Journal of Advances in Science and Technology
Vol. 20, Issue No. 2, September-2023, ISSN 2230-9659

DOI: https://doi.org/10.29070/48mqzj25

Safetly Aspects of Boimedical Waste Management Towards Minimising Environment Toxicity

A Gopal [1] * , Dr. Devendra Kumar Namdeo [2]

1. Research Scholar, Shri Krishna University, Chhatarpur, M.P., India
gopalaksanipally@gmail.com ,
2. Assistant Professor, Shri Krishna University, Chhatarpur, M.P., India

Abstract: The waste generated in various hospitals and healthcare facilities, including the waste of industries, can be grouped under biomedical waste (BMW). The constituents of this type of waste are various infectious and hazardous materials. This waste is then identified, segregated, and treated scientifically. There is an inevitable need for healthcare professionals to have adequate knowledge and a proper attitude towards BMW and its management. BMW generated can either be solid or liquid waste comprising infectious or potentially infectious materials, such as medical, research, or laboratory waste.

Keywords: Boimedical waste management, Environment toxicity

X

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 (Glenn & Garwal, 1999; Anonymous, 1998; Chitnis et al., 2005) The management of bio-medical waste is still in its infancy all over the world. There is a lot of confusion with the problems among the generators, operators, decision-makers and the general community about the safe management of bio-medical waste. The reason may be a lack of awareness. Hence resource material on the environment for hospital administrators, surgeons, doctors, nurses, paramedical staff and waste retrievers, is the need of the hour (Almuneef & Memish, 2003; Acharya & Meeta, 2000).

DEFINITION OF BIOMEDICAL WASTE

Biomedical operations, including the diagnosis, prevention, or treatment of certain illnesses, create biomedical waste, which is defined as trash that includes infectious or potentially contagious elements. The most common places to find biological waste are healthcare facilities, funeral homes, dental offices, veterinary offices, pathology labs, medical research labs, medical clinics, health clinics, nursing homes, home health care, and hospitals. As per the Indian National Regulations for the Management and Handling of Biomedical Waste, 1998 Medical waste includes anything that comes out of diagnosing, treating, or immunizing humans or animals, as well as everything that comes out of research into these topics or the making or testing of biologicals. As per the guidelines provided by the Indian government's center for excellence in the field of environment and forest, Any solid or liquid waste, including with its container and any intermediate products, that is created when diagnosing, treating, or immunizing humans or animals is referred to as bio-medical waste. The World Health Organization reports that biological waste might include anywhere from 75 to 90% trash, just like regular municipal or household trash. Included in this category may include more easily managed ordinary garbage such as paper, plastic packaging, food scraps, etc., which poses less of a threat to the environment. The other 10–25% is biological waste, which may be infectious or otherwise dangerous if not handled properly; it poses risks to both humans and the environment if not addressed. This category of biomedical waste includes needles and other sharps, infectious agents, poisonous chemicals, genotoxic waste, radioactive waste, and other potentially dangerous substances. The contamination of both types of biological waste poses a serious risk to environmental health unless they are treated independently and appropriately. The World Health Organization classifies biomedical waste into 10 broad types:

1. Infectious waste.
2. Pathological waste and anatomical waste.
3. Hazardous pharmaceutical waste.
4. Hazardous chemical waste.
5. Waste containing heavy metals.
6. Waste due to pressurized containers.
7. Sharps.
8. Genotoxic waste / Cytotoxic waste.
9. Radioactive waste.
10. Highly infectious waste.

BIOMEDICAL WASTE: AN OVERVIEW

Biomedical Waste (BMW) includes all types of potentially hazardous materials, including solids, liquids, sharps, and laboratory waste, and is collected from healthcare facilities' clinical wards. The word "BMW"

encourages additional caution in waste management and disposal to safeguard the environment for the public and prevent harm to it. There is a vast array of potential health hazards that people face throughout their lives. On a daily basis, healthcare institutions all around the globe produce a substantial quantity of trash that might be infectious and toxic (Cole, 1995).

Globally, there has been a substantial development in the health industry. Despite medical waste being classified as hazardous waste due to the serious and direct threat it poses to human health, the fraction of waste generated by healthcare institutions has not received the same amount of attention as other types of waste, especially in developing nations (Coad, 1992; WHO, 1999; Oweis, Mohamad and Ohood, 2005).

In accordance with the Environmental (Protection) Act, 1986, the Ministry of Environment & Forests (MoEF) published the Biomedical Waste (Management & Handling) Rules, 1998. The Central Government published the Bio-Medical Waste Management Rules, 2016 via G.S.R. 343(E) dated 28th March, 2016. This was done in exercise of the powers conferred by Section 6, 8, and 25 of the Environment (Protection) Act, 1986 (29 of 1986). The rules supersede the Bio-Medical Waste (Management and Handling) Rules, 1998 and any subsequent amendments to them. Veterinary clinics, animal houses, pathology labs, blood banks, hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, school first aid rooms, forensic laboratories, and research labs are all encompassed by these regulations, as are all individuals who produce, gather, receive, store, transport, treat, dispose, or handle biomedical waste in any way.

As per the Indian National Regulations for the Management and Handling of Biomedical Waste, 1998 This includes all types of waste, including solid, fluid, and liquid materials, as well as their containers and any byproducts, that are created while diagnosing, treating, or immunizing humans or animals, conducting related research, or producing or testing biological materials. It also includes animal waste from slaughterhouses or any comparable facility (Notice posted in the Gazette by the Ministry of Environment and Forests) Any waste that is created during the diagnosis, treatment, immunization, research related to these processes, or the production or testing of biological materials, including those categories listed in Schedule I of these rules, is considered biomedical waste, according to the draft rules for biomedical waste management in 2011. [Released in India's Official Gazette] "Bio medical waste" is defined as any type of waste that is created as a result of diagnosing, treating, or immunizing humans or animals, as well as any research related to these processes, the production or testing of biological materials, or health camps, as per the Bio-medical Waste Management Rules, 2016.

MAJOR AND MINOR SOURCES OF BIOMEDICAL WASTE

The quantity and variety of garbage generated by hospitals have been on the rise in recent decades. Not only does hospital trash endanger patients and healthcare workers, it also endangers the public and the environment. Up until recently, hospitals just "disposed off" their trash instead of managing it. When disposed of in unregulated or illegal landfills, including empty lots in nearby neighborhoods or slums, hospital trash poses a far higher risk than municipal solid waste alone. In addition to the obvious dangers to public health (AIDS, Hepatitis, plague, cholera, etc.), this may increase pollution levels in the environment. (Deci et al., 2013) the biological waste sources, both large and little.

HEALTH HAZARDS ASSOCIATED WITH POOR MANAGEMENT OF BIO-MEDICAL WASTE

Worldwide, sharps-related accidents in 2000 were estimated by the World Health Organization (WHO) to account for 66,000 new cases of hepatitis B, 16,000 new cases of hepatitis C, and 200 to 5,000 new cases of HIV among healthcare workers. This matter has just lately attracted global interest. Some injuries, such as hepatitis B and C and malignancies, may not manifest immediately but instead accumulate or remain latent in the body for a long time.

CLASSIFICATION OF BIOMEDICAL WASTE

The term "health-care waste" encompasses any and all trash that is a byproduct of medical treatment. In both human and veterinary medicine, it encompasses diagnostics and the provision of preventative, curative, and palliative care. In 2008, 170 parties to the Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal provided technical guidelines for the environmentally sound management of biomedical and health-care waste. The following is a classification of health-care waste:-

HEALTH CARE WASTE

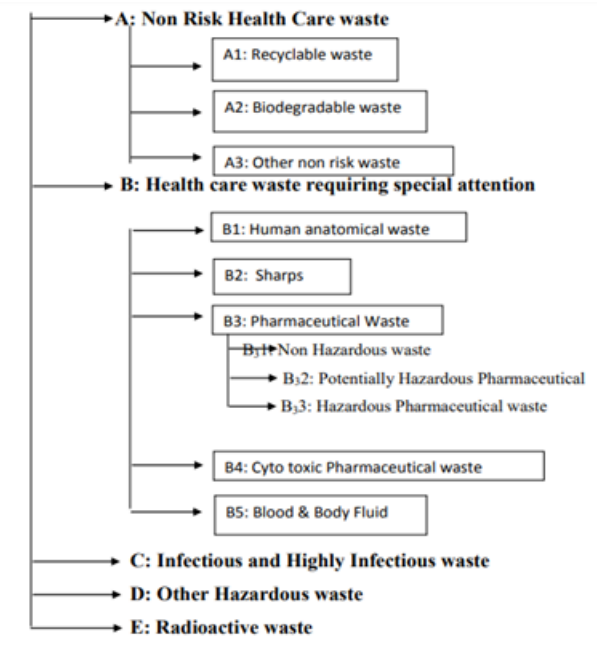

Figure 1: Classification of biomedical waste management

HAZARDS TO THE GENERAL PUBLIC

The general public's health can also be adversely affected by bio-medical waste. Improper practices such as dumping of bio-medical waste in municipal dustbins, open spaces, water bodies etc., leads to the spread of diseases. Emissions from incinerators and open burning also lead to exposure to harmful gases which can cause cancer and respiratory diseases (Manohar et al, 1998; Da silva et al, 2005). Plastic waste can choke animals, which scavenge on openly dumped waste. Injuries from sharps are common feature-

affecting animals. Harmful chemicals such as dioxins and furans can cause serious health hazards to animals and birds. Certain heavy metals can affect the reproductive health of the animals (Code & Christic, 1999).

HEALTH HAZARDS

According to the WHO, the global life expectancy is increasing year after year. However, deaths due to infectious disease are increasing. A study conducted by the WHO in 1996, reveals that more than 50,000 people die everyday from infectious diseases. One of major causes for the increase in infectious diseases is improper waste management. List of infections and diseases documented to have spread through bio-medical waste. Tuberculosis, pneumonia, diarrhoeal diseases, tetanus, whooping cough etc., are other common diseases spread due to improper waste management (Chitins et al, 2002; Chitins et al, 2003; Tudor et al, 2005; Marinkovic et al, 2005). Occupational health hazards Occupational health concerns exist for janitorial and laundry workers, nurses, emergency medical personnel, and refuse workers. Injuries from sharps and exposure to harmful chemical waste and radioactive waste also cause health hazards to employees in institutions generating bio-medical waste. Proper management of waste can solve the problem of occupational hazards to a large extent (Patil & Shekar, 2001).

LIFE CYCLE ASSESSMENT OF BIOMEDICAL WASTE & IT MANAGEMENT

The environmental implications of a product may be better understood by doing a life cycle assessment (LCA), which starts with the extraction of raw materials and continues through manufacture and disposal (Horne et al., 2009). The primary goal of life-cycle assessment (LCA) is to find the least harmful product by considering its impact on the environment at every stage of its existence (Guinee, 2002). This method calculates a product's life cycle by breaking it down into its component parts and keeping track of each step along the way: from mining for raw materials to processing those resources into finished goods, from packing and shipping to final usage. Creating an inventory of important inputs and outputs and assessing possible environmental implications are typical steps in an LCA (Hill, 2005). Figure 1.2 shows the four interconnected steps that make up LCA methodology: defining goals and scope, conducting an inventory analysis, assessing impacts, and finally, interpreting the results.

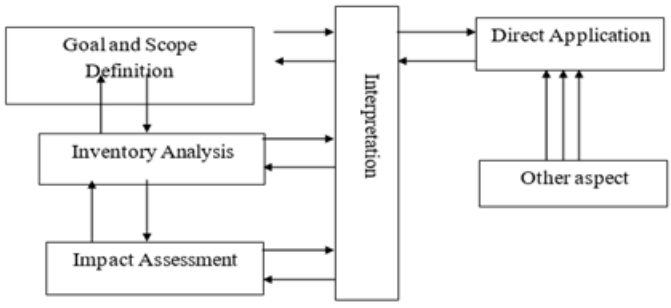

Figure 2: Life Cycle Assessment Framework phases

Judgments on waste management system selection or strategic judgments about resource allocation priorities might benefit from this context's usage of Life Cycle Assessment methodology. Using a life-cycle approach, we can see how much energy is used, what materials are used up, and how much waste is

created from the time that hospitals and clinics acquire them all the way to the disposal of the biological waste. A comprehensive strategy that takes into account not only healthcare facilities but also supplier chains and end-of-life disposal methods is necessary to optimize hospital environmental solutions.

CONCLUSION

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. In order to accelerate the rate at which proper processing and management methods are designed, timely regulatory and legislative policies and procedures are needed.

References

1. A study of awareness about biomedical waste management among health care personnel. Agarwal A, Yadav A, Yadav C, Mahore R, Singh A. Asian J Manag. 2022;13:171–175.
2. A study on evaluation of biomedical waste management in a tertiary care hospital in South India . [Sep; 2022];Ramalingam AJ, Saikumar C. Trop J Pathol Microbiol. 2018 4:518–524.
3. Biohazards symbol: development of a biological hazards warning signal. Baldwin CL, Runkle RS. Science. 1967;158:264–265.
4. Bio-medical waste disposal in India: from paper to practice, what has been effected. Kumar SR, Abinaya NV, Venkatesan A, Natrajan M. Indian J Health Sci Biomed Res . 2019;12:202–210.
5. Biomedical waste management guidelines 2016: what's done and what needs to be done. Singhal L, Tuli AK, Gautam V. Indian J Med Microbiol. 2017;35:194–198.
6. Biomedical waste management in India - a review. Kanyal D, Kanyal Butola L, Ambad R . https://www.researchgate.net/publication/350995999_Biomedical_Waste_Management_in_India-A_Review Indian J Forensic Med Toxicol. 2021;15:108–113.
7. Biomedical waste management in India: critical appraisal. Datta P, Mohi GK, Chander J. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC5784295/ J Lab Physicians. 2018;10:6–14.
8. Biomedical waste management: a study on assessment of knowledge, attitude and practices among health care professionals in a tertiary care teaching hospital. Rao D, Dhakshaini MR, Kurthukoti A, Doddawad VG. Biomed Pharmacol J. 2018;11:1737–1743.
9. COVID 19 Pandemic and biomedical waste management practices in healthcare system. Mondal R, Mishra S, Pillai JS, Sahoo MC. J Family Med Prim Care. 2022;11:439–446. doi: 10.4103/jfmpc.jfmpc_1139_21.
10. Keeping in pace with the new biomedical waste management rules: what we need to know! Bhalla GS,

Bandyopadhyay K, Sahai K. Med J Armed Forces India. 2019;75:240–245.

11. Medical laboratory waste generation rate, management practices and associated factors in Addis Ababa, Ethiopia. Endris S, Tamir Z, Sisay A. PLoS One. 2022;17:0.

12. Nanoparticles impact in biomedical waste management. Patil PM, Bohara RA. Waste Manag Res. 2020;38:1189–1203. doi: 10.1177/0734242X20936761.

13. Review on biomedical waste management. Salvi SS, Waghmare S, Thombare V, Mandlik S, Veer S, Walke P, Zambare P. https://www.ijert.org/review-on-bio-medical-waste-management Int J Eng Res Technol. 2022;11:63–69.

14. Self-reported healthcare waste segregation practice and its correlate among healthcare workers in hospitals of Southeast Ethiopia. Sahiledengle B. BMC Health Serv Res. 2019;19:591.

15. The impact of incinerators on human health and environment. Sharma R, Sharma M, Sharma R, Sharma V. Rev Environ Health. 2013;28:67–72.

16. The importance of waste incineration. Lup DT, Stroe AM, Chezan PM, Pica EM. Studia UBB Ambientum. 2018;63:43–48.

17. To study the knowledge about the handling of biomedical waste among health-care workers in a COVID-19 hospital setting. Singh S, Tom V, Verma R, Malik I, Vashist MG, Dahiya P. J Educ Health Promot. 2022;11:193. doi: 10.4103/jehp.jehp_871_21.