

Bio medical Waste Management : A Case Study of Pune City

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Abstract-There are number of hospitals in all over the India which emits the Bio medical waste in large quantities in the form of contaminated and non-contaminated waste which are hazardous to health. Proper handling, treatment and disposal of Bio medical waste play a vital role in hospital infection controlled program. Unfortunately lack of adequate training, improper management, illiteracy about handling and awareness and no execution of Bio medical handling rules leads to staid health and environmental apprehension. Careless handling and disposal of these infectious wastes may lead to serious threat to life human as well as animals. This study explains the existing information about bio medical waste management, segregation, transportation, storage, treatment and disposal. Also this study explains lacunas of existing management system of bio medical waste, the recommendations and suggestions of bio medical waste management.

I. INTRODUCTION

Bio medical waste is any solid or liquid waste which is generated during the diagnosis, treatment or immunization of human beings or animals. Waste generated in the health care facilities categorized in general waste, chemicals, sharps, potentially infectious waste, pharmaceuticals and radioactive material. Also these bio medical waste consists human anatomical body parts, discarded medicines, cytotoxic drugs, cotton, dressings and liquid waste. These waste generates from hospitals, health centers, medical colleges, research centers, blood banks, clinics, funeral services and vaccination centers. According to World Health Organization 20% waste is hazardous and remaining 80% waste is considered as domestic waste.

Management of bio medical waste is an integral part of infection control and hygiene program in health care setting which is still in its infancy all over the world. The problems of the Bio medical Waste disposal in the hospitals and health care institutions have become issues of increasing concern. Most countries of the world are facing the grim situation arising out of environmental pollution due to pathological waste arising from increasing population and the consequent rapid growth in the number of health care centers. India generates around three million tonnes of Bio medical waste every year and the amount is expected to grow at eight per cent annually. The central government to perform functions effectively as contemplated Environment Protection Act 1986 has made various rules, notifications

and orders including the Bio medical Wastes (Management and Handling) Rules 1998.

II. Objectives of study

Present study has following objectives:

- Review the existing condition of Bio medical Waste Management system.
- To minimize the lacunas present in the segregation, transportation, storage, treatment and disposal.
- To strengthening the existing Bio medical waste management system

III. Future Scope

1. Suitability of charges of Central Treatment Facility to suit the large & small hospitals.
2. Optimization of routes through detail field study for effective and economical BMW management taking into account money involved right from generation of waste to its final disposal.
3. To search for cost effective technology for treatment of biomedical and hazardous waste. Also, to search for suitable materials to be used as containers for bio-medical waste requiring incineration/autoclaving/ microwaving.

IV. Existing Bio medical waste management system

In Pune, there are near about 6000 hospitals which emit Bio medical waste about 1600 tons per month. This study of Bio medical waste is conducted by visiting hospitals like **Sahyadri Hospital(Kothrud) Poona hospital, Sahyadri**

Hospital(Deccan) and treatment plant of Bio medical waste which is **Passco Environmental Solutions Pvt. Ltd.** All the biomedical waste data is collected from various Dept. of hospitals as Pathology lab, OPD, Casualty, Male general ward, Female general ward, Private rooms and various wards. Existing Bio medical waste management system includes the collection, storage, at source segregation, transportation, on site segregation, treatment and disposal. This management system of Bio medical waste is explained as:

1. Collection of Bio medical waste :-

The collection of bio medical waste involves use of different types of container from various sources of bio medical wastes like Operation theatre, laboratory, wards, kitchen, corridor etc. The containers or bins should be placed in such a way that 100% collection is achieved. Sharps must always be kept in puncture proof containers to avoid injuries to the workers. Once collection occurs then bio medical waste is stored in proper place. Segregated wastes of different categories need to be collected in identifiable containers.

2. Storage :-

A storage location for health-care waste should be designated inside the health-care establishment or research facility. The waste, in bags or containers, should be stored in a separate area/room, or building of a size appropriate to the quantities of waste produced and the frequency of collection. All biomedical waste shall be securely packaged in biohazard containers which shall be labeled with the symbols .All BMWs packaged in containers marked biohazard No person shall store biomedical waste above 0° C for more than seven days without the written approval of the relevant lead agency, provided that untreated pathological waste shall be disposed of within 48 hours. All wastes treated and collected daily by the private waste company contracted. These bio medical waste is collected from all the departments of hospitals by labours or workers. At the all Hospitals, each unit has a Sluice room where all the wastes segregated are stored before disposal. The room is big enough to hold all the wastes from the unit that it is serving. These wastes are collected by the housekeeping staff on duty from the point of waste production and taken to the sluice room for further management.

3. At source segregation:-

Bio medical waste segregation for better waste management in hospitals plays a predominant role. For reducing the volume of infectious waste segregation is important at the point of generation.

At the all Hospitals, all departments are directed to use the color codes for separating wastes as guided by the hospital

management depending on the type of waste. There is use of white colour code for the syringes with puncture proof box instead of blue colour coded bags. Black colour coded bags are used for Plastic papers, Empty I.V bottles, Empty medicine bottles, All types of papers, Paper hand towels. Also red bags for all used swabs, used catheters, used gloves, I.V giving sets, body tissues, contaminated papers, vacutainers and ampoules and yellow for non contaminated waste as Branulas, Surgical bottles, Ampoules, Vials, Cuvettes.

4. Transportation

Health-care waste should be transported within the hospital or other facility by means of wheeled trolleys, containers, or carts that are not used for any other purpose and meet the following specifications: easy to load and unload; no sharp edges that could damage waste bags or containers during loading and unloading; easy to clean. All waste bag seals should be in place and intact at the end of transportation. Transportation of all the bio medical waste of all pune city i.e. of 6000 hospitals is under the Pune Municipal Corporation's Passco Environmental Solutions Private Ltd. The transportation vehicles of Passco are small size truck upto 5 tonnes. They have implemented new technology for small clinics less than 15 beds are two wheelers.

5. On site segregation

At the treatment plant segregation is important for selection of the treatment method. All Bio medical waste is segregated in reusable, non-reusable, contaminated, non-contaminated.

6. Treatment

Treatments given to Bio medical waste are as:

a) Incineration

This is high temperature thermal process employing combustion of the waste under controlled condition for convert bio medical waste containing infectious and pathological material into inert material and gases. Incineration can be oil fired or electrically powered or a combination. 85-90% of total Bio medical waste is treated by incineration. Temperature used in incinerator is about 1100-1200degree celcius and stack height about 30 m above ground.

b) Autoclaving

The autoclave operates on the principle of standard pressure cooker. The process involves using steam at high temperature. The steam generated at high temperature penetrates waste materials and kills the micro organism. The system operates with temp 121 degree C and steam pressure of 15psi. for 60 to 90 min. Autoclave treatment has been

recommended for micro biology and bio technology waste, waste sharps.

c) Plasma pyrolysis

Plasma pyrolysis is a state of the art technology for safe disposal of medical waste. It is an environment friendly technology, which converts organic waste into commercially useful byproducts. The intense heat generated by the plasma enables it to disposed all types of wastes including municipal solid waste, biomedical waste and hazardous waste in a safe and reliable manner. Medical waste in pyrolysed into CO₂, H₂ and hydrocarbons when it comes in contact with plasma arc. These gases are burned and produced high temp about 1200 degree C.

d) Chemical Disinfection

High level disinfectants like chlorine releasing compounds are used for disinfecting materials contaminated with blood and its products. The disinfectants are as sodium hypochlorite, calcium hypochlorite, NaOCl powder and chloramine.

e) Microwaving with shredder

Shredders are used to destroy paper, plastic waste and syringes. After autoclaving plastic waste is sent to shredder and then the waste is sold out to authorized plastic molding units. The microwave is based on the principle of generation of high frequency wave. These waves cause the particles within the waste material to vibrate, generating heat. The heat generated and steam from within kills the all pathogens.

7. Disposal

Incineration ash is used as landfill at soft soil, for foundation. Also ash is used for embankments, in road construction. Plastic is reused.

V. Conclusion

- Poor management at study center.
- No well-documented instructions.
- Improper segregation.
- Mixing of BMW with domestic waste and commercial waste.
- Due to poor segregation plastic waste reaches to treatment site.
- No general awareness
- Illiteracy about Bio medical waste
- No following of rules about bio medical waste
- Insufficient training and education on medical waste management to staff, workers or labours in health care center.

- Ignorance is high about health care due to mentality and habits.

VI. Recommendations:-

This study indicates a need for training programs for different levels of hospital staff in bio medical waste management and education programs in bio medical waste segregation, strict implementation and monitoring BMW management will help in change the current practices. Training programs on Bio medical waste management for health care professionals need to focus on empowering them with sufficiently broad and practical knowledge.

- Improving waste minimization and management: If proper segregation is achieved, the volume of infectious wastes can be effectively reduce, while the volume of recyclable wastes would increase, risks can be minimized.
- The Bio medical waste management plan should be availed to all departments then a regular program of inspection and review can be undertaken within the hospital so segregation of BMW should be much better than before.
- A written Bio medical waste management program must be included in a health care facility's policy and procedure manuals. It must also included in house education, occupational health and safety, orientation program for all employee.
- There should be segregation at source according to colour coded system.
- Penalties should provided to the defaulters of Bio medical waste.
- Campaigning Programs must be arranged to increase the awareness about bio medical waste handling.
- There should be trained and educated separate staff in health care centers for the handling of Bio medical waste.
- Well-documented instructions should be present and implemented in hospitals about bio medical waste. Records should be maintained of bio medical waste quantity daily, monthly and annually.
- CPCB, MPCB and corporations should provide strict rules against Bio medical waste Also should conduct audits of hospitals once in a year.
- Research is required to establish a database.

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