

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

BIO MEDICAL WASTE MANAGEMENT

ANANDINI KUMARI

Lecturer, Mechanical Department, Government Polytechnic, Ranchi

ABSTRACT

The objective of this study is (i) to summarize the rules for management and handling of biomedical wastes, (ii) to give the definition, categories of biomedical wastes, suggested storage containers including colour-coding and treatment options, (iii) mainly to highlight the effects of biomedical waste in the environment such as air, land, radioactive pollution and (iv) disposal of wastes, regulation and recommendations. Health-care waste management in several countries including India is receiving greater attention due to stringent regulations. The waste generation rate ranges between 0.5 and 2.0 kg bed-1day-1. The solid waste from the hospitals consists of bandages, linen and other infectious waste (30-35%), plastics (7- 10%), disposable syringes (0.3-0.5%), glass (3-5%) and other general wastes including food (40-45%). Several survey works carried out by various research organizations by (Government and Non government and private sectors) have been discussed and reviewed in this paper.

Keywords- Data management, emissions, biomedical wastes, hazardous waste, health-care establishment, regulations, waste-management plan, waste disposal.

I. INTRODUCTION

'Bio-medical waste' means any waste generated during diagnosis, treatment or immunization of human beings or animals. Management of healthcare waste is an integral part of infection control and hygiene programs in healthcare settings. These settings are a major contributor to community-acquired infection, as they produce large amounts of biomedical waste. Biomedical waste can be categorized based on the risk of causing injury and/or infection during handling and disposal. Wastes targeted for precautions during handling and disposal include sharps (needles or scalpel blades), pathological wastes (anatomical body parts, microbiology cultures and blood samples) and infectious wastes (items contaminated with body fluids and discharges such as dressing, catheters and I.V. lines). Other wastes generated in healthcare settings include radioactive wastes, mercury containing instruments and polyvinyl chloride (PVC) plastics. These are among the most environmentally sensitive by-products of healthcare (Askarain et al., 2004; Remy, 2001). WHO stated that 85% of hospital wastes are actually non-hazardous, around 10% are infectious and around 5% are non-infectious but hazardous wastes. In the USA, about 15% of hospital waste is regulated as infectious waste. In India this could range from 15% to 35% depending on the total amount of waste generated.



Figure Typical Bio Medical Waste

II. WHAT IS BIO-MEDICAL WASTE?

Bio medical waste consists of solid, liquid, sharps and laboratory waste that are potentially infectious or dangerous. It differs from other types of hazardous waste such as industrial waste. Common producers of bio medical waste are hospitals, health clinics, nursing homes, and medical research laboratories, offices of physicians, dentists and veterinarians. As per Bio- Medical Waste (Management and Handling) Rules, 1998, and as amended "Bio-medical waste" means 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 and including categories mentioned in Schedule I. The schedule I includes human anatomical waste, animal waste, microbiology & biotechnology waste, waste sharps, discarded medicines and cytotoxic drugs, soiled waste, solid waste, liquid waste, incineration ash and chemical waste.



Figure 2 Types of wastes

- (1) "Act" means the Environment (Protection) Act, 1986 (29 of 1986);
- (2) "Animal House" means a place where animals are reared/kept for experiments or testing purposes;
- (3) "Authorisation" means permission granted by the prescribed authority for the generation, collection, reception, storage, BIO-MEDICAL WASTE (MANAGEMENT AND HANDLING) RULES, 1998 transportation, treatment, disposal and/or any other form of

Transportation, treatment, disposal and/or any other form of handling of bio-medical waste in accordance with these rules and any guidelines issued by the Central Government.

- (4) "Authorised person" means an occupier or operator authorised by the prescribed authority to generate, collect, receive, store, transport, treat, dispose and/or handle bio-medical waste in accordance with these rules and any guidelines issued by the Central Government;
- (5) "Bio-medical waste" means any waste, which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining thereto or in the production or testing of biological, and including categories mentioned in Schedule I;
- (6) "Biological" means any preparation made from organisms or micro-organisms or product of metabolism and biochemical reactions intended for use in the diagnosis, immunisation or the treatment of human beings or animals or in research activities pertaining thereto;
- (7) "Bio-medical waste treatment facility" means any facility wherein treatment, disposal of bio-medical waste or processes incidental to such treatment or disposal is carried out;
- (8) "Occupier" in relation to any institution generating bio-medical waste, which includes a hospital, nursing home, clinic dispensary, veterinary institution, animal house, pathological laboratory, blood bank by whatever name called, means a person who has control over that institution and/or its premises;
- (9) "Operator of a bio-medical waste facility"

Risk from Bio-Medical Waste If Not Managed Properly

All individuals exposed to bio-medical waste are potentially at risk of being injured or infected. They include -

- Medical staff: doctors, nurses, sanitary staff and hospital maintenance personnel;
- In and out patients receiving treatment in healthcare facilities.
- Visitors of hospitals.

- Workers in support services linked to healthcare facilities such as laundries, waste handling and transportation services.
- Workers in waste disposal facilities, including scavengers.
- The general public and more specifically the children playing with the items they can find in the waste outside the healthcare facilities when it is directly accessible to them.

If bio-medical waste is not managed properly, it also causes environmental, occupational and public health hazard.

Environmental Hazard

In appropriate treatment and disposal of bio-medical waste contributes to environmental pollution, uncontrolled incineration causes air pollution, dumping in nallas, tanks and along the river bed causes water pollution and unscientific land filling causes soil pollution.

III. OCCUPATIONAL HAZARD

A risk to all those who generate, collect, segregate, handle, package, store, transport, treat and dispose bio-medical waste. Occupational exposure to blood can result from percutaneous injury (needle stick or other sharps injury), mucocutaneous injury (splash of blood or other body fluids into the eyes, nose or mouth) or blood contact with non-intact skin. The most common form of occupational exposure to blood and the most likely to result in infection is needle stick injury. The most common cause of needle stick injury is two handed recapping and the unsafe collection and disposal of sharps waste. Over 20 blood born diseases can be transmitted but particular concern is the threat of spread of infectious / communicable diseases like AIDS, Hepatitis B & C, Cholera, Tuberculosis, Diphtheria etc. Waste chemicals, radioactivity and heavy metals etc. are hazardous to health.

IV. PUBLIC HEALTH HAZARD

Poor management of bio-medical waste can cause serious disease to health-care personnel, to waste workers, patients and to the general public. The greatest risk posed by infectious waste is accidental needle stick injuries, which can cause hepatitis B and hepatitis C and HIV infection. There are however numerous other diseases which could be transmitted by contact with infectious bio-medical wastes. During the handling of wastes, injuries occur when syringe, needles or other sharps have not been collected in puncture proof containers. Inappropriate design and / or overflow of existing sharps container and more over person who owns or controls or operates a facility for the collection, reception, storage, transport, treatment, disposal or any other form of handling of bio-medical waste;



Figure 3

V. THE RISK OF INFECTION DUE TO OCCUPATIONAL EXPOSURE IS AS FOLLOWS.

HBV

Health-care workers who have received hepatitis B vaccine and have developed immunity to the virus are at virtually no risk for infection. For an unvaccinated person, the risk from a single needle stick or a cut exposure to HBV- infected blood ranges from 6- 30% and depends on the hepatitis B e antigen (HBeAg) status of the source individual. Individuals who are both hepatitis B surface antigen (HBsAg) positive and (HBeAg) positive have more virus in their blood and are more likely to transmit HBV.

HCV

Based on limited studies, the risk for infection after a needle stick or cut exposure to HCV infected blood is approximately 1.8%. The risk following a blood splash is unknown, but is believed to be very small, however, HCV infection from such an exposure has been reported.

HIV

The average risk of HIV infection after a needle stick or cut exposure to HIV-infected blood is 0.3% (i.e., three-tenths of one percent, or about 1 in 300). Stated another way, 99.7% of needle 15 EPTRI Bio-Medical Waste Management H A Z A O R I D B 16 stick /cut exposures do not lead to infection. The risk after exposure of the eye, nose, or mouth to HIV-infected blood is estimated to be, on average, 0.1% (1 in 1,000). The risk after exposure of the skin to HIV- infected blood is estimated to be less than 0.1%. A small amount of blood on intact skin probably poses no risk at all. There have been no documented cases of HIV transmission due to an exposure involving a small amount of blood on intact skin (a few drops of blood on skin for a short period of time). The risk may be higher if the skin is damaged (for example, by a recent cut) or if the contact involves a large area of skin or is prolonged(for example, being covered in blood for hours).

Bio-Medical Waste Management in Hospitals Where Common Bio-Medical Waste Facility is Not Available
As a guideline, the cradle to grave management of bio-medical waste is planned in the following four steps:

STEP I-IDENTIFICATION OF AREAS OF BIO-MEDICAL WASTE GENERATION:

The first step is to identify the areas of waste generation in the hospitals. In almost all the units i.e. outpatient, wards, operation theatre, labour room, pathology labs, intensive care units etc., waste is generated.

STEP II – CATEGORIZATION IN AND QUANTIFICATION OF BIO-MEDICAL WASTE:

The second step is to categorize the waste according to Bio-Medical Waste (management and Handling) Rules. The quantification will help in placing the bins, bags, containers of appropriate quantity and at appropriate places as close to the source of waste generation as possible.

STEP III-SEGREGATION, HANDLING AND STORAGE:

Segregation:

Segregation is a very important factor in bio-medical waste management system. Depending on the categories of bio-medical waste, specific color coded containers are used for proper segregation and storage of wastes for further appropriate treatment and disposal. For instance, the waste which goes for incinerator or deep burial should be collected in yellow plastic bag, bin, container. The waste which goes for autoclaving/microwaving/chemical treatment should be collected in red bin, bag, container. The waste which goes for autoclaving or microwaving or chemical treatment and destruction shredding should be collected in blue bin, bag, container. The waste sharps such as needles, blades etc. which goes for autoclaving / microwaving / chemical treatment and destruction/shredding should be collected in white puncture proof, translucent container, the waste which goes for disposal in secured land fill should be collected in black bin, bag, container.



Figure 4

Handling

As soon as the bio-medical waste is generated, it should be segregated into color coded containers, bins, bags as mentioned above. When these are three quarterfull, the handling of bags should be such that it should be picked up from the neck and placed in the trolley so that bags can be picked up by the neck again for further handling. Manual handling of waste bags should be minimized to reduce the risk of needle prick injury and infection. While handling, care should be taken that no other forms of waste should be mixed with biomedical waste. An easy access to waste collection vehicle should be provided. The waste should be transported through pre defined route within the hospital by means of wheeled trolleys, containers or carts that are not used for any other purpose, to the centre to the central temporary storage area. The trolleys should be cleaned daily.

Temporary Central Storage:

Recommendations for the storage area and its equipment are as follows:

- The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy to clean and disinfect.
- There should be water supply for cleaning purposes.
- The storage area should afford easy access for staff in charge of handling the waste.
- It should be possible to lock the store to prevent access by unauthorized persons.
- Easy access for waste collection vehicles is essential.
- There should be protection from the sun.
- The storage area should be inaccessible for animals, insects, and birds.
- There should be good lighting and at least passive ventilation.
- The storage area should not be situated in the proximity of fresh food stores or food preparation areas.
- A supply of cleaning equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage area.

VI. CONCLUSIONS

Proper management of Bio medical waste is a concern that has been recognized by both government agencies and the Non government organizations. Several hazards and toxic materials containing should be disposed off with proper take and care. Inadequate and inefficient segregation and transportation system may cause severe problem to the society hence implementing of protective measures, written policies all of these factors contribute to increased risk of exposure of staff, patients and the community to biomedical hazards. Lack of concern in persons working in that area, less motivation, awareness and cost factor are some of the problems faced in the proper hospital waste management. Proper surveys of waste management procedures in various practices are needed. Clearly there is a need for education as to the hazards associated with improper waste disposal. An effective communication strategy is imperative keeping in view the low awareness level among different category of staff in the health care establishments regarding biomedical waste management. One important direction for future research would be to project the flows of bio medical waste worldwide.

REFERENCES

1. Acharya DB, Meeta S, (2000) *Hospital Waste Management*. Minerva Press, New Delhi 2000, pp 15,47.
2. HAZWAMS/30/2005-06. Askarian M, Vakili M, Kabir G, (2004) *Hospital waste management status in university hospitals of the Fars province, Iran*. *Int. J. Environ. Health Res.* 14, 295–305.
3. Anonymous (1998). *Biomedical waste (management and handling) rules, The Gazette of India, Extraordinary, Part II, Section 3(ii), dated 27th July, pp. 10-20, 460. Ministry of Environment and Forests, Notification N. S.O.630 (E)*.
4. Askarian M. Vakili M, Kabir G (2004b) *Results of a hospital waste survey in private hospitals in Fars province, Iran*. *Waste Manage.* 24, 347-352
5. Anonymous, (2000) *Guide lines for common hazardous waste incineration Central Pollution Control Board Ministry of Environment & Forests Hazardous Waste Management Series*
6. Almuneef M, Memish Z, (2003) *Effective medical waste management: it can be done*. *American Journal of Infection Control*, 31, 188–192.
7. Anonymous, (1997) *World Health Organization, Regional Office of South East Asia. Safe Management of Wastes from Health Care Activities..*
8. Baccini P, Brunner P, (1991) *The Metabolism of the Anthroposphere*, Springer Verlag, Berlin, 1991
9. Baveja, G., Muralidhar, S. & Aggarwal, P.(2000) *Hospital waste management– an overview*. *Hosp.*