical Waste Treatment Facility (CBWTF) and non-infectious waste to the Nagar Nigam for final disposal.

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