



Biomedical waste management in Hospitals

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ABSTRACT

Hospital waste is a special type of waste which carries high potential of infection and injury. It is essential that all medical waste materials are segregated at the point of generation, appropriately treated and disposed safely. This paper focuses on the identification and classification of biomedical waste. It also focuses on Steps involved in Bio-medical waste management, waste segregation, colour coding for waste segregation and its collection, treatment and disposal as per rules, 2016. This paper also comprises how to keep record of all waste material disposals. On the basis of this data we can get various options for reuse and recycle of waste material. Today, Current disposal techniques adopted for hospital wastes are- sewage/drains, incineration and Autoclave. But these methods are having some merits as well as demerits. This review creates interesting areas for future research too. Researchers should focus on the usage of effective micro-organism and solar energy in waste disposal. The waste to energy concept should be further developed to conserve the fossil fuels. So it is ethical and social responsibility of health care professionals to do proper identification, segregation and disposal of bio medical waste.

Keywords:-Bio-medical waste, segregation, incineration

INTRODUCTION:

Waste means any useless, unwanted or discarded substance or material, irrespective of whether or not such substance or material has any other or future use. According to Biomedical waste (Management and Handling) Rules, 2016 of India, 'biomedical waste' is defined as "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 biological or in health camps".

OBJECTIVES

- 1.To study the mechanism of bio-medical waste management.
- 2.To highlight the challenges faced while ensuring bio-medical waste management in India.

METHODOLOGY

This research is based on the secondary data gathered through various sources, like ministry of environment and pollution website and after the review of various researches done in the area. We searched the information through books, journals, magazines as well as to ensure the comprehensiveness and effective analysis.

RESULTS AND DISCUSSION

Salient features of BMW Management Rules, 2016[1]

- 1.The ambit of the rules has been expended to include vaccination camps, blood donation camps, surgical camps or any other healthcare activity.
- 2.Phase-out the use of chlorinated plastic bags, gloves and blood bags within two years.
- 3.Pre- treatment of the laboratory waste, microbiological waste, blood samples and



blood bags through disinfection or sterilization.

4. Provide training to all healthcare workers and immunise all workers regularly.

5. Establish a bar code system for bags.

6. BMW has been classified into 4 categories instead of 10.

7. New rule prescribed more stringent standards for incinerator to reduce pollution.

8. State govt. to provide land for setting up BMW treatment and disposal facility.

9. Operator of a common bio-medical waste treatment and disposal facility to ensure the timely collection of BMW from the HCFs and assists the HCFs in conduct of training.

Classification of Healthcare Waste[2]

Waste generated from the healthcare facility is classified as following:-

a) Bio Medical Waste (BMW)

b) General Waste

These categories are further divided into following types of waste

c) Other Wastes

a) Bio Medical Waste

It includes all the waste generated from the Health care Facility which can have any adverse effect to the health of a person or to the environment in general if not disposed properly. All such wastes is considered as infectious and such waste has to be managed as per Bio Medical Waste Management (BMWM) Rules, 2016.

The BMW generated from the health care facility further divided into four categories based on segregation pathway and colour code, which is as follows

1. Yellow Category

2. Red Category

3. White Category

4. Blue Category

CATEGORY	TYPE OF WASTE	Treatment and disposal option
YELLOW	Human Anatomical Waste Human tissues, organs, body parts and foetus below the viability period.	It should be handed over to Common Bio-medical Waste Treatment and Disposal Facility (CBWTF- Common Bio-medical Waste Treatment and Disposal Facility) with a copy of official Medical Termination of Pregnancy (MTP) certificate. It is then disposed through Plasma Pyrolysis unit or twin chambered compact incinerator with 2 sec retention time.
	Animal Anatomical Waste Experimental animal body parts, organs, tissues, including the waste generated from animals used in experiments.	
	Soiled Waste Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing discarded blood and blood components.	It should be disposed through Plasma Pyrolysis unit or in incinerator. Can also be disposed in deep burial pits.
	Chemical Waste Chemical used in production of biological and used or discarded disinfectants	It should be handover to CBWTF for final disposal by incineration.
	Chemical liquid waste Like Silver X-ray film developing liquid, discarded formalin, infected secretions, aspirated body fluids, liquids from laboratories.	Silver X-ray film developing liquid should be sold to the authorized recyclers for resource recovery.
	Discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask and gown.	Through incineration by CBWTF operator.
Microbiology, Biotechnology and other clinical laboratory waste(Pre- treated) It contains: Blood bags, Laboratory	By autoclave, microwave or hydroclave. Can also be disposed in captive deep burial pits.	

	cultures stocks or specimens of microorganisms, live or attenuated vaccines, human and animal cell culture used in research, dishes and devices used for cultures.	
RED	It contain disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes without needles, fixed needle syringes with their needle cuts, vacationers and gloves.	All recyclable waste must be sterilized using autoclave, microwaving and hydroclaving. Rest is send to CBWTF for final treatment.
WHITE	Waste Sharps including metals. Needles, syringes with fixed needles, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps.	First it should be sterilized after that disposed it by landfill or steel foundry.
BLUE	Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	Glass should be first sterilized and then send it for recycle by CBWTF team.

b) General Waste

This waste mainly consists mainly: Newspaper, paper and card boxes (dry waste), Plastic water bottles(dry waste), food waste, food container, packaging material, plastic water bottles. These waste are further collected separately as dry wastes and wet wastes. Such waste is required to be handled as per Solid Waste Management Rules, 2016 and Construction & Demolition Waste Management Rules, 2016, as applicable.

c) Other Wastes

It consists of used electronic wastes, used batteries, and radioactive wastes and is required to be handled as per e-waste management rule, 2016, Batteries (Management & Handling Rules, 2001, and Rules/guidelines under Atomic Energy Act, 1962 respectively.

Steps involved in Bio- medical Waste Management

Following are the steps involved in Bio-medical Waste Management:

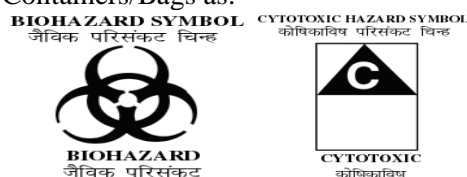
1. Segregation of waste
2. Collection of waste
3. Storage of waste
4. Transportation of waste
5. Treatment of waste

1) Segregation: It is the first step which insures that wastes do not get mixed with non-infectious wastes. Segregation at source makes

it easier to prevent spread of infection, help it easier to choose among the options of disposal.

2) Collection: It is collected according to the type of waste in different types of containers. The container chosen should be placed in such a way that 100% collection is achieved. Sharp object should be kept in puncture- proof containers to avoid injuries and infections. The bins and bags should indicating the nature of waste to the patients and public.

Schedule III (Rule 6) of Bio-medical Waste (Management and Handling) Rules 1998 specifies the Label for Bio-Medical Waste Containers/Bags as:



Label shall be non-washable and prominently visible.

3) Storage: The duration of storage should not exceed for 8-10 hrs in big hospitals, and 24 hrs in nursing homes. Storage area should be marked with a caution sign.

4) Transportation: It must be done with the help of closed trolleys/containers fitted with wheels. Trolleys should be as per the volume of waste generated from Hospitals.

First four steps (Segregation, Collection, Transportation and Storage) is the exclusive responsibility of Health Care Facility[3]. While Treatment and Disposal is primarily

responsibility of CBWTF (Common Bio-medical Waste Treatment and Disposal Facility) operator except for lab and highly infectious waste, which is required to be pre-treated by the HCF. Following are the responsibilities of HCF- Health care Facility (HCF) for management and handling of bio-medical waste:

1. BMW should be segregated at the point of generation by the person who is generating the waste in designated colour coded bin/container.
2. BMW and general waste shall not be mixed. Storage time of waste should be as less as possible so that waste storage, transportation and disposal is done within 48 hours.
3. Phase out use of chlorinated plastic bags (excluding blood bags) and gloves by definite time.
4. No secondary handling or pilferage of waste shall be done at healthcare facility. If CBWTF facility is available at a distance of 75 km from the HCF, BMW should be treated and disposed only through such CBWTF Operator.
5. Only Laboratory and Highly infectious waste shall be pre-treated onsite before sending for final treatment or disposal through CBWTF Operator.
6. Provide bar-code labels on all colour coded bags or containers containing segregated BMW before such waste goes for final disposal through a CBWTF [4].
7. Every authorised person shall maintain records related to the handling of bio-medical waste, for a period of 5 years, in accordance with these rules and guidelines issued by the Central Government or Central Pollution Control Board (CPCB) or the prescribed authority as the case may be.
8. An annual report shall submit to the prescribed authority by 31 January every year, to include information about the categories and quantities of BMW handled during the preceding year. The prescribed authority shall send this information in a compiled form to the CPCB by 31st March every year [5].

Current disposal techniques of BMWs [6]

1. By Incineration: This is a high temperature thermal process employing combustion of the waste under controlled condition for converting them into inert material and gases. Incinerators can be oil fired or electrically powered or a combination thereof. Broadly, three types of incinerators are used for hospital

waste: Multiple hearth type, rotary kiln and controlled air types.

2. By Non-Incineration Technology: It includes four basic processes: Thermal, Chemical, Irradiative, and Biological. The majority of non-incineration technologies employ the thermal and chemical process. Main purpose of this treatment is to decontaminate waste by destroying pathogens.

3. Autoclaving: The autoclave is equipment used to remove microorganisms (virus, bacteria, fungus etc.) and spores using high pressure and high temperature steam sterilization. This is of two types: Gravity flow autoclave and vacuum autoclave.

4. Microwave Irradiation: It is based on the principle of generation of high frequency waves. These waves cause the particles within the waste material to vibrate and generate heat. This heat generated from within kills all pathogens.

5. Chemical Methods: It is a process in which chemicals are used which acts as disinfectants like- Sodium hypochlorite, dissolve chlorine dioxide, per acetic acid, hydrogen peroxide etc.

6. Plasma Pyrolysis: It is a state-of-the-art technology for safe disposal of medical waste. It is an environment friendly technology, which converts organic waste into commercially useful by-products.

Challenges of biomedical waste in India-

- Problem in treatment of large amount of BMW in accordance with BMW Rule 2016.
- Number of Common BMW treatment Facilities are not adequate handle all the bio medical waste generated.
- Promotion of public private partnership.
- Lack of funds.
- Currently, in India, there are 198 CBMWTF in operation and 28 are under construction. There is a great need for rapid development of many more CBMWTF to fulfil the need of treatment and disposal of all BMW generated in India.
- New technologies to be promoted for destruction of toxic bio medical waste.
- Awareness need to be strengthened with regards to bio medical waste management.

Conclusion



Medical waste should be classified according to their source, type and risk factors associated with their handling, storage and ultimate disposal. The segregation of waste at source is the key step and reduction, reuse and recycling should be considered in proper perspectives. For this an improved image of the healthcare should be established and quality of life should also increase. If we want to protect our environment and health community we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of community.

Reference

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6. <http://www.cseindia.org>