



BIOMEDICAL WASTE MANAGEMENT OVERVIEW AND IMPACT

Imagine chopping some vegetables and cutting your finger by mistake. Without even thinking about it, you reach for a cotton ball to clean the gash and wrap it up with a bandaid. Similarly, healthcare facilities make use of materials like gauze, cotton, plaster casts and more to heal wounds.

Let's think further.

What about used syringes? Or of body parts removed during surgeries like appendicitis or amputation? From the scrubs and gloves that healthcare workers use, to radioactive elements, **there is 550 tonnes of waste produced daily in India.**¹ All these and more fall under a category called Biomedical waste.

Biomedical waste, as defined by the Biomedical Waste (Management and Handling) Rules, 1998 of India, is **“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.”**²

As unpleasant as thinking about these things is, it can get worse if we don't. Improper disposal of medical waste can cause parasitic infections, lung infections, viral infections and meningitis among other health and environmental issues.

We've reached a stage where waste management has become a burning issue. World leaders are scratching their heads about how to segregate waste efficiently so as to not end up in a 'Wall-E-esque' world. Biomedical waste management is a part of it. A study suggests that India is likely to generate about **776 tonnes of medical waste per day by 2022.**²

How is biomedical waste currently being segregated? Are there any laws in India that govern it? We get into all this and more in the next section.

The most crucial step in biomedical waste management is segregation. Only after segregation at source is done can the medical waste have the appropriate treatment.

SEGREGATING BIOMEDICAL WASTE AT SOURCE ⁴



Infected Waste, Human Anatomical Waste, Animal Anatomical Waste, Lab Waste Soiled Waste

Human tissues and anatomical waste, body parts, placenta, extracted tooth, surgical waste, cotton, bandages, solid plaster casts, beddings linen, menstrual cloths, sanitary napkins, disposable diapers, earbuds, fetus within 12 weeks of pregnancy, discarded medicines, cytotoxic drugs, discarded containers of chemicals and disinfectants, laboratory cultures, stocks or specimen of micro - organisms, live or attenuated vaccines, human cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures. Waste generated from animals used in experiments or testing.



Contaminated Recyclable Waste

Tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes with their needles cut), vacutainers and gloves. This includes waste pipette tips, plastic pipette, eppendorf, rubber teats, drains, oxygen mask, thick plastic splash proof gowns, rubber apron, ICT test cards, ELISA plate and vials not containing blood samples.



Glassware, Metallic Body Implant

Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes. This includes glass slides and glass pipette. Implants used for orthopaedic surgeries. This includes metal sternal wire, gigli saw wire and orthopaedic splint.



Sharps

Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes waste sharps such as lumbar puncture needle, trocar cannula, IABP cannula, arthroscopy blade, insulin pen needle, lancet needle, removac needle, eye needle, cardioplegia needle and surgical stab knife.

WAYS TO TREAT BIOMEDICAL WASTE

Segregation of biomedical waste is followed by its treatment and final disposal. Depending upon the type of medical waste, different processes for treatment are recommended.

Process	WHAT is the process?	WHY this process?	For WHICH medical waste?
Incineration	Controlled burning of the medical waste in a dedicated incinerator.	It can destroy pathogens, reduce the amount of waste going into landfills, break down hazardous organic chemicals.	Typically for pathological waste like organs, tissues or body parts. Also used on pharmaceutical waste like pills, injectables and antibiotics.
Autoclaving	Closed chambers that apply heat, pressure, and steam, over a period of time.	To sterilize medical equipment for re-use and for disposal as well. Used for waste that is unlikely to combust or give off substantial off-gas.	Mainly used for sharps waste including needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.
Gas sterilization	Medical waste is fed into an evacuated air-tight chamber and treated with a sterilizing agent (such as ethylene oxide or formaldehyde).	The gas that comes into contact with the waste kills harmful, infectious agents.	Typically used to kill off pathogens.
Chemical disinfection	Use of chemical agents for disinfection, eg: chlorine.	To reduce the risk of disease transmission and to disinfect materials.	Typically used on chemical and liquid waste that is generated from laboratory cleaning. Also used to maintain hygiene inside healthcare facilities.
Microwave	Microwave radiation is used to treat wastewater sludge and as a heat source to treat medical waste.	Good way to treat medical waste that has water in it.	Typically used for sharps waste including needles, scalpels, broken glass and broken capillary tube. Also used for infectious waste.
Irradiation	This method involves sterilizing waste by exposing it to a cobalt source.	Cobalt gives out gamma radiations that destroy all microbes in waste.	Mainly used for infectious waste and for sharps waste including needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.
Thermal inactivation	Heating waste to temperatures at which infectious agents are killed.	Good for when there is a large amount of liquid waste.	Used on sharps waste including needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires, and infectious waste.

*Source in 'Additional References' section

The rules also provide guidelines for **proper disposal of biomedical waste** once the treatment is done. For example, incinerated ash, treated solid wastes can be disposed in captive deep burial pits or municipal landfills or utilized in waste-to-energy platforms.

Some other types of waste require special treatment. For instance, It is mandatory for each health care facility that dead fetus waste should be handed over to CBWTF in yellow bag with a copy of the official Medical Termination of Pregnancy (MTP) certificate from the Obstetrician or the Medical Superintendent / SMO/ CMO of the HCF. ⁴



Common acronyms:

BMW: Biomedical Waste

BMWM: Biomedical Waste Management

HCF: Health Care Facility

CBWTF: Common Biomedical Waste Treatment and Disposal Facility

THE CALL FOR STRICTER PROTOCOLS IN INDIA

The government has set-up BMWM rules for efficient waste disposal. In fact, the first BMW rules were put forth in 1998. ⁵ These rules underwent amendments in 2000, 2003, and 2011, 2016 and 2019. According to the rules, Health Care Facilities are in charge of management and handling of biomedical waste. They should ensure segregation, collection, transportation, treatment and disposal of biomedical waste. After that, it is sent to a Common Biomedical Waste Treatment and Disposal Facility (CBWTF). ⁷ The rule also states that it should never be disposed of at dumping sites. However, the problem lies in implementation.

In India, **199 common biomedical waste treatment facilities** (CBWTFs) are in operation and **23** are under construction. ⁵ Based on 2017 data.

STARTLING INSTANCES SHOWING THE URGENT NEED FOR BIOMEDICAL WASTE MANAGEMENT

- In 2009, over **200 people** in Gujarat **contracted hepatitis B due to the reuse of unsterilized syringes**.⁸
- A 2017 study in Jharkhand showed that hospitals and nursing homes blatantly **flouted BMW laws** with respect to segregation, collection, storage, treatment and disposal.⁷
- In 2019, the Bihar Pollution Control Board **served closure notices to 219 health facilities** in Patna for not complying with the Biomedical Waste Management (BMW) Rules 2016.⁷
- As of 2019, Delhi's biomedical waste is unmonitored. The Delhi Pollution Control Board (DPCC) **does not have updated data** about how many healthcare facilities (HCFs) it has to regulate nor the total amount of waste generated by them.⁷
- In Delhi, a 2019 report had found that three out of five dumping sites had **needles, syringes, gloves, glass vials and dental casts mixed with solid waste**. Liquid waste is freely mixed with the public sewer, sometimes even without any pre-treatment.⁷



CONCLUSION

Though India has created good measures to control medical waste pollution, the on-ground realities are starkly different. The law can only provide a guideline, it is up to HCFs to ensure that these laws are followed. Hence, there is an urgent need to implement, strengthen and fund the disposal of biomedical waste.

References:

1. India to generate 775.5 tonnes of medical waste daily by 2020: Study, Economic Times, March 2018
2. Mathur P, Patan S, Shobhawat S. Need of Biomedical Waste Management System in Hospitals - An Emerging issue - A Review. *Curr World Environ* 2012;7(1):117-124. Available from: <http://www.cwejournal.org/?p=1969>
3. These Diseases Can Be Caused By Improperly Disposed-of Medical Waste, *MedPro*, Sept 2017
4. Guidelines for Management of Healthcare Waste as per Biomedical Waste Management Rules, 2016
5. Need of Biomedical Waste Management System in Hospitals - An Emerging issue - A Review, 27th May 2015. [hepatitis-b-outbreak-in-gujarat-a-wake-up-call/](https://www.ijme.in/articles/hepatitis-b-outbreak-in-gujarat-a-wake-up-call/)
6. Datta P, Mohi GK, Chander J. Biomedical waste management in India: Critical appraisal. *J Lab Physicians*. 2018;10(1):6-14. doi:10.4103/JLP.JLP_89_17
7. Biomedical waste in Delhi: What monitoring without figures, asks report, *Down To Earth*, December 2019
8. SEETHARAM, S. (2016). Hepatitis B outbreak in Gujarat: a wake-up call. *Indian Journal of Medical Ethics*, 6 (3), 120. Retrieved from <https://ijme.in/articles/hepatitis-b-outbreak-in-gujarat-a-wake-up-call/>
9. <http://nswai.com/docs/Management%20of%20Biomedical%20Waste%20in%20India%20and%20Other%20Countries%20-%20A%20Review.pdf>

Additional references:

- Treatment of Medical Waste, Malsparo
- Medical Waste Disposal - The Definitive Guide November 2019, Biomedical Waste Solutions