Unit-2: Biomedical Waste Management

Definition

Biomedical waste is any type of waste either solid or liquid comprising of harmful materials produced by healthcare facilities e.g. hospitals, practices, health camps etc. This waste comprises of human tissues, contaminated blood, body fluids, discarded medicines, drugs, contaminated cotton, dressings, and sharps such as needles, glass, blades, scalpels, lancets.

Introduction

Biomedical waste collection and disposal has highest risk to healthcare, sanitation workers and the general community. The biomedical waste minus appropriate disinfection leads to acquired immune deficiency syndrome (AIDS), Hepatitis B & C, severe acute respiratory syndrome (SARS), tetanus, psychosocial trauma etc. Biomedical waste management is significant to defend the environment and health of the population.

Necessity of Biomedical Waste Management:

Inadequate management of waste produced in health care facilities causes a direct health hazards on the general public, the health care workers and on the environment. There is an obligation for the supervision of biomedical waste to abate the risk of contamination outside the hospital for waste handlers, scavengers and those living in the locality of hospitals. Management is also required due to the risk of air, water, and soil pollution, or due to unsuitable incineration emissions and ash. It plays a vital role in removal of the discarded drugs that can be repacked and traded off.

Classification of Biomedical Waste

The World Health Organization (WHO) has categorized biomedical waste into eight categories. They are:

1. **Infectious Waste –** Any biomedical waste that is infectious or contaminated.
2. **Sharps –** Sharps objects like needles, scalpels, broken glass, and razors.
3. **Pathological Waste –** Body parts of humans or animals, including tissues, fluids, or blood.
4. **Pharmaceutical Waste –** Unused drugs, medicine, or creams that are expiring.
5. **Genotoxic Waste –** Toxic drugs and hazardous toxic waste

6. **Radioactive Waste –** Any waste containing potentially radioactive materials
7. **Chemical Waste –** Liquid waste from machines, batteries, and disinfectants is chemical.
8. **General/Other Waste –** All other non-hazardous waste.

Objective of Biomedical Management

The following are the goals of its management-

- To protect against the risk of spreading diseases.
- To protect the health and well-being of health personnel and the community.
- To protect against injury and potentially fatal infection.
- To provide environment-friendly waste management solutions.
- To promote the quality and sustainability of the environment.

Biomedical Waste Management:

Biomedical waste management is of prodigious impact because biomedical waste can harmfully affect health leading to serious implications to the people who get in touch with it. Segregation, storage and safe disposal of the waste is very crucial to the effective management of biomedical waste in a workplace.

Segregation

Further, the Central Pollution Control Board (CPBC) has designated separate colour-coded bins to dispose of biomedical wastes as per their nature.

1. **Yellow Bin:** For anatomical waste, chemical waste, soiled waste, chemotherapy waste, discarded linen and medicines, and laboratory waste.
2. **Red Bin:** For contaminated plastic wastes
3. **Blue Bin:** For glass waste and metallic implants
4. **Black Bin:** For hazardous and other waste

The wastes in each of the bins have different treatment and disposal methods.

Packaging

- Bio-medical waste bags and sharps containers should be filled to no more than three quarters full. Once this level is reached, they should be sealed ready for collection.

- Plastic bags should never be stapled but may be tied or sealed with a plastic tag or tie.

- Replacement bags or containers should be available at each waste-collection location so that full ones can immediately be replaced.

- Colour coded waste bags and containers should be printed with the bio-hazard symbol, labelled with details such as date, type of waste, waste quantity, senders name and receivers details as well as bar coded label to allow them to be tracked till final disposal.

• Ensure that Bar coded stickers are pasted on each bag as per the guidelines of CPCB by 27 March, 2019 2.3.3

Collection

1. Collection of biomedical waste should be done as per biomedical waste (management and handling) rules 1998.

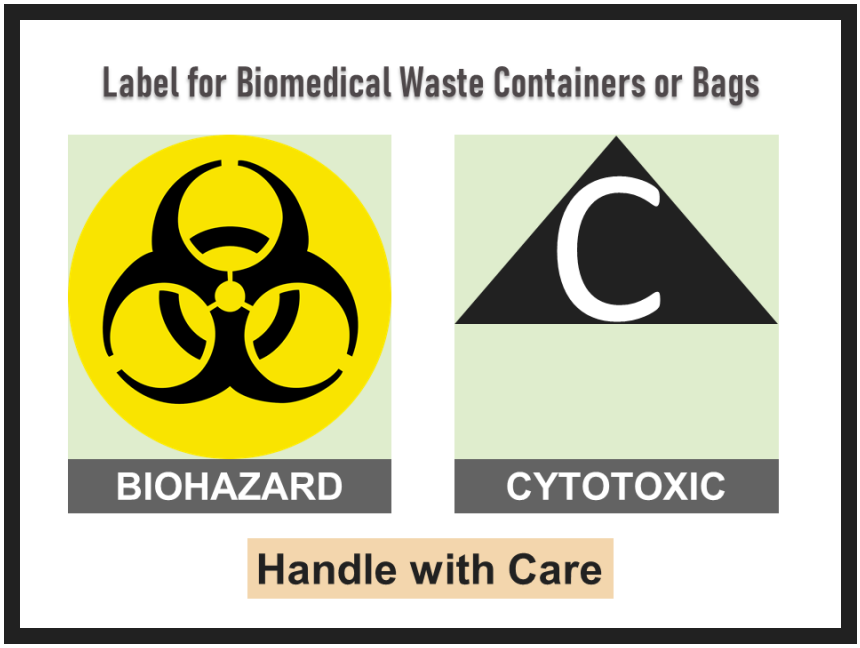
2. All the items sent to incineration should be placed in yellow colored bags.

3. All the biomedical waste to be sent for microwave/autoclave/chemical treatment should be placed in red colored bags.

Any waste, which is sent to shredder after autoclaving/microwaving/chemical tertment, is to be packed in blue/white translucent bag.

Labeling

All the bags/ containers/ bins used for collection and storage of bio-medical waste, must be labelled with the Symbol of Bio Hazard or Cytotoxic Hazard as the case may be as per the type of waste in accordance with the BMWM Rules, 2016. Bio-medical waste bags / containers are required to be provided with bar code labels in accordance with CPCB guidelines for "Guidelines for barcode System for Effective Management of Biomedical Waste".



Storage of Biomedical Waste:

Healthcare facilities must make available a storage area for medical waste until it is collected for treatment and clearance. Storage area should be designated carefully which is remote to the general public and must display cautionary symbols & signs. It should be deposited in a dry and secured area before being transported. The area must be sheltered from water, wind, rodents, insects and animals. Harmful biomedical waste should not be stored for more than 3 months.

Transport of clinical waste to treatment/disposal unit outside the hospital

1. If the hospital waste is to be transported outside the hospital for final treatment and disposal in a shared facility, guidelines as per the rules should be followed

2. Large hospitals having their own treatment facility in their campus may not need to transport their waste over long distances. Smaller establishment may need to transport waste over some distance, hence road transport must be provided.

3. Hazardous biomedical waste needing transport to a long distance should be kept in container and should have lables prescribed in schedule of biomedical waste management and handling rules 1998.
4. The transport is to be done through dedicated vehicle specially constructed for the purpose having fully enclosed body, lined internally with stainless steel or aluminium to provide smooth and impervious surface, which can be cleaned. The drivers compartment should be separated from the loas compartment with a bulkhead. The load compartment should be provided with roof vents for ventilation.

Treatment of Biomedical Waste:

Biomedical waste treatment refers to the procedures to eliminate the harmful effects of the waste. There are numerous treatment options which maximize safety during management and disposal of the waste. It also reduces environmental hazards. Incineration, Autoclaving, irradiation and chemical treatments are the most used methods for management and cleansing of biomedical waste.

Incineration

It is a treatment process used to transform pathological and pharmaceutical waste into ash, flue gases and heat. Functioning temperature for incineration should be in the range of 800-1400 degree Celsius. It reduces the bulk of waste by 90-95% and thus decreases harmful effects on the surroundings.

Autoclaving

It is a method of steam sterilization and is the most common substitute to incineration. Autoclaving necessitates a temperature of 121 degree Celsius and pressure of about 15 pounds per square inch (psi) for 20-30 minutes. This action is applied to inactivate the contagious agents and to sterilize the apparatus used in clinical services. It is less expensive and carries no recognized health impacts.

Chemical treatment

This treatment is frequently used to decontaminate liquid waste, so that it can be disposed-off nearby. It makes use of a number of techniques such as oxidation, reduction, precipitation and pH neutralization to transform waste into less dangerous substances. Chlorine, sodium hydroxide or calcium oxide can be used agreeing to the nature of waste.

Microwaving

During this process, waste is shredded, mixed with water, and then internally heated to kill microorganisms and other harmful elements. One of the main benefits of this process is the shredding aspect; it **lowers the volume** of biomedical waste, and it is reportedly **more energy efficient** to use this method than to incinerate. While it can't be used for all biomedical wastes, it can be utilized for a good 90% of it, just like autoclaving.

Irradiation

These methods are at present being used in waste treatment procedures which include gamma, electron-beam, ultraviolet and X-rays. Irradiation sterilizes waste in a sealed off chamber by uncovering it to a radioactive cobalt-60 which gives out gamma rays that are lethal to micro-organisms. It is very costly as associated to other methods and protections must be taken to guard workers from detrimental effects of radiations such as cancer, radiation sickness or even death.

Disposal of Biomedical Waste

Land disposal is usually employed for remediation of waste which is decontaminated by appropriate treatment approaches. This technique is generally used in developing countries which includes the throwing away of waste into a landfill. Land-filling should be conducted at places where groundwater level is low and which are far from flooding sources. Radioactive wastes are commonly dumped in the oceans far away from human inhabitations. Every state and local government has its own rules and regulations for dumping of sanitized waste