



## **BIOMEDICAL WASTE MANGEMENT IN THE DISTRICT OF BALASORE, ODISHA :A CRITICAL SURVEY**

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### **ABSTRACT**

Biomedical waste has become a serious health hazard irrespective of states & nations worldwide. Careless and indiscriminate disposal of this waste by healthcare establishments and research institutions can contribute to the spread of serious diseases such as hepatitis and AIDS (HIV) among those who handle it and also among the general public. The present study pertains to the biomedical waste management practices at various Hospitals in the district of Balasore, odisha. The study shows that infectious and non-infectious wastes are dumped together within the hospital premises, resulting in a mixing of the two, which are then disposed of with municipal waste at the dumping sites in the city. All types of wastes are collected in common bins placed outside the patients wards. For disposal of this waste the hospital depends on the generosity of the Balasore Municipal Corporation, whose employees generally collect it every 2 or 3 days. The hospitals do not have any treatment facility for infectious waste. The laboratory waste materials, which are disposed of directly into the municipal sewer without proper disinfection of pathogens. All disposable plastic items are segregated by the rag pickers from the hospital as well as municipal bins and dumps. The waste is deposited either inside the hospital grounds, or outside in the community bin for further transportation and disposal along with municipal solid waste. The open dumping of the waste makes it freely accessible to rag pickers who become exposed to serious health hazards due to injuries from sharps, needles and other types of material used when giving injections. The results of the study demonstrate the need for strict enforcement of legal provisions and a better environmental management system for the disposal of biomedical waste in the Hospitals, as well as other healthcare establishments in Balasore, Odisha.

**Keywords-** Anatomical Waste, Bio-Medical, Disinfection, Incineration, Syringe

### **INTRODUCTION**

Bio-Medical Waste is defined as “any solid, fluid or liquid waste, including its container and any intermediate product, which is generated during its diagnosis, treatment or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biological and the animal waste from slaughter houses or any other like

establishments.” Whereas Medical Waste is a term used to describe “any waste that is generated in the diagnosis, Treatment or immunization of human beings or animals, in research pertaining thereto, or in the production or testing of biological. <sup>[1]</sup>” The modern hospitals and health care institutions including research centers use a wide variety of

drugs including antibiotics, cytotoxics, corrosive chemicals, radioactive substances, which ultimately become part of hospital waste. The advent of disposables in the hospitals has brought in its wake, attendant, ills i.e. inappropriate recycling, unauthorized and illegal re-use and increase in the quantum of waste [3]. The separate Outpatient department (OPDs) for Medicine, Surgery, Orthopedics, Eye, Radiotherapy, Physiotherapy and Electro Medical Diagnosis Dept. (including facilities for ECG, EEG, TMT, Endoscopic procedures etc.) are also available. Almost more than 1000 patients (average) attend these OPD every day [2]. The Emergency Department of the hospital runs round the clock with almost more than 400 patients attending the Casualty of the hospital every day. The facilities of emergency lab. X-Ray, ultrasound, ECG, CT scan and Blood Bank are available 24 hours in the emergency. An emergency indoor ward, post operative recovery ward, emergency OT complex and disaster ward is also attached to the casualty. The OPD Labs. (Pathology/Microbiology/Biochemistry) are also separately located near the OPD blocks for the benefit of OPD patients. The separate Blood Bank and the Immunization Section (Antirabic) is also available [5]. The hospital has its own CSSD, Laundry, Kitchen, Mortuary and hospital stores.

**CATEGORISATION OF BIO-MEDICAL WASTES**

**Human Anatomical:** Human tissues, organs, body Wastes parts

**Animal Wastes :** Animal tissues, organs, body parts carcasses, bleeding parts, fluid, blood and experimental animals used in research, waste

generated by veterinary hospitals, discharge from hospitals, animals houses [7].

**Microbiology & Biotechnology waste :** Waste from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell culture used in research and infectious agents from research and industrial laboratories, waste from production of biological, toxins, dishes and devices used for transfer of cultures.

**Waste Sharps:** Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps.

**Discarded Medicines:** Waste comprising of outdated contaminated and discarded medicines.

**Solid Waste:** Items contaminated with blood, and body fluids including cotton, dressings, solid linen, plaster casts, linen, beddings, other material contaminated with blood.

**Solid Waste:** Wastes generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets etc.

**Liquid Waste:** Waste generated from laboratory and washing, cleaning, housekeeping and disinfecting activities.

**Incineration Ash:** Ash from incineration of any bio-medical waste.

**Chemical Waste:** Chemicals used in production of biological, chemicals used in disinfection, as insecticides, etc.

**PRACTICAL OPERATIONAL MANAGEMENT**

The practical operational aspects regarding proper management of Bio-Medical Wastes has been described under each step starting with the generation and ending with final disposal of wastes [9].

Type of Wastes	Site of Generation	Final Disposal By
Non-Hazardous (General)	Office, Kitchen, Cafeteria, Billing, Administration, Cashier, Rest rooms Hostels, Residential areas, Pantries in wards, Stores, etc.	Municipal/Civic Authorities
Hazardous (Infectious and toxic)	Wards, Treatment, room, nursing station, Isolation rooms, Operation theatres, Intensive Care Units and post operative recovery room, Minor OTs, Blood Bank Pharmacy and Medical Stores, All laboratories, Pharmacology OPDs' Injection rooms and procedure rooms, Dialysis and Endoscopy rooms, CT Scan, MRI rooms and various follow up clinics	GMC-as per Bio- Medical Waste Rules

**TREATMENT AND DISPOSAL OF HOSPITAL WASTE**

**1. Civic Authorities:** Most of the waste (about 80%-90%) generated in the hospital is general waste

which is similar to the waste generated in house and offices [11]. This waste is non toxic and non infectious, and comprises of paper, leftover food articles, peels of fruits, disposable and paper

containers for tea/coffee etc., card boards boxes, outer cover or wrapping of disposable items like syringes, needles sets etc. These general wastes should be put into black colored polythene bags and are deposited at the municipal dump opposite to the mortuary. It is subsequently collected by the local municipal authorities for disposal every day. The Sanitation Officer is responsible for proper co-ordination between municipal authorities and GMC. However, it is the responsibility of the hospital security (Police/contractor) to ensure that rag pickers are not allowed entry into the dumps<sup>[13]</sup>.

**2. Incineration:** The waste collected in yellow colored bags is transported to the site of incineration, adjacent to the generator room. The incinerator is maintained on contract basis by the Engineering services department and is manned by a supervisor and workers. After the waste (in yellow colored bags) is deposited in the custody of the supervisor, the sanitation staff should obtain a proper receipt, and the entire process should be documented<sup>[19]</sup>. It is the responsibility of the supervisor to ensure that rag pickers and other unwanted elements do not rummage through the waste for re-using of disposables and plastics. The functioning of the incinerator and the number of cycles operated per day should be documented in a log book. Regular monitoring of the process should be carried out by the engineers as per Odisha Pollution Control Board norms and feedback provided to officer in charge<sup>[16]</sup>. The ash produced by incineration should be sent for secure land filling.

**3. Autoclaving and Shredding:** Once the autoclave facility is installed in the hospital, the waste collected in blue bags will be transported to the site of autoclaving and shredding for treatment. The process of deposition of the waste for autoclaving and shredding will also be documented and a register will be maintained for the same<sup>[21]</sup>. The supervisor will ensure that rag pickers and other unwanted persons do not gain access to the waste stored there, prior to autoclaving and shredding. The functioning of the autoclave and shredder including the number of cycles per day will be maintained in a log table and periodically monitored by engineers as per guidelines & norms.

**4. Radioactive Waste:** Radioactive wastes are generated during the process of body organ imaging,

tumor localization, therapeutic processes in Radiotherapy Department. These applications of radioactive materials generate some solid radioactive waste i.e. vials, syringes, absorbent paper, protective clothing etc. Concentration and storage under strict supervision in a large drum/container till it has decayed is principally used<sup>[16]</sup>. The radioactive material in liquid form (including patients urine) are generally diluted and dispersed in the sewers. Gaseous radioactive waste can be diluted through dispersal in the outside atmosphere. Under normal circumstances, urine and faeces can be handled as non-radioactive waste so long as the room is routinely monitored for radioactive contamination<sup>[13]</sup>.

**5. Liquid and Chemical Wastes :** These wastes should be disinfected by chemical treatment using at least 1% sodium hypochlorite solution; and then discharged into drains/sewers where it is taken care of by the principle of dilution and dispersal. The responsibility for proper disposal of liquid wastes lies with the sanitation supervisor in case of weekly “gang” cleaning of indoor patient care areas; and with the nursing staff in case of routine cleaning. Responsibility of chemical waste should be with the persons/staff using the chemicals and generating the waste<sup>[21]</sup>.

### ***SPECIAL PRECAUTIONS FOR BIO MEDICAL WASTES IN HOSPITALS***

#### **(A)Points of remembrance for Waste Management in the Hospital**

- 1. Do segregate waste at point of generation to**
  - (a) Infection
  - (b) Non-Infectious/Garbage
  - (c) Sharps/Needles.
- 2. Do collect waste in color coded containers/bags**
  - (a) Yellow – Infectious waste for incineration.
  - (b) Black – Garbage for dumping in municipal bin.
  - (c) Blue (inner perforated) – Sharps/needles.
- 3. Do decontaminate all sharps and plastic waste by chemical/autoclave.**
- 4. Do shred plastic waste (cut all tubings into pieces by scissors).**
- 5. Do use syringe and needle destroyer.**
- 6. Do incinerate blood soaked dressings/body parts etc.**
- 7. Do cover waste collection containers.**

8. Do transport through covered trolleys/wheel barrows.
9. Do provide protective wear mask, gloves, plastic apron, gum boot to transporters & handlers.
10. Do immunize all waste handlers.

### ***(B) Don'ts for handling and Disposal of Hospital Waste***

1. Don't mix the infectious with non-infectious waste.
2. Don't throw sharps in the trash or into non-puncture proof containers.
3. Don't recap the needle or bend or break needles by hand.
4. Don't fill the waste container more than 3/4th of capacity.
5. Don't allow unauthorized persons access to waste collection/storage areas.
6. Don't use open buckets for infectious waste or sharps.
7. Don't incinerate plastic waste.

### ***(C) Do's and Don'ts for Chemical Treatment***

1. Do apply to sharp or infected plastic waste.
2. Do use 1% hypochlorite or equivalent disinfectant. Proper concentration is essential.
3. Do ensure all surfaces come in contact with chemical (including lumen).
4. Do let the contact time be at least 30 minutes.
5. Do change chemical solutions frequently (with every shift).
6. Do handle with gloves and mask. Wear apron and boots if splash

## **CONCLUSION**

The segregation of waste at source is the key step and reduction, reuse and recycling should be considered in proper perspectives. Construction of a Medical Waste Materials Recovery Facility (MED-MRF) will reduce the quantities of medical waste requiring landfill or incineration. Incineration used to be the method of choice for most hazardous health

care wastes and is still widely used. However, little is documented about the physical health of community members who live close to incinerators. The use of proper APCDs during incineration would significantly reduce the carcinogenic potencies associated with PAH emissions from HWI/MWI to the residential area. Municipal Corporations, State Governments, and the Central Government need to plan and construct centralized facilities to recycle, treat, and dispose of biomedical waste. Large-scale enterprises should be encouraged to recycle, to treat, and to dispose of wastes by means of constructing facilities, and to have extra capacities available to the for a reasonable fee. The fundamental information for selecting and designing the most efficient treatment method of hospital waste is obtained by means of waste composition analysis. The final choice of treatment system should be made carefully, on the basis of various factors, many of which depend on local conditions including the amount and composition of waste generated, available space, regulatory approval, public acceptance, and cost. With their handling, storage and ultimate disposal. The safety and acceptability of many widely used health care waste management practices are of serious concern from public health point of view. Disposal methods, including terrestrial dumping, uncontrolled burning & dumping of hospital waste specially in landfills, remain a prominent means of disposal and many landfills remain primitive in their operation. Alternative treatment technologies for healthcare waste management include incineration with heat recovery and waste gas cleaning and accelerated compositing, but both of these technologies are subject to criticism. To find out outcomes of practiced methodology, we made a case study of a rural medical hospital, starting from point sources segregation of waste to final disposal. This paper discusses the outcome of our case study findings. An innovative technology using plasma pyrolysis for treating hospital waste is suggested with its proposed benefits and appropriateness.

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