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A Study: Biomedical Waste Management in India

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Abstract: *The amount of biomedical waste generated per day is increasing day by day with increase in the healthcare facilities. This paper presents an analysis study of various techniques used for biomedical waste management along with the knowledge and attitude of people and healthcare workers. Along with this the scenario of biomedical waste management in various hospitals in India is discussed. This waste is sometimes very hazardous and can lead to dreadful effects. So, the waste is needed to be treated using adequate treatment method.*

Keywords - *biomedical waste, healthcare, knowledge, practice*

I. INTRODUCTION

Healthcare is an essential aspect of life; these activities generate a large amount of waste called biomedical waste [2]. This waste generated by healthcare activities can be hazardous or toxic or something deadly as it is contaminated by disease carrying pathogens which can infect patients, healthcare workers and other public present near there. Increase in the healthcare facilities and the rising trend of using disposal material has increased the amount of biomedical waste significantly and hence creating serious threats to health of society and environment also. Biomedical waste can contain cotton, needles, vials, specimen, human organs etc. and proper disposal of different types of biomedical waste differently is essential [4].

II. PROBLEMS RELATED TO BIOMEDICAL WASTE

About 80 percent of total waste generated in healthcare activities is a general waste but the remaining 20 percent of it involves toxic, infectious and radioactive waste [1] and 20 percent of this non general biomedical waste is highly dangerous and can be a serious threat to the community and the environment if it is not segregated disposed of adequately.

In 1998, Ministry of Environment and Forensic, Government of India, gave some guidance how different biomedical waste can be handled [5], but even after a long time of their implementation most of hospitals in India don't use the desired standards for the biomedical waste management [3]. According to the report, 18 to 64 percent of hospitals and other healthcare institutions do not use the satisfactory methods for biomedical waste management (BMW). It was predicted that this can be due to insufficient amount of resources required for BMW, or lack of awareness among the healthcare officials, or it may be due to the use of poor disposal method [3].

In India about 30 percent of the total injections administered each year were done using reused or improperly sterilized medical equipment, and about 10 percent of healthcare institutions sell these used syringes to the waste pickers. A research showed that the a population which lives within 3km distance from old incinerators, saw an increase of risk is contracting cancer by 3.5 percent [4].

III. BIOMEDICAL WASTE MANAGEMENT

BMW is classified into different categories and each category has its own methods of disposal. These categories are shown below:

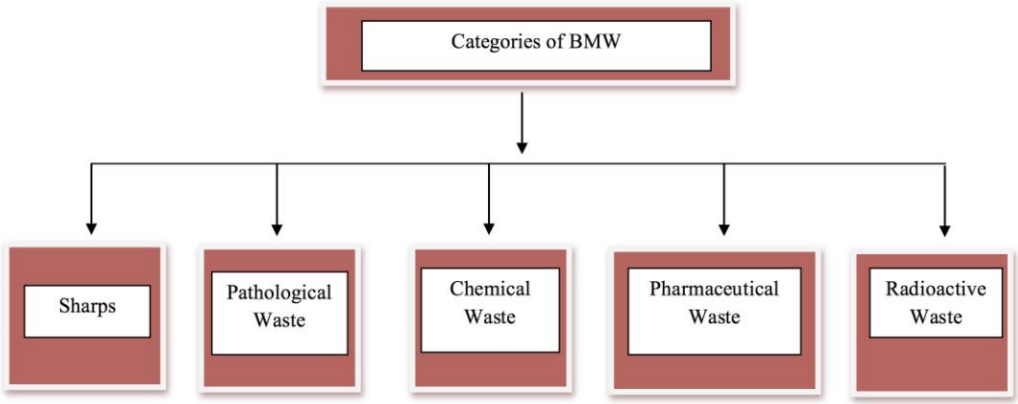

Figure 1: Categories of BMW

IV. BIOMEDICAL WASTE MANAGEMENT TECHNIQUES

There are four levels of disinfecting the biomedical waste during its treatment. These levels evaluate the new or the existing medical waste treatment methods.

Level 1: Low Level Disinfectants

In this level most of the vegetative bacteria, fungi and some viruses become inactive, but micro bacteria and bacterial spores remains active. Therefore a treatment method of this level is considered inadequate.

Level 2: Intermediate Level Disinfectant

This type of treatment methods includes inactivating all the micro bacteria, viruses and fungi and vegetative bacteria, although the bacterial spores remains active.

Level 3: High Level Disinfectants

At least log and reduction of bacterial spores of either B subtious or B stearothermophilus is included so as to achieve a high level disinfection. A 4log10 reduction is considered equal to about 99.99 percent reduction of bacterial spores.

Level 4: Sterilization

This level is achieved by at least 6log reduction in spores of B stearothermophilus.

V. BIOMEDICAL WASTE MANAGEMENT TECHNIQUES

1. Autoclaving:

This is a thermal process in which waste comes in direct contact with steam in a controlled manner for disinfecting the waste for a sufficient duration. For easy treatment and for safety during operation, the horizontal system is preferred, specially designed for treatment purpose. According to a research, for effective inactivation of microorganisms and bacterial spores, for a small amount of waste, a 121°C temperature is required for 60 minutes [9].

Uses: Autoclaving is typically used for sterilizing the reusable medical equipments.

Limitation: Autoclaves allow treatment for only limited quantities of the waste and release harmful gases.

2. Microwave Irradiation:

In microwave irradiation method, the inactivation of microbial is done by using the heating effect of electromagnet rays. The frequency of these rays lies between 300 and 300,000 MHz. Most of the microorganisms gets destroyed a frequency of about 2450 MHz [9].

Uses: Microwave irradiation method is used for disinfecting a variety of biomedical waste.

Limitation: It is not used for the treatment of cytotoxic, hazardous or radioactive waste. Contaminated animal careasses, body parts and human organs are also excluded.

3. Chemical methods:

Chemical disinfecting is previously used to kill microorganisms on floors, walls and medical equipments, but now it is also used for biomedical waste treatment. In this method chemicals are used to inactivate or to kill pathogens. The result of chemical treatment is disinfection rather than sterilization. Sodium Hypochlorite, Fenton Reagent, and Hydrogen peroxide are the most commonly used chemicals for this method.

Uses: Chemical method is most useful for the treatment of liquid biomedical waste such as urine, blood, stools, or for hospital sewage.

Limitation: It has relatively high capital and high operational cost. Also, some microbes may become resistant to some disinfectants.

4. Solar Disinfection:

This method uses the thermal effect of solar rays for disinfecting the biomedical waste. 7 log reduction in amount of viable bacteria, when a box type solar cooker is used to disinfect the waste.

Uses: It can be used as a low cost technique for the countries which cannot afford costly treatment methods.

Limitation: It cannot be used for the treatment of cytotoxic, hazardous or radioactive waste.

VI. KNOWLEDGE, ATTITUDE AND PRACTICES IN BIOMEDICAL WASTE

L. Joseph [1] performed many cross sectional audits from the year 2009 to 2012 on biomedical waste, segregation and awareness of the hospital common waste in the hospital. The study concluded that periodic training and emphasis on policies implementation is necessary for optimizing the compliances to the effective segregation. Also, the involvement of the hospital administration plays a vital role in creating policies efficiently.

Asif Choudhary and Deepika Stathia [2] carried a study at Gandhinagar hospital, Jammu to carry out their study, they have monitored various samples of biomedical waste generated from the hospital about 3 months. They concluded that the average solid waste generated per bed per day was 632.04 g of which almost 61.28 g is biodegradable and rest is non-biodegradable. Biomedical waste treatment in the hospital involves the collection by the sweepers then disposing in the community dustbins. Thus the waste is not disposed off in an efficient and secure method.

The INCLEN programme evaluates network study group New Delhi formed a situational analysis and prediction about performances in 25 districts from 20 states in India [3]. The health facilities were assigned into one of the three categories (Red, Yellow, Green) based on their cumulative median score. The result of analysis depicts that about 85 percent of primary, 60 percent of secondary and 54 percent of tertiary healthcare institutions falls under the red category. The study emphasis on the urgent need of greater commitment towards BMW Management policies.

Dr. Anjali Acharya [4] studied the impact of the biomedical waste on the environment of the Pune city. A survey is conducted in the 10 hospitals of the Pune city, which shows that more than 55 percent of employees are unaware about the adequate collection and treatment methods of biomedical waste. Nearly 62 percent respondents of survey does not found it a serious issue and approximately 45 percent of users were ignorant.

Vijay Krishna [5] depicts the scenario of biomedical waste management in Varanasi city (U.P) and concluded that biomedical waste treatment is generated by a private organization, Centre for Pollution Control (CPC) which works very effectively. There are a number of guidelines for management of infectious waste from medical institutions. CPC is responsible for collection, segregation and treatment of the waste in best suitable manners along with the documenting at every step of treatment.

Kokila Selvaraj [6] conducted a descriptive cross sectional study about the knowledge and practice of biomedical waste management in the medical officials of Kanchipuram town. The study was conducted using pre-tested structured questionnaire. The results revels about 70 percent practitioners have not undergone any type of training location with respect to biomedical waste management. Most of them said that BMW should be

properly segregated then also 36.2 percent stalls dump the waste with general waste. In all 61 percent medical officials do not know what happens to the BMW in the end.

VII. DISCUSSION

318 out of 388 of primary care, 15 out of 25 of secondary care, 13 out of 24 tertiary facilities are in RED category, which needs a lot of efforts to improve the biomedical waste management across all over country. The state of BMW Management at primary care health facilities indicates requirements of major inputs for improvement. The situation was worst in rural areas with median score 1.58 as compared to the urban facilities with median score 2.74. Public sector providers in rural areas had better BMW Management system then counterparts in urban areas. In contrast, there was almost complete lack of biomedical waste management system in private sectors in rural areas.

VIII. CONCLUSION AND SUGGESTION

Each and every healthcare facilities which generates biomedical waste, needs to set up requisite treatment facilities to ensure proper treatment of wastes and its disposal so as to minimise risk of exposure to staff, patients, doctors and the community from biomedical hazards. Safe and effective management of biomedical waste is not only a legal necessity but also a social responsibility [2].

Some suggestions are given below:

- BMW marked vehicles must be increased.
- Alternatives transport must be used to collect the waste in case the driver is not present or bad condition of vehicles.
- BMW vehicles should be covered properly to prevent the waste from leaking.
- BMW should not be mixed with other municipal waste.
- Colour code for BMW must be followed.
- Regular training programme should be organised for the staff.
- BMW Management Board must be established in each district.

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