

BIO MEDICAL WASTE PROBLEMS, MANAGEMENT & LEGAL ISSUES

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Abstract:- Biomedical waste is a burning issue all over the world. Covid-19 Pandemic has affected more than 200 countries. India being the world's second most populated country. So the healthcare system is also very big to manage such large population and the biomedical waste produced in the course of the health care activities during Treating, Diagnosing and immunizing Human being or animals or while doing Study/Research activities the collection, storage and disposal of medical solid wastes are a growing environmental problem in Indian cities which needs immediate attention before it goes out of hand. Recognizing the dangerous nature of biomedical waste the central pollution board of the Govt. Of India in the erstwhile Ministry of Environment & Forests provided a regulatory framework for management of Bio-Medical waste & issued the guidelines to the health care system of country to ensure a proper and safe disposal of biomedical waste. That is "BIO-MEDICAL WASTE MANAGEMENT AND HANDLING RULES 1998". Thereafter with few amendments in year 2000 and in March 29th 2016, the new Rules & latest in 2020 regarding guidelines for monitoring compliance of common Bio-Medical waste generated from Covid-19 Patient management at healthcare system as well as quarantine centres & home care issued new guidelines to manage the Bio medical waste. While the government of India is making lots of efforts to expand medical services by allowing private medical in the country but the management of medical wastes has received little attention despite their potential environmental hazards and public health risks. The all the Govt. & Private Hospitals, Govt & Private Veterinary clinics/Hospitals, Pathology Labs & Blood banks and quacks at rural as well as urban areas generate Bio medical waste in a large quantity everyday, but the medical waste is not properly managed at both collection and segregation level everywhere except the health facilities that are registered under the State/Central pollution board. Millions of infected face masks and PPE kit throne the road side and dumping ground by public during Covid-19 pandemic phase in India. Most of the quacks are not aware of means & hazards of biomedical waste. They do generate the biomedical waste in a very large quantity but do not collect segregate and dispose the waste in a prescribed manner. They throw the biomedical waste in the domestic drainage or in the open fields. The infected biomedical waste from the home care and quarantine patient was thrown on the road side. Bio-Medical waste from veterinary hospitals/clinics also produces Zoonotic disease in human being. A number of remedial measures to improve the situation including the construction of commercial incinerator in the city are suggested. Telecast Public awareness programme on mass and electronic media regarding Bio medical waste/Covid-19 waste along with Swachh Bharat Abhiyan. Give training to all the health workers at periphery areas by regular training Programmes regarding collection, Segregation, Transport, & Disposal of Bio medical waste according in prescribed manner. Recruit Nodal officer to keep watch on all the health care bodies. According to 2016 rules, the distance of incinerator should not be more than 75 KM. Therefore an Incinerator plant should be established at so the management & of Bio medical waste could be possible in an effective manner to protect humanity & Environment.

Key Words- Bio-Medical waste, Diagnosis, Immunization, Environmental Hazards, Quacks, Covid-19 , Swachh Bharat Abhiyan, Incinerator, Segregation, etc.

Introduction-

Biomedical waste is a burning issue not only in India but also all over the world. At present whole of the world is fighting with Covid-19 infection. In order to deal with COVID-19 pandemic, State and Central Governments have initiated various steps, which include setting up of quarantine centers/camps, Isolation wards, sample collection centers and laboratories. The healthcare system of India is also very large to manage huge population and the biomedical waste generated in a very large quantity in the course of health care activities during Treating, Diagnosing and Immunizing human being or animals or while doing Study/Research activities. Biomedical waste is a real problem for Human Community and Environment. The Government of India has recently started the "SWACHH BHARAT ABHYAN" to clean out rivers and cities of our country but every government has little attention on biomedical waste disposal to protect our community and environment. It requires serious attention. Everybody knows that Covid-19 Infection is very contagious and life threatening. Therefore, It is very challenging to deal the biomedical waste management in our country.

Definition-

According to Biomedical waste [Management & Handling Rules] 2016 – Any waste which is generated during the diagnosis, treatment, or immunization of Human beings or Animals or in research activities pertaining there to or in the production or testing of biological or in health camps including the categories mentioned in Schedule.

Sources Of Biomedical Waste-

Major Sources	Minor Sources
Hospitals and Nursing Homes	Clinics
Labs	Dental Clinics
Research Centres and Animal Research	Home care
Blood Banks	Cosmetic Clinics
Mortuaries	Institutions
Autopsy Centres	Paramedics
Slaughter Houses	Quacks [Jhola Chhap]
Health camps [Medical & Surgical]	Blood donation & vaccination camps
Forensic Labs	1 st Aid rooms of schools.

Problems due to Biomedical waste-

1. Infections- Covid-19, HIV, HBV, HBC, etc.
2. Infected PPE kit & Gloves, masks can produce Covid-19 infection.
3. Chemical toxicity-burns and poisoning.
4. Cyto toxicity- irritant to skin and secondary cancer due to mutation.
5. Physical injuries- punctured wounds and sharp cut.
6. Water pollution due to seepage of chemicals and drainage of Infectious material in water bodies and ground water while dumping.
7. Air pollution- By burning of biomedical waste in the open fields.

Classification of Biomedical waste:-

A:- **Non-Hazardous:-** In most of the set-ups of healthcare approximately 75-85% of generated wastes is constituted by non-hazardous wastes, This includes wastes constituting remnants of food and peels of fruit; wash water as well as paper cartons; packaging materials etc.

B:- **Hazardous Wastes:-** It is about 15-25%. These include:

- Sharp objects like scalpel, blades, needles, syringes etc.
- Infectious materials like infected PPE kit, masks, gloves, dressing, gauze, pus, human

body parts and tissues etc.

- Pathological samples for blood, urine, body fluids and biopsy materials and discarded lab chemicals.
- Radioactive materials for research purpose.
- Pharmaceuticals-Cytotoxic, discarded & expired drugs.
- Others (often sanitary waste produced at hospitals)

• **Types of Bio Medical waste hazards**

A:- Human Health Hazards:- Biomedical waste may pose an injury and exposure risks via occupational contact with medical waste for doctors, nurses, and janitorial, laundry and refuse workers. Further, there are opportunities for the general public to come into contact medical waste, such as infected needles, infected PPE kit, masks, gloves used illicitly outside healthcare settings. According to WHO injections with contaminated syringes caused 21 million hepatitis B virus infections, 2 million hepatitis C virus and 260 thousand HIV infections in India by year 2000.

B:- Environmental Hazards:- It occurs due to improper handling and management of the bio-medical waste include toxic emission of dioxins, Furan gas, carbon & sulphur particle form defective inefficient incineration, indiscriminate disposal of Incineration as residue, Leachate from improper waste treatment residue leading to contamination of ground water and Incinerator which do not achieve prescribed enough high temperatures [1350-1650 degree Celsius] actually ends up producing toxic gases from plastics, because the temperature [lower & lower than prescribed] actually ends up in producing toxic gases from plastics, because the temperature at which they burns technically incorrect and hazardous to environment also.

Bio-Medical waste & Law in India:-

Recognizing the dangerous nature of biomedical waste the central pollution board of the Govt. Of India in the erstwhile Ministry of Environment & Forests provided a regulatory framework for management of Bio-medical waste & issued the guidelines to the health care system of country to ensure a proper and safe disposal of biomedical waste. That is “**BIO-MEDICAL WASTE MANAGEMENT AND HANDLING RULES, 1998**”. Thereafter with few amendments in **year 2000** and “**THE BIOMEDICAL WASTE MANAGEMENT RULES, 2016**” and now the new Guidelines for Handling, Treatment, and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients – Revision 4

Applicability of the Rules- These rules will apply to Hospitals, Nursing home, Veterinary hospitals, Animal houses, Pathological Labs, Blood banks, Research centres. This rule shall apply to any person who comes into contact with bio-medical waste in any form, whether he or she generate, collects, receives, stores, transports, treats disposes or handles such waste.

This act will not apply to-

1. Radioactive waste [as covered under Atomic Energy Act].
2. Hazardous chemicals covered under Hazardous Chemical Rules, 1989.
3. Solid waste covered under Municipal solid waste management & handling Rules, 2000.
4. Lead Acid Batteries [Management & Handling Rules, 2001].
5. Hazardous micro organisms genetically engineered micro organism & cell covered under Genetically Engineered Micro- Organism or Cells Rules, 1989.
6. Waste covered under the E-waste (Management and Handling) Rules, 2011.

These rules amended in year 2000. According to these rules 10 categories of biomedical waste with colour coding were decided. So it was very difficult to segregate the waste in such this much categories of waste in their respective colour coded bins/Bags.

In March 29th 2016 again another amendment was done that is known as “**THE BIOMEDICAL WASTE MANAGEMENT RULES, 2016**”.

In these rules several amendments have been done. Now only four categories of colour coding Yellow, Red, White/Transparent & Blue bags/bins are prescribed. So now it is quite easy to segregate & proper disposal of biomedical waste in a effective manner.

HEALTH FACILITIES AT MORENA DISTRICT

The total population of Morena district is about 22 lakhs (year-2021). There are one district hospital with one city dispensary and about 30 Nursing Homes, 3 Civil Hospital, 5 community health centres (CHCs) which render medical services to the public of Morena. There are 6 community health centres (CHCs), 18 primary health centres (PHCs), 196 Sub Health Centres. Apart from that there are 350 registered Allopathic, Pathology Labs, Dental Ayush, and Homeopathy Clinics with day care facility, the only blood bank is in District Hospital Morena. All these govt. & Private hospitals collect, segregate, store the BMW that is collected by a private agency from Agra for disposal as in prescribed manner. Health care centres perform vaccinations programmes at periphery areas Delivery & primary treatment is also done at Sub centres also. From sub centres the disposal of bio medical waste is done by deep burial. And there are more than 850 Quacks (Jhola chhap) are doing medical practices in rural as well as urban areas. Other than this various unauthorised & unregistered Labs & Clinic are running in the Morena District giving medical facility & producing biomedical waste in a large quantity. They do generate the biomedical waste in a large quantity but do not segregate, collect and dispose the waste in a prescribed manner. And throw the biomedical waste either in the domestic open drainage or in open field. During Covid-19 Pandemic millions of infected masks & gloves thrown by public in the open fields and drainage system. It can be hazardous because this could spread many types of dreaded infections to the other nearby healthy people. And with rain water toxins & infections form this waste can spread to larger area of field & can reach up to ground water.

S.No	Category of Hospital	No. of Hospitals	No. of Beds	Govt./Private
1.	District Hospital Morena	1	600	Govt.
2.	Civil Hospital (Morena & Sabalgarh)	3	150	Govt.
3.	Civil Dispensary Morena	1	20	Govt.
4.	Community Health Centres	6	150	Govt.
5.	Primary Health Centres	18	180	Govt.
6.	Sub Health Centres	196	----	Govt.
7.	Nursing Homes & Multi Speciality	30	550	Private
8.	Clinics (Allopathy, Dental, Ayurved & Homeopathy)	250	Day care centres	Private
9.	Ayurvedic Hospital Morena	1	20	Govt.
10.	Blood Banks	1	-----	One Red cross & one Private
11.	Veterinary Hospital at district as well as block level	1+8	----	Govt.
12.	Pet Clinics	No data	No data	Private
13.	Pathology Labs	30	-----	Private
14.	Quacks	More than 850	Day care	Private

Management of Bio-Medical waste

If the bio-medical waste is not managed properly & along with municipal waste it is dumped in the municipal dumping pits or trenches then it can increase the air, ground & water pollution by its infectious & toxic nature. This can again increase the possibility of acquiring many untreatable diseases like HIV, HB-B, HBC etc. The steps in the management of biomedical waste include generation, accumulation, handling, storage, treatment, transport and disposal.

Treatment and disposal of BMW

Treatment Modalities:-

The goals of biomedical waste treatment are to reduce or eliminate the waste's hazards, and usually to make the waste unrecognizable. Treatment should render the waste safe for subsequent handling and disposal. There are several treatment methods that can accomplish these goals.

1. **Autoclave:-** An autoclave uses steam and pressure [15psi] for 45 minutes to sterilize the waste or reduce its microbiological load to a level at which it may be safely disposed of many healthcare facilities routinely use an autoclave to sterilize medical supplies.
2. **Incinerator:-** Incineration is a waste treatment process that involves the combustion of organic substances at very high temperature contained in waste materials. Incineration and other high temperature waste treatment systems are described as "thermal treatment". Incineration of waste materials converts the waste into ash, flue gas and heat.
3. **Deep Burial:-** Disposal by deep burial is permitted only in rural or remote areas where there is no access to common bio-medical waste treatment facility. This will be carried out with prior approval from the prescribed authority, but this method is not much eco friendly because many toxins & infectious agents may sweep in the nearby water body like pond or river & may infect them. And some toxins & infectious material with rain water may sweep down to infect the ground water.
4. **Boiling:-** This plastic material I.V. set & other plastic catheters etc. can be sterilized by boiling at 120 degree Celsius for at least 1 hour, but even after this few bacteria's & their spores can survive at high temperature.
5. **Treatment with sodium hypochlorite solution:-** The floor is cleaned and mopped with 10% sodium hypochlorite solution and the surgical instruments are also treated by sodium hypochlorite solution 10% for 10 minutes & then wash in running Tap water.
6. **Covid-19 waste:-** Infected PPE kit, masks & gloves are kept in a separate yellow bag for 72 hours then after threading & shredding this solid waste bags to be tied securely in leak-proof bags, sprayed with sodium hypo-chlorite solution and hand over to authorized waste collector of ULB's on daily basis. The (inner and outer) surface of containers/bins/trolleys used for storage of COVID-19 waste should be disinfected with 1% sodium hypochlorite solution daily.

Every state has state pollution control board under which all the health cares providers, Research labs, Genetic labs, diagnostic centres are registered. This body is meant for effective management & handling of Bio-medical waste in the state.

Rules:-

A. Generation

- (1) Bio-medical waste shall be treated and disposed of in accordance with schedule.
- (2) The lab and highly infectious bio-medical waste generated shall be pre-treated by equipment like autoclave or microwave.
- (3) No occupier (generator) shall establish onsite treatment and disposal facility, if a service of common bio-medical waste treatment facility is available at a distance of 75KM.
- (4) In cases where service of the common bio-medical waste treatment facility is not available, the Occupiers (generator) shall setup requisite bio-medical waste treatment.
- (5) After mutilation or shredding, whichever is applicable, the recyclables from the treated bio-medical wastes such as plastics and glass shall be given to such recyclers having valid authorisation or registration from the respective prescribed authority.

(6) The handling and disposal of all the mercury waste and lead waste shall be in accordance with the respective rules and regulations.

B. Segregation, packaging, transportation and storage:-

(1) No untreated bio-medical waste shall be mixed with other wastes.

(2) The bio-medical waste shall be segregated into different coloured containers or bags at the point of generation in accordance with schedule I prior to its storage, transportation, treatment and disposal.

(3) Untreated human anatomical waste animal anatomical waste, soiled waste and biotechnology waste shall not be stored beyond a period of 48 hours.

(4) Microbiology waste and all other clinical laboratory waste shall be pre-treated by sterilization as per WHO guidelines before sending them to common biomedical waste treatment facility [Incinerator].

(5) Treatment with sodium hypochlorite solution- the floor is cleaned and mopped with 10% sodium hypochlorite solution and the surgical instruments are also treated by sodium hypochlorite solution 10% for 10 minutes & then wash in running Tap water.

Schedule:- I

COLOUR CODING AND TYPE OF CONTAINER FOR DISPOSAL OF BIO-MEDICAL WASTES

Colour Coding of bags/Bins	Type of Waste	Treatment options
Yellow Bag/Bin	<ol style="list-style-type: none"> Human & Animal body parts, organs, Tissues, blood & other body fluids dressings, swabs & foetus below viability period, etc. Expired or Discarded medicine. Chemical waste includes discarded disinfectant, infected secretions, aspirated body fluids and liquids from laboratories and floor washings, cleaning and housekeeping. Discarded linen, beddings contaminated with blood or body fluids. 	<ol style="list-style-type: none"> Incineration or Plasma Pyrolysis or deep burial. Expired cytotoxic drugs and items returned back to the supplier or the manufacturer for incineration. The chemical liquid waste should be pre-treated before mixing with other waste water.
Red Bag/Bins	Contaminated Waste (Recyclable)- Waste generated from disposable items such as tubing's, bottles, I.V. Sets, urine bags, syringes etc.	By autoclaving or microwaving/hydroclaving followed by shredding.
White bag/bins(Transparent)	It includes needles, syringes with fix needles, blades, scalpels or any other contaminated sharp object which may cause puncture or cuts.	Autoclaving or dry heat sterilization followed by shredding or mutilation or encapsulation in metal container and sent for final disposal for recycling plant.
Blue bag/bins	Glassware-Broken or discarded and contaminated glass including medicine vials and ampoules.	Disinfection by cleaning with detergents and sodium hypochlorite treatment or
		autoclaving or microwaving and sent for recycling.
Separate Yellow Bag For Covid-19	PPE kit, masks & gloves etc.	Kept for 3 days then after shredding & threading

		disposed with biomedical waste.
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Conclusion:-

Since environment pollution has become a major concern with respect to the future of life on our planet. It is legal duty of the management of the health care institution & Research centres to ensure that bio-medical waste are managed properly, without putting extra burden on health care staff in their duties and causing any adverse impacts on human health or environment. Based on the results the following suggestions were listed as follows:

- The doctors and nurses should take the responsibility to classify correctly the bio-medical waste at the source, which allows subsequent waste segregation to occur properly.
- Telecast Public awareness programme regarding Bio Medical Waste on Electronic mass media and make a joint effort with Swachh Bharat Abhiyan.
- Give training to all the health workers at periphery areas by regular training Programme regarding Covid-19 guidelines collection, Segregation, Transport, & Disposal of Bio medical waste. Recruits Nodal officer to keep watch on all the health care bodies.
- According to 2016 rules, the distance of incinerator should not be more than 75KM. But Bio Medical waste from Morena after collection is transported to Agra. It is about 95KM. So an Incinerator plant should be established at Morena head quarter, so from all the blocks of Morena can dispose their Bio medical waste in an effective manner.
- The quacks that are practicing at Rural as well as in urban areas are not aware about proper disposal of waste. Therefore, the Govt./CPCB should start awareness programme and training for effective implementation of bio-medical waste disposal and handling rules, 2016 and Revision-4 for Covid-19 guidelines 2021 for Covid-19 related waste management.
- Each step of waste management can be evaluated by methodical examination of all the regulated medical waste by a waste audit.
- Waste minimizing activities such as waste reduction, reuse and recycling should be adopted for beneficial and safe waste management.
- Bio-medical waste management should be connected with Swachh Bharat Abhiyan to make better public awareness. And this could be a very effective way to control generation, recycling and effective management of bio-medical waste.
- All people in health care establishment should be made aware of the potential risk of mishandling of hospital waste by conducting training programmes.
- It is firmly believed that collective community effort rather than individual attempts would make handling and disposal of bio-medical waste economically and operationally viable.

Citation:-

1. **Data from district hospital, Morena**
2. **“BIO-MEDICAL WASTE MANAGEMENT AND HANDLING RULES, 1998”**
3. **“BIO-MEDICAL WASTE MANAGEMENT AND HANDLING RULES, 2000” (Amendment)**
4. **“BIO-MEDICAL WASTE MANAGEMENT AND HANDLING RULES, 2016”**
5. **Guidelines for Handling, Treatment, and Disposal of Waste Generated during Treatment/Diagnosis/ Quarantine of COVID-19 Patients – Revision 4**


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