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Techniques of Biomedical Waste Management

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Abstract: *With an expansion in healthcare facilities, the daily production of biomedical waste is gradually rising. In addition to analyzing several contemporary methods for managing biomedical waste, this research report also examines patient and healthcare worker habits. Additionally, the handling of biomedical waste in several Indian institutions is covered. This waste can be really dangerous at times and raise the incidence of fear. Therefore, it is necessary to manage the wastage utilizing effective treatment techniques.*

Keywords: Biomedical Waste, Healthcare, Knowledge, Practice

I. INTRODUCTION

A vital component of existence is healthcare, and this industry generates a considerable volume of biological waste. Because it is contaminated with disease-carrying bacteria that might infect patients, healthcare staff, and nearby residents, the waste produced by healthcare activities may be harmful or even lethal. Biomedical waste has expanded dramatically as a result of the expansion of healthcare institutions and the rising trend of employing disposal materials, posing serious risks to both the environment and society's health. Biomedical waste might include cotton, needles, specimens, human organs, and more, therefore it's crucial to properly dispose of each type in a distinct way.

II. PROBLEMS RELATED TO BIOMEDICAL WASTE

About 80% of the waste produced by healthcare activities is common garbage, but the remaining 20% is made up of poisonous, infectious, and radioactive waste. If this non-general biomedical waste is not properly disposed of, it can constitute a major threat to the community and the environment.

Even after a considerable amount of time has passed since their implementation, the majority of hospitals in India still do not adhere to the desired standards for the management of various biomedical wastes, according to guidelines provided in 1998 by the Ministry of Environment and Forensic, Government of India. According to the survey, 18–64% of hospitals and other healthcare facilities don't use satisfactory procedures for managing biomedical waste (BMW). It was expected that this might be because BMW doesn't have enough resources, medical staff members are unaware of the problem, or our regular disposal procedure was used.

Roughly 10% of healthcare facilities in India trade used syringes to waste pickers, and about 30% of all injections provided annually use repurposed or inadequately sanitised medical equipment. According to a study, those who reside within three kilometres of an old incinerator have a 3.5 percent higher risk of developing cancer.

III. BIOMEDICAL WASTE MANAGEMENT

Each type of BMW has its own disposal method, and each category is grouped into. The following lists these categories:

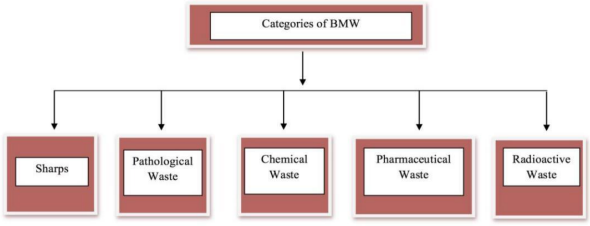

Figure 1: Categories of BMW

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3.1 Biomedical Waste Management Techniques

When biological waste is being treated, there are 4 degrees of disinfection. These levels assess the efficacy of both new and old medical waste treatment methods.

Level 1: Low Level Disinfectants

The majority of vegetative bacteria, fungi, and some viruses become dormant in this initial level, however microbes and bacterial particles continue to be active. This amount of treatment is therefore deemed insufficient.

Level 2: Intermediate Level Disinfectant

Although the bacterial spores are still active, this sort of treatment involves inactivating all microbes, viruses, fungus, and vegetative bacteria.

Level 3: High Level Disinfectants

To obtain a high level of disinfection, at least log and decrease of bacterial spores of either B subtious or B stear other mophilus are incorporated. It is estimated that a 4log10 reduction corresponds to a 99.99 percent reduction of bacterial spores.

Level 4: Sterilization

This level is attained by a minimum 6-log reduction in B stearo thermophilus particle concentration.

IV BIOMEDICAL WASTE MANAGEMENT TECHNIQUES

4.1 Autoclaving

In order to disinfect the waste for a long enough time, waste is brought into close contact with steam in this thermal process. The horizontal system, which is especially made for treatment purposes, is recommended for simplicity of treatment and for operational safety. A 121°C temperature is needed for 1 hour for a modest amount of garbage in order to effectively inactivate microorganisms and bacterial components, according to studies.

- Uses: Usually, reusable medical equipment is sterilized in an autoclave.
- Limitation: Only small amounts of the waste can be treated using autoclaves, which also emit dangerous gases.

4.2 Microwave Irradiation

The inactivation of microorganisms is accomplished utilizing the heating effect of magnetic beams in microwave irradiation techniques. Between 300 and 300,000 MHz is the range of frequency for these rays. At a frequency of roughly 2450 MHz, the majority of bacteria are destroyed.

- Uses: A new kind of biomedical waste is disinfected using the microwave irradiation technique.
- Limitation: For the treatment of cytotoxic, dangerous, or radioactive waste, it is not used. Human organs, other bodily parts, and contaminated animal carcasses are also prohibited.

4.3 Chemical Methods

Previously used to destroy bacteria on floors, walls, and medical equipment, chemical disinfection is now employed to treat biological waste. In this method, chemicals are employed to neutralise or eradicate germs. Disinfection rather than sterilisation is the end effect of chemical treatment. The most often used chemicals for this procedure are sodium hypochlorite, fenton reagent, and hydrogen peroxide.

- Uses: The treatment of liquid biomedical waste, such as blood, urine, or hospital sewage, is best accomplished using a chemical approach.
- Limitation: Its operational costs are comparatively considerable. Additionally, some microorganisms could develop resistance to certain disinfectants.

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4.4 Solar Disinfection

This technique uses the thermal effect of sun light to sterilise biomedical waste. The amount of live bacteria decreases by 7 logs when the trash is sterilized in a box-style solar oven.

- Uses: For nations that cannot afford expensive treatment methods, it can be employed as a low-cost technique.
- Limitation: Cytotoxic, dangerous, or radioactive waste treatment cannot be done using this method.

VI. KNOWLEDGE, ATTITUDE AND PRACTICES IN BIOMEDICAL WASTE

From 2009 to 2012, L. Joseph conducted numerous cross-sectional audits on biological waste, segregation, and awareness of the hospital's general garbage. The study came to the conclusion that in order to maximize adherence to the effective segregation, periodic training and emphasis on policy execution are required. Additionally, the hospital administration's involvement is crucial for formulating policies effectively.

In order to conduct their research, Asif Choudhary and Deepika Stathia spent roughly three months observing various samples of the biological waste produced by the Gandhinagar Hospital in Jammu. They came to the conclusion that the average amount of solid waste produced per bed per day was 632.04 grammes, of which nearly 61.28 grammes are biodegradable and the remaining are not. The housekeeping crew at the hospital collects biomedical waste, which is then disposed of in public trash cans. As a result, the trash is not disposed of effectively and securely.

The INCLEN programmer analyses network study group New Delhi's scenario analysis and forecasts growth in 25 districts from 20 Indian states. Depending on their overall median score, the healthcare facilities were categorized into Red, Yellow, or Green. According to the analysis's findings, the majority of primary, secondary, and tertiary healthcare institutions—or 85%, 60%, and 54%, respectively—fall into the red category. A greater commitment to BMW Management policies is urgently required, according to the report.

Dr. Anjali Acharya investigates how biomedical waste affects Pune's ecosystem. More than 55% of personnel in Pune's ten hospitals are found to be ignorant of the proper methods for collecting and treating biomedical waste, according to a survey. In the survey, about 62 percent of participants did not consider it to be a severe problem, and about 45 percent of users were illiterate.

The management of biomedical waste in Banaras, Uttar Pradesh, is illustrated by Vijay Krishna, who came to the conclusion that the private sector's Center for Pollution Control (CPC) generates and treats biomedical waste in an efficient manner. For managing infectious waste from medical establishments, various criteria exist. The collection, separation, and treatment of waste in the best possible ways, as well as the documentation of each stage of treatment, are all CPC's responsibility.

A descriptive cross-sectional study on the awareness and application of biological waste management among Kanchipuram town's medical officials was carried out by Kokila Selvaraj. A standardised questionnaire that had been evaluated in advance was used for the investigation. About 70% of practitioners, according to the statistics, have not received any kind of training in the handling of biomedical waste. Most of them agreed that BMW garbage should be properly divided, however 36.2% of stalls still dump their trash alongside regular trash. Medical professionals are unsure of what happens to the BMW in the end in 61 percent of cases.

VII. DISCUSSION

The management of biomedical waste must be improved nationwide, with 318 out of 388 primary care facilities, 15 out of 25 secondary care facilities, and 13 out of 24 tertiary facilities falling into the RED category. Primary care medical institutions' BMW Management status reveals the need for significant upgrade inputs. Compared to urban facilities, which had a median score of 2.74, the situation was poor in rural areas, with a score of 1.58. Compared to their urban counterparts, public sector providers in rural areas had a better BMW Management system. In contrast, private organizations in rural areas nearly completely lacked a biomedical waste management system.

VIII. CONCLUSION AND SUGGESTION

In order to lower the danger of exposing employees, patients, doctors, and the community to biomedical hazards, each and every healthcare facility that produces biological waste must put up the necessary treatment facilities to assure

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effective waste treatment and disposal. Biomedical waste management requires safe and responsible handling on a social as well as a legal level. Some suggestions are given below:

- There must be more BMW-branded automobiles.
- In the event that the driver is absent or the vehicles are in poor condition, alternate modes of transportation must be used to collect the waste.
- It is important to adequately cover BMW automobiles to stop waste from leaking.
- BMW must never be combined with other municipal garbage.
- The BMW color scheme must be observed.
- The personnel should have access to regular training programmes.
- In each district, a BMW Management Board must be constituted.

IX. BIOMEDICAL WASTE MANAGEMENT

years	biomedical waste management
2015-16	5.01 lakh kg a day
2016-16	5.19 lakh kg a day
2017-18	5.26 lakhs a day

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