

**THE EFFECTIVENESS OF MEDICAL WASTE MANAGEMENT SYSTEM – IN  
HOSPITALS**

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**Abstract**

In healthcare, medical waste has its major role. Likewise, medical waste management is also the most important. Medical waste is the waste that occurs during medical diagnosis, treatment, and research studies. Medical waste has its different characteristics according to their nature and its state. Proper waste handling procedures lead to a healthy nation and environment. In India, various types of hospitals like tertiary care hospital, primary health care centers, clinics, nursing homes have its own terms and conditions to manage their waste properly. Training is given to the healthcare workers to the proper disposal of medical waste to avoid infections, needle prick injury and how it is dangerous to human health. Medical Waste management system constitutes processes like proper collection, proper segregation, proper treatment and disposal of waste. The purpose of this paper is to analyze the changes adopted by the healthcare sector for medical waste management system. Few suggestions are made at the end for the effectiveness of medical waste management system.

**Keywords:** Medical waste, healthcare, healthcare workers, needle prick injury.

**Introduction**

In today's scenario, Hospitals are increasing tremendously. Medical Waste generation is also huge in quantity and also is of several types. Improper medical waste management practices among hospital workers possess huge health risk issues. Medical waste is nothing but infectious waste generated during diagnosis, testing, treatment, research or production of biological products for humans or animals. Medical waste includes syringes, laboratory waste, discarded medicines, body fluids, body parts, sharp needles, culture waste. Medical wastes are generated inside the hospital by hospital workers and patients. Central pollution control board, common waste treatment facility, occupational safety and health administration, centers for disease control and prevention are the agencies that regulate different aspects of medical waste. Particularly viruses include AIDS, hepatitis B transmitted from syringe needles contaminated by human blood. Vector-borne diseases like typhoid, cholera, jaundice are transmitted through the production of pathogens from medical waste.

**LITERATURE REVIEW:**

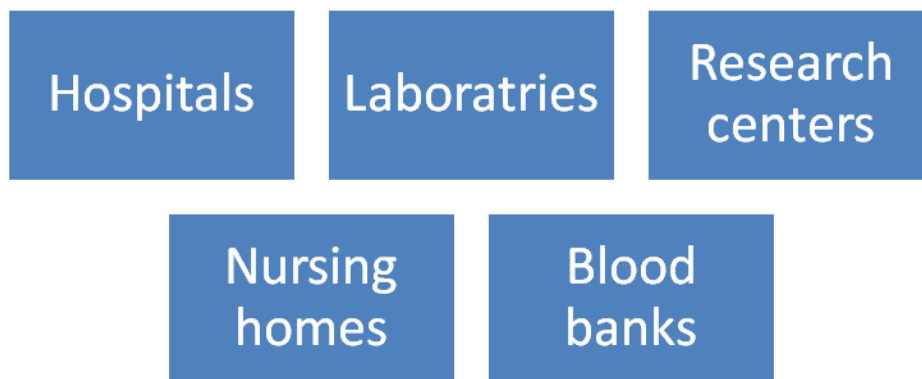
- (Acharya et al., 2000;Alagoz et al., 2008) The word 'biomedical waste' is any waste that is produced during analysis, treatment or vaccination of human beings or animals, or in the study activities applied to or in the invention or testing of biological, and covers the classes mentioned in schedule-1 of govt. of India rules 1998. WHO evaluated that only 20% of total healthcare waste is infectious or and dangerous to human health and environment. The threats of bio-medical waste can cause numerous health diseases like respiratory, skin infections, gastroenteritis, HIV/AIDS, hepatitis, etc. Further, it causes contamination of land and water, and when treated by open burning or burning in burners it releases harmful gases that causes to environmental pollution.
- Seymour Block S. (2001) Infectious waste should be treated before disposal, whereas treatment for non-infectious solid and liquid wastes is not needed before disposal. The cost is ten times higher than non-infectious waste while disposing infectious waste. While reducing the quantity of infectious waste generation, obviously the cost for disposing infectious waste becomes less.
- Askarian et al. (2004) conducted a survey on management and disposal of clinical waste in private hospitals in Fars province, Iran. In this study, the amount of different kinds of waste produced at hospitals was determined and a relationship between the weight of the waste generated and several factors such as number of bed, economic, social and cultural status of the patients and the general condition of the area where the hospital was situated. But the results did not confirm a statistically significant correlation between types of health services provided.
- Awad, A. R et al. (2004) In mathematical model to correlate the clinical waste generation as a function of independent variables and applied statistical analysis like multivariate regression analysis to show that some variables were the most significant factors affecting the generation rate. It was observed a linear relation between the amount of waste generated from hospitals and the number of patients, number of beds, bed occupancy rate and type of hospitals.
- Sawalem, M., et al. (2009) several factors such as the type of healthcare establishment, level of instrumentation and location affect waste generation rates. The result showed that the highest generation rates at Tripoli Medical Centre are attributed to larger number of patients.

- Mochungong, P. I. K. (2011) The Clinical Waste Management practices cover all processes from the point of identification the wastes, to the place it is disposed in an incinerator. Initial handling, collecting, transporting, disposing and monitoring of waste materials are collectively called waste management. The primary objectives of waste management are reducing the amount and hazards of waste. Reusing the waste through the provision of secondary raw materials and use of the waste as energy resource are other objectives of waste management.

### ***SOURCES OF MEDICAL WASTE:***

Medical waste is generated from various sources and it is categorized according to their produced quantity i.e minor and major sources.

#### **The Major source of medical waste**



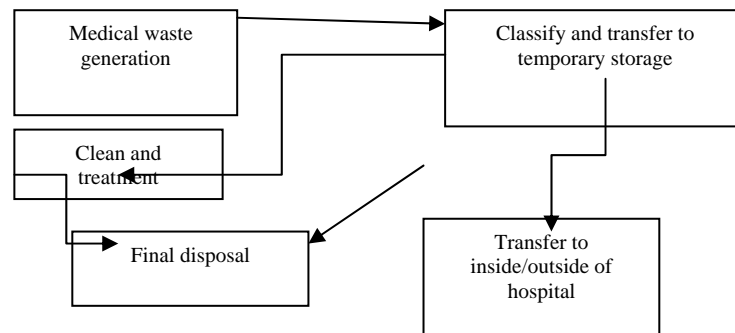
#### **The Minor source of medical waste**



### **MEDICAL WASTE MANAGEMENT IN HOSPITALS:**

The management of medical waste is not only the responsibility of concern management but also every healthcare department providing personnel to the safe management of waste. This process begins at the point of generation to segregation of non-hazardous waste in the specified color-coded bags, storage of waste in utility rooms specially allocated for this use and disposal of medical waste in an appropriate manner.

**FRAMEWORK OF MEDICAL WASTE MANAGEMENT PLAN:**



**CATEGORIZATION OF MEDICAL WASTE:**

Medical waste is categorized according to their nature and state which have the possibility to possess harmful to the public. According to the World Health Organization, medical waste is categorized into two major types includes:

*Non – hazardous waste:* Waste which does not harmful to human and environment. 85% of medical waste is non-hazardous. Medical waste which does not have substance like blood, chemicals, and other body fluids. Nonhazardous waste includes general waste and waste materials which we can recycle and use them in the future.

*Hazardous waste:* Also known as infectious waste which means it is harmful to human and gives more infections to the environment if it is not managed properly. 15% of medical waste is very dangerous to human. Hazardous waste includes:

- *Radioactive waste* is the by-product of nuclear power generators which is used in research and medicine.
- *Pathological waste:* human being and animal pathological waste which is predictable organs, tissues, body parts that must be disposed of. Human pathological waste excludes teeth, bone structures, body fluids removed during surgery, autopsy.
- *Sharps waste:* syringes and needles, intravenous (IV) tubing with needles attached, giving sets, scalpel blades, knives, lancets, blades, and broken glass.
- *Cytotoxic waste:* that is used for cancer and it is very dangerous
- *Pharmaceutical waste:* which is expired, unused and contaminated medicines, drugs
- *Chemical waste* is heavy metals contained in medical devices, detergents, solvents used in laboratories.

### ***RISK FACTORS ASSOCIATED WITH MEDICAL WASTE***

Medical waste produced in all healthcare units. Within the healthcare units, a certain group of people is commonly affected by some infections or diseases associated with medical waste. Doctors, nurses, healthcare workers, patients, visitors, medical waste transportation persons are included under risk. Three commonly transmitted diseases among healthcare workers include Hepatitis B virus, Hepatitis C virus, human immune deficiency virus (HIV). Workers involved in the collection and transportation of medical waste are affected by some certain disease through the production of pathogens and contact with medical waste. Infections include gastrointestinal infections, Respiratory infections, eye infection, skin infections, AIDS, Hemorrhagic fever, Meningitis, Anthrax. Chemical and pharmaceutical waste is toxic, corrosive, flammable, and explosive in nature which is under risk. A large quantity of medical waste generates through expired and unused pharmaceutical drugs. Source of pharmaceutical waste is: partially used vials, expired medicines, breakage of containers. This type of waste can cause poisoning through absorption of the skin or mucous membrane, by inhalation. Ecosystem and water surface becomes toxic due to the removal of medical waste by the drainage system.

### ***EFFECTIVE METHODS OF HANDLING – MEDICAL WASTE:***

- *Segregation and storage:* segregation is essential knowledge among healthcare workers because proper segregation process can avoid infections, needle prick injuries. Generated medical waste is to be segregated in proper containers or bags. Containers or bags do not have any leakage. Containers or bags are designed according to preferred weight and volume. All the containers or bags are to be labeled properly for easy identification of segregated waste. The label pasted in the containers should have time, weight and area of collecting waste. All the containers or bags are filled  $\frac{3}{4}$  in capacity must be sealed. Infectious waste should not be stored beyond 48 hours. The storage area should be separated as per the category of medical waste.
- *Medical waste handling and transportation:* Before transportation, the medical waste is to be stored inside the hospital premises temporarily. While inside transportation the medical waste has to be transported through closed containers or trolleys. The vehicles which are used for outside transportation

should be covered or fully secured. There should not have any leakage or sharp edges in the vehicle.

- *Treatment and disposal of medical waste:* Medical waste is to be treated and disposed of according to the categories of waste generated in the hospital. Several methods have been developed to treat and dispose of medical waste.
- *Microwaving:* The application of microwave technology treatment also can disinfect waste. Waste is first shredded, and then mixed with water and internally heated to neutralize all present biological. Computerized controls are employed to ensure the minimum parameters for disinfection and proper equipment function. As with autoclaving, approximately 90% of medical wastes can be treated with this process. The shredding process results in a volume reduction, and energy use is reportedly lower than that of an incinerator.
- *Chemical disinfection:* Chemical disinfection, primarily through the use of chlorine compounds, kills microorganisms in medical waste and can sometimes oxidize hazardous chemical constituents. Mainly used to disinfect liquid waste such as blood, urine and hospital sewage. Chlorine bleach has been used. Ethylene oxide treatment is used more often to sterilize equipment that will be reused. The types of chemicals used for disinfection of medical waste are mostly aldehydes, chlorine compounds, ammonium salts, and phenol compounds.
- *Autoclaving:* Autoclaving is nothing but the thermal treatment that uses high-pressure steam. It works under the treatment of boiling point of water increases when it is under pressure. It is typically used to disinfectant or sterilizing of equipment or deeply penetrates all materials and kills microorganisms. The main function is to decontamination of sharps and other medical wastes. Medical wastes such as chemical waste, including chemotherapy waste, as well as pharmaceutical waste can't be decontaminated in an autoclave.

### **NEED OF MEDICAL WASTE MANAGEMENT IN HEALTHCARE:**

There are several reasons for the need of proper medical waste management system in healthcare.

- Nosocomial infections can easily spread from one person to another person, can avoid through the proper infection control practices.
- Water, air, and the soil get polluted directly due to the improper management of medical waste or due to defective incineration emissions and ash.
- All categories of peoples working in healthcare and especially waste handlers are affected by infections due to improper handling of sharps.

### **JUDICIAL INTERVENTIONS AND ITS EFFECTIVENESS:**

- **B.L. WADHERA V. UNION OF INDIA CASE - 1996**

The First stone for the biomedical waste management was laid by the writ petition *B.L. Wadhara v. Union of India* at Supreme Court of India at 1996, 2 years before the establishment of Bio-Medical Waste (Management and Handling) Rules, 1998. This case relates the failure of Delhi Municipal Corporation (DMC) in garbage clearance and hospital waste management, relating to the non-availability of financial resources. The judgment ordered DMC that unavailability of funds cannot be pleaded as a reason for the nonperformance of a statutory obligation. The judgment also ordered for the appointment of Municipal magistrates for the trial of an offense under Corporation Act. The judgment earmarked the following guidelines with reference to hospital waste management. (a) All hospitals with 50 beds and above are ordered to install incinerators or any other equally effective waste disposal mechanism under their own administrative responsibly. (b) The incinerator or alternative methods should be compliant with the standards laid by the pollution control board. (c) The Central and the State Pollution Control Boards should regularly send their teams to verify the proper implementation of the above orders.

- **STATE OF KARNATAKA AND OTHERS V. B. KRISHNA BHAT AND OTHERS CASE – 2000**

2 years after the establishment of Bio-Medical Waste (Management and Handling) Rules, 1998, there came the *State of Karnataka and Others v. B. Krishna Bhat and Others* at Karnataka High Court. The series of legal proceedings of this case finally resulting in the judge giving 56 interim orders covering a broad range of improvement of roads, public health and infrastructural facilities in Bangalore. Among that order 39 tagged for the direction for the government for hospital waste



management. (a) It totally banned throwing hospital waste in any public area. (b) The big hospital to install incinerators. (c) The small hospitals to transport the hospital waste from their facility to corporation incinerators.

- **M.VIJAYA V.CHAIRMAN AND MANAGING DIRECTOR, SINGARENI COLLIERIES CO., LTD., HYDERABAD AND OTHERS CASE – 2001**

This case started when the petitioner wrote a letter to the Honorable Chief Justice of Andhra Pradesh High Court. She had an operation called hysterectomy at Singareni Maternity center, for which she had a blood transfusion. The transfused blood was not screened for HIV, which led the patient to be infected with HIV. The court by itself took up the case. The detailed legal proceeding led the court to issued orders, the orders pertaining to Bio-medical waste management are:(a) All the hospitals (both government and private) should be directed to dispose of their Bio-Medical Waste in terms of Bio-Medical Waste (Management and Handling) Rules, 1998 and they shall strictly comply with the norms specified therein . (b) Such hospitals shall be directed to obtain the necessary authorization for disposal of the waste from the Pollution Control Board.

- **JAGATSINGHPUR, ODISHA BIO-MEDICAL WASTE MANAGEMENT VIOLATION CASE – 2014**

This is the first conviction in biomedical waste rule violation against any government hospital in Odisha. In 2010 filed a case in the court of the sub-divisional judicial magistrate (SDJM) in Jagatsinghpur against the then CDMO Nityananda Panda, alleging the district headquarters hospital was dumping untreated biomedical waste in the open and was not giving due importance to non-mixing (segregation) of waste. The court convicted the former CDMO and sentenced him six months imprisonment and directed him to pay Rs 50,000 penalty for contravention of Section-15 of Environment (protection) Act, 1986, and violation of Biomedical Waste (management and handling) Rules, 1998.

- **OIL COUNTRY TUBULAR LTD. V. A.P. POLLUTION CONTROL BOARD AND ANR CASE -2005**

This Case was filed at Andhra Pradesh High Court regarding the controversies in obtaining No objection certificate from the Pollution Control Board. The court directed the Yellareddy Gram Panchayat, Nalgonda District in Andhra Pradesh to ensure their 'No Objection Certificate' should contain conditions about waste



management including Bio-Medical Waste, compliance with Bio-Medical Waste (Management and Handling) Rules, 1998 for industry propose to be set up.

### **CONCLUSION:**

Due to the changes adopted in segregation and proper disposal methods the medical waste system is going good without any hazardous. There is suggestion to become more effective: Plasma gasification (newer replacement for incineration) is a non-incineration thermal process which uses extremely high temperatures to completely decompose input waste material into very simple molecules. In simple terms, the solid waste materials are vaporized. In Gasification, uses little or no oxygen, the solid waste is converted into simple molecules called SYNGAS, (CO, H<sub>2</sub> syngas) which can either be combusted to produce electric power or cleanly converted via gas-to-liquid (GTL) catalysis into liquid fuels and a variety of chemical compounds. Without coordination, willingness, knowledge, and participation of the healthcare workers the medical waste management system cannot be implemented successfully. The most imperative component of the waste management plans is to develop a system and culture through education, training, reduces health risks, save money, and the persistent motivation of the healthcare staff.

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