

A Study on Assessment Practices of Biomedical Waste Management in Hospital of Jaipur as Smart City

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Abstract—Waste disposal is a big problem all over the world. It is of different types such as municipal waste, industrial waste, commercial waste, biomedical waste, E-waste etc. Biomedical waste management (BMW) is one of the biggest challenges of the present day time because of its direct impact on the health of human beings. Its safe and proper disposal is extremely important because it is hazardous in nature. In the past, medical waste was often mixed with municipal solid waste and disposed in nearby landfills. In current scenario, many efforts have been made by environmental regulatory agencies to better manage the biomedical waste. In this paper a detailed field visit method was implemented to collect information regarding different biomedical waste management aspects, including medical waste generation, collection and segregation, storage, transportation, disposal and safety of cleaning personnel. This paper also focused on the problems associated with biomedical waste.

Keywords: Waste, Hazardous, Municipal Solid Waste, Disposal, Segregation.

1. INTRODUCTION

Major problems associated with BMW management in various hospitals executing the acts of Biomedical Waste is not giving satisfaction as some hospitals are disposing of waste in a hazardous, not proper and extensive manner [1]. As per World Health Organization (WHO) some piece of medicinal services squanders are viewed as most dangerous that can influence human wellbeing and dirty the earth. Govt. of India notified the Bio-Medical Waste (Management and Handlings) Rules on 27th July 1998; under the provisions of Environment Act 1986 [2].

The World Health Organization (WHO) has categorized the BMW into eight categories, includes,

- General Waste
- Infectious or dangerous waste
- Radioactive
- Chemical
- Pathological

- Pressurized containers
- Pharmaceuticals

When patient care activities are carried out in care of health setting, various waste is produced which has the possible reason harm to environment and human beings. Such waste incorporates dirtied cotton, wraps, hypodermic needles, syringes, tubing, for example, intravenous sets, and urinary catheters and so on [2]. This type waste is commonly known as bio-medical waste in world, though it is also known by many other names such as clinical waste, medical waste and care of health waste in different parts of world [3]. Such waste constitutes simply 15 to 25% of aggregate waste created in a healing center, the remaining being general waste, for example, squander paper, wrapper of medications, cardboard and left-finished nourishment and so on .

2. BIOMEDICAL WASTE

As per Biomedical Waste (Management and Handling) Rules, 1998 of India, BMW is defined as “Any waste generated during the process of diagnosis and treatment or immunization of human beings or animals or in research activities contributing to the biological production or testing”.

2.1 Classification of Biological Wastes [2]

• Hazardous Wastes

Waste that is suspected to includes infectious material or which because of its biological or physical nature may be adverse effect on humans, animals, plants or the environment.

Hazardous waste includes:-

- Human or animal specimen cultures.
- Human surgery specimens or removed tissues.
- Animal parts, tissues, flu
- Waste containing blood.

• Non-Hazardous Wastes

Squanders that are insoluble, don't respond with different materials, and don't decompose. Examples of squanders are synthetically idle and insoluble substances, squander which postures nothreat to human wellbeing or nature, glass and a few plastics that are inactive and insoluble strong waste materials. Effects of biomedical waste are as follows [Table-1]:

Table 1: Types of Infectious Caused By Biomedical Waste

Infection Type	Pathogen Agents	Transmission Path
Gastrointestinal infections	Enterobacteria: Salmonell, Shigella spp.	Faeces or/and vomiting liquid
Respiratory infections	Mycobacterium tuberculosis Measles virus Streptococcus pneumoniae	Respiratory secretions, saliva
Eye infections	Herpes virus	Eye secretions
Genital infections	Neisseria gonorrhoeae Herpes virus	Genital secretions
Skin infections	Streptococcus spp.	Purulent secretions
Anthrax	Bacillus anthracis	Secretions of skin lesions
Meningitis	Neisseria meningitidis	LCR
AIDS	HIV	Blood, semen, vaginal secretions
Haemorrhagic fevers	Junin Viruses, Lassa, Ebola Marburg	Biological fluids and secretions
Septicemia	Staphylococcus ssp	Blood
Viral Hepatitis type A	VHA	Faeces
Viral Hepatitis type B and C	VHB, VHC	Blood, biological fluids

3. METHODOLOGY

The data was collected from the SMS Hospital, Jaipur. The study was conducted during the period from January 2018 to March 2018. The study did not cover all hospitals in Jaipur; we were still able to collection of SMS Hospital. Information & data collected by visit of hospital 6 times. The staff is; 255 Doctors, 660Nurses and no. of beds 6000. The total patients in hospital are 20,000 and in 2017, more than 29.6 lakhs patients were registered at SMS Hospital's OPD.

4. STUDY AREA

The area selected for the study is SMS Hospital, Tonk road in Jaipur. The SMS hospital is biggest hospital of Jaipur. Hospital suitable for outer cities and the patients load also more than other hospitals of Jaipur. Biomedical waste from SMS hospital is 2200Kg/day which provided all required research is possible to conducts.

5. DATA ANALYSIS

The data of biomedical waste is collected by visit in hospital .the data is following; Yellow beg (Human anatomical) is 450-500Kg/day, Red beg (Contaminated waste) is 550-700Kg/day, Blue beg (Glassware) is 100-250 Kg/day, White beg (Sharps metals) is 50-150Kg/day and Black beg (General waste) is 850-900Kg/day. Total Biomedical waste is 2200Kg/day.

6. BIOMEDICAL WASTE MANAGEMENT [2-8]

6.1 Collection

Generate of biomedical waste in hospital collected by the help of different colors beg for different waste.

Table 2: Waste generated data of SMS Hospital, Jaipur

Color	Type of Waste	Quantity(Kg/day)
Yellow	Human anatomical, discarded medicines	450-500
Red	Contaminated waste(Recyclable)	550-700
Blue	Glassware	100-250
Black	General waste	850-900
White	Sharps metals	50-150

6.2 Segregation

Initially segregation process is done at source to reduce the waste management problem up to 15%. Segregation is done accordingly to color coded bags like as red, yellow, blue, white, black etc. Though, the hospital waste generated is about 3kg/bed/day, only 0.28 to 0.38 kg/bed/day of it is infectious.

6.3 Transportation

The waste ought to be transported for treatment either in trolleys or in secured wheelbarrow. Manual stacking ought to be maintained a strategic distance from to the extent for as would be prudent. The packs/Container containing BMWs ought to be tied/lidded before transportation. Before transporting the pack containing BMWs, it ought to be went with a marked report by Nurse/Doctor specifying date, move, amount and goal.

6.4 Disinfection and destruction

Infectious wastes are to be disinfected before final disposal as it contains pathological microorganisms causing diseases. Wastes are unloaded at the place of treatment and separated per colour codes, properly treated and then disposed.

6.5 Disposal Method

6.5.1. Autoclaving

This is a thermal process in which waste comes in direct contact with steam in a controlled manner for disinfecting the waste for a sufficient duration. For easy treatment and for safety during operation, the horizontal system is preferred, specially designed for treatment purpose. According to a

research, for effective inactivation of microorganisms and bacterial spores, for a small amount of waste, a 121°C temperature is required for 60minutes.

Uses: Autoclaving is typically used for sterilizing the reusable medical equipments.

Limitation: Autoclaves allow treatment for only limited quantities of the waste and release harmful gases.

6.5.2. Microwave Irradiation

In microwave irradiation method, the inactivation of microbial is done by using the heating effect of electromagnetic rays. The frequency of these rays lies between 300 and 300,000 MHz. Most of the microorganisms gets destroyed a frequency of about 2450 MHz.

Uses: Microwave irradiation method is used for disinfecting a variety of biomedical waste.

6.5.3. Incineration

This is proved in which there is increase temperature causes dry oxidation. To reduce organic & combustible waste to inorganic incombustible to reduce volume & weight that cannot be revealed, reused or disposed in outer land fields. The drawback to incineration is more costly process of operating. The advantage of incineration is no Pretreatment is required and suitable for low heating volume above 2000 Kcal/Kg for single chamber & 3500 Kcal/Kg for double-chamber. The waste should be less moisture as less than 30% and also combustible.

6.5.4. Pyrolysis

Pyrolysis It is like incineration in which it uses high heat to destroy medical waste and produces lower levels of pollution than incineration.

Pyrolysis is a thermal decomposition of materials at high temperatures in an internal atmosphere such as gas of a vacuum. Pyrolysis is most commonly applied to the disposal of organic materials. It is one of the processes involved in charring wood, starting at 250–300 °C.

7. RESULT

The overall mean score for BMW of 6 days data at source of generation of waste was 2200Kg/day. The 20% of total waste is disposed by incineration method, 15% of total waste is disposed by pyrolysis method, 15% of total waste by Autoclaving method and 50% of total waste (general waste) is disposed with municipal waste.

8. CONCLUSIONS

The present study was done to the practices of biomedical waste management in SMS hospital, Jaipur using a checklist. It was observed that more needs to be laid for disinfection of waste. in 'Treatment Room of wards' which are used exclusively by management system of Hospital. In SMS hospital waste collection and segregation is 88% completed which required more efforts.

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