A Review: Biomedical Waste

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Abstract: The production of biomedical waste increases exponentially in tandem with the expansion and development of healthcare and medical facilities. The production and elimination of this trash has become an issue for nations everywhere, not just India. It is created when people and animals are being sampled, tested, diagnosed, treated, immunised, operated on, and in research studies. The difficulties and solutions related to disposing of biomedical waste properly are examined in this review paper. It explores the classification of biomedical waste and highlights the importance of careful collection, disposal, and segregation techniques. Biomedical wastes have the potential to cause physical harm and health hazards; they can also spread diseases like Hepatitis B, C, E, dengue, and HIV through improperly contained contaminated sharps; they can also multiply and mutate the pathogenic microbial population in municipal waste through the dumping of untreated biomedical waste. The problems that could result from poor management, such as the spread of infectious diseases, are also highlighted in this study. Additionally, it talks about how laws and technological advancements support efficient biomedical waste management, guaranteeing a secure and long-lasting healthcare environment.

Keywords: Biomedical Waste, Management, HIV, Environment, Treatment.

INTRODUCTION

A variety of substances that could be harmful to both human health and the environment are included in biomedical waste, which is a result of healthcare operations. It is crucial to control biomedical waste in order to stop the spread of illnesses and save ecosystems. An overview of the problems with biomedical waste and the urgent need for organised, effective management is given in this introduction. It examines the various origins and forms of biomedical waste, highlighting the need for careful management from creation to disposal. The effective handling of biomedical waste becomes more and more important as healthcare services grow. In order to guarantee a safer and healthier society, this introduction lays the groundwork for a thorough examination of the tactics, laws, and technology used in biomedical waste management.

The interaction and integration of a person's micro (internal) and macro (external or surrounding) environments determines the health status of an individual or community. An imbalance between these two could have detrimental effects on the health of the country. Thus, in order to raise living standards and encourage a healthy community, a balance needs to be maintained [1].

Due to environmental contamination brought on by pathological waste produced by expanding populations and the consequent sharp increase in the number of health care facilities, most countries in the world—especially developing ones—are in grave danger [2]. Clinical wastes are another term for medical wastes in hospitals. According to the National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (2013) [3], waste products are the usual word used to describe wastes generated in healthcare facilities (hospitals, clinics, doctor's offices, and veterinary hospitals). Waste management has not yet been seen as a problem in the medical field. In the 1980s, there were concerns expressed about the possibility of contracting the hepatitis B and HIV viruses. Thus, the proper disposal of biological wastes has emerged as a significant global issue, not only in India. Planning and implementing procedures and practices that are updated at different levels of the plan on the management of biomedical wastes and their relationship to environmental health are urgently needed [4][5].

Safe and dependable waste management is not only required by law, but it is also a social responsibility. When it comes to appropriate hospital waste management, there are several problems that might

occur, including indifference, lack of excitement, cost, and comprehension. Education concerning the risks associated with improper disposal of trash is necessary. One major barrier to garbage disposal is apathy towards the concept of waste management. An efficient communication approach is crucial since different kinds of personnel in healthcare facilities have poor levels of awareness regarding biological waste management [6]. One of India's greatest successes has been to change the mindset of those running healthcare facilities, motivating them to employ private waste management services and incorporate best practices into their daily operations [7].

In this review paper we aim to highlight the definition, source, classification, segregation, storage and disposal of biomedical waste.

Definition of Biomedical Waste:

"Any waste generated during the process of diagnosis and treatment or immunisation of human beings or animals or in research activities contributing to the biological production or testing" is the definition of BMW according to the Biomedical Waste (Management and Handling) Rules, 1998 of India [8]. One of India's accomplishments is the transformation of health operators' mindsets to effectively integrate waste management related to healthcare into their daily operations.

Sources of Biomedical Waste:

The major and secondary sources of healthcare waste generation are determined by the amounts produced and are based on the training component of the Project "Environmentally Sound Management of Medical Wastes in India" in 2018 [9] [10]. Secondary sources include waste from clinics, ambulances, funeral services, slaughterhouses, and educational institutions. Primary sources include waste produced by hospitals, medical colleges, nursing homes, dialysis centres, maternity homes, blood banks, and immunisation centres.

Classification of Biomedical Waste:

The World Health Organisation (WHO) classifies medical waste into eight categories: sharps, pharmaceuticals, infectious to possibly infectious waste, pathological, radioactive, chemical, general trash, and pressurised containers.

Non–Hazardous Wastes:

In most healthcare facilities, 85 percent of the trash generated is classified as non-hazardous. Food scraps, fruit peels, wash water, paper cartons, packing materials, and other wastes are included in this [11].

Hazardous Wastes:

Various terms for infectious wastes have been used in research papers, as well as legislation and guidelines, over the years. Infectious and non-infectious wastes; medical and biological wastes; hazardous and red bag wastes; contaminated; infectious medical wastes; and managed wastes in the medical profession are among them. Essentially, both of these terms refer to the same forms of waste, even though the terms used in regulations are generally more precise.

Steps for Effective Bio-Medical Waste (BMW) Management:

BMWs should be transported and stored in a way that poses no risks to the environment or public health. There is a significant risk that a separated BMW will be discovered during collection and transportation by members of the public, rag pickers, animals, birds, etc. Because of this, every safety measure needs to be taken to guarantee that the separated BMWs transported by healthcare units reach the treatment facility undamaged, unspilt, or exposed to unwanted access by people, animals, or other entities. To oversee the collection and transportation of BMW, a responsible individual from the operator of a typical biomedical waste treatment plant must always be in the truck. Important steps in the safe and scientific management of biomedical waste in any setting include collection, handling, sorting, mutilation, disinfection, storage, transportation, and final disposal [12][13][14][15].

Segregation and Storage:

Important first steps towards guaranteeing efficient and secure waste management in healthcare institutions are the isolation and storage of biomedical waste. At the point of generation, segregation refers to the methodical separation of various biological waste kinds. In order to avoid cross-contamination and enable appropriate treatment techniques, this procedure is essential. Biomedical waste is usually divided into many types by healthcare facilities, including pathological, chemical, infectious, and

sharps waste. There are distinct handling protocols needed for each group. Color-coded bins and proper labelling are used in segregation at the source to distinguish between different sorts of waste.

Storage needs to be done correctly as well. Biomedical waste needs to be kept in containers that are corrosion-resistant, leak-proof, and marked with biohazard symbols. Furthermore, to keep unauthorised people away from potentially dangerous goods, facilities must set up specific storage spaces with restricted access.

Healthcare facilities may reduce the risks connected with biomedical waste and help create a safer and more environmentally friendly waste management system by putting strict segregation procedures and secure storage methods into place.

Handling and Transport:

Biomedical wastes need to be handled and moved in a way that doesn't endanger the environment or public health. Unhandled biohazardous waste can only be managed or transported by technical personnel who have undergone the necessary training. Waste needs to be segregated into color-coded containers or bags as soon as it is created. Reducing the chance of infection and needle prick injuries is necessary when handling these materials. It is not appropriate to mix biomedical waste with other types of garbage. Transporting untreated medical waste from the source to another treatment location and disposing of it there is required if it is not handled on-site. The following elements need to be taken into account when moving BMWs [

1. The biomedical waste containers and the truck carrier should have their own cabins.
2. Examining the waste cabin floor's consistency in terms of leak resistance.
3. The trash cabin should be made with easy-to-clean disinfecting surfaces and tier-based waste container storage in mind.
4. Reduce the amount of stagnant water; the interior surface of the cabin should be adequately smooth.
5. Enough sides and/or rear ports should be included to enable quick loading and unloading of garbage bins.
6. The car needs to have the BMW emblem visible.

TREATMENT AND DISPOSAL METHODS

The basic idea behind biological waste disposal is that mutilation or shredding must be able to prevent unintentional reuse. In its most basic form, a one-percentage solution of hypochlorite is used for chemical treatment. On the other hand, no preparation is necessary for incineration. The deep burial method is anticipated to be used only in places with fewer than 5 lakh residents. Additionally, waste treatment must to be carried out as near to the source as feasible. Keeping all of these factors in mind, table 1 illustrates the need for careful and precise handling and disposal of various waste kinds [16][11][13][17][10].

CONCLUSION

One of the main social duties of both individuals and government/state authorities is the management of biological wastes. Some issues and constraints with the effective management of biological wastes include a lack of care and awareness as well as financial considerations. As a result, the general public has to be informed about the health risks connected to biomedical wastes and should take this seriously. In the end, environmental and personal health protection depend greatly on our ability to become more aware of our surroundings. Therefore, rather than just employers who are involved in health, the community at large would benefit from knowing more about BMW. The appropriate handling of biological wastes is crucial in today's global health environment. This will ensure maintenance of ecological balance; biodiversity as well as health of global community as a whole.

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