International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

Hospital Waste Management and its Impact

Dr. Gangadhar[1], M. Sajjanar[2]

Associate Professor in Zoology, Shri Vijay Mahantesh Arts, Science & Commerce College, Ilkal-587125, Karnataka, India

Abstract: ***All human activities produce waste. We all know that such waste may be dangerous and needs safe disposal. Industrial waste, sewage and agricultural waste pollute water, soil and air. It can also be dangerous to human beings and environment. Similarly, hospitals and other health care facilities generates lots of waste which can transmit infections, particularly HIV, Hepatitis B& C and Tetanus, to the people who handle it or come in contact with it.***

Keywords: Safe Disposal, Industrial Waste, Sewage, Agricultural Waste, Environment

1. Introduction

Most countries of the world, especially the developing nations, are facing the grim situation arising out of environment pollution due to pathological waste arising from increasing population and consequent rapid growth in the number of health care centers. India is no exception to this and it is estimated that there are no more than 15, 000small and private hospitals and nursing homes in the country. This is apart from clinics and pathological labs, which also generate sizeable amount of medical waste.

India generates around three million tones of medical waste every year and the amount is expected to grow at eight percent annually. Creating large dumping grounds and incinerators in the first step and some progressive states such as Maharastra, Karnataka and TamilNadu are making efforts despite opposition.

Barring a few large private hospitals in metros, none of the other smaller hospitals and nursing homes have any effective system to safely dispose of their wastes. With no care or caution, these health establishments have been dumping waste in local municipal bins or even worse, out in the open. Such irresponsible dumping has been promoting unauthorized reuse of medical waste by the rag pickers for some year now.

Surveys carried out by various agencies show that the health care establishments in India are not giving due attention to their waste management. After the notification of the Bio-medical Waste (Handling and Management) Rules, 1998, these establishments are slowly streamlining the process of waste segregation, collection, treatment, and disposal. Many of the larger hospitals have either installed the treatment facilities or are in the process of doing so.

Bio-Medical Waste
Bio-medical waste means any solid and/or liquid waste including its container and any intermediate product, which is generated during the diagnosis, treatment or immunization of human beings or animals. Biomedical waste poses hazard due to two principal reasons - the first is infectivity and other toxicity.

Types of Biomedical Waste
- Human anatomical waste like tissues, organs and body parts
- Animal wastes generated during research from veterinary hospitals
- Microbiology and biotechnology wastes
- Waste sharps like hypodermic needles, syringes, scalpels and broken glass.
- Discarded medicines and cytotoxic drugs.
- Soiled waste such as dressing, bandages, plaster casts, material contarninated with blood, tubes and catheters.
- Liquid waste from any of the infected areas.
- Incineration ash and other chemical wastes.

Legal Aspect
The Central Government, to perform its functions effectively as contemplated under sections 6, 8, and 25 of the Environment Protection Act, 1986, has made various Rules, Notifications and Orders including the Bio-medical wastes (Management & Handling) Rules, 1998.A brief summary of the provisions in Bio-medical wastes (Managernent & Handling) Rules, 1998 is given below.
- Section 3 establishes the authority of the government to undertake various steps for protection and improvement of the environment.
- Section 5 provides for issuance of directions in writing
- Section 6 empowers the government to make rules.
- Section 8 permits the education of individuals dealing with hazardous wastes regarding various safety measures.
- Section 10 bestows authority to enter the premises and inspect.
- Section 15 allows the government to take punitive steps against defaulters. This involves imprisonment up to five years or penalty of up to rupees one lakh or both. In case the default continues, it would then attract a penalty of rupees five thousand per day up to one year and thereafter imprisonment up to seven years.
- Section 17 provides for punishment in case of violations by government departments.

Even after the June, 2000 deadline most of the large hospitals have not complied with these Rules, as there is no specified authority to monitor the implementation of these Rules. But, the fact is that in most of the states, the pollution control boards that are connected with waste in general do not have adequate powers or commitment to enforce the Rules.

Applicability of BMW Rules, 1998
The BMW Rules are applicable to every occupier of an institution generating biomedical waste which includes a

hospital, nursing homes, clinic, dispensary veterinary institutions, animal houses, pathological lab, blood bank by whatever name called, the rules are applicable to even handlers.

Common Bio- medical wastes treatment facility (CBWTFs)

The Common Biomedical wastes treatment facility, (see rules 14, amended in June 2000, which cast the responsibilities on municipal bodies to collect biomedical wastes/ treated biomedical wastes and also provide sites for setting up of incinerator.) The owners of CBWTFs are service providers, who are providing services to health care units for collection of BMWs for its final disposal to their site.

Example: Inventory of Tamilnadu

The Tamilnadu Pollution Control Board enforces the biomedical Waste (Management and Handling) Rules, 1998 as amended in 2000. As part of this process, the Board has so far inventoried 317 Government hospitals and 1, 835 private hospitals. The Board has issued directions to the Government and private hospitals to take time-bound action for identifying sites and setting up common facilities for management of biomedical wastes in coordination with the Indian Medical Association.

So far 11 sites have been identified for the above said purpose.

The components of a common biomedical waste treatment and disposal facility [CBWTFs] are autoclave, shredder, compactor, and incinerator for anatomical waste, secured landfill facility, laboratory and vehicles for transportation of wastes.

The biomedical waste (BMW) management requires its categorization as a first step. The BMW Rules classify the BMW into ten categories.

Categories of Biomedical Waste Schedule - I

Waste Category	*Type Of Waste*	*Treatment And Disposal Option*
Category No. 1	Human Anatomical Waste (Human tissues, organs, body parts)	Incineration @ / deep burial*
Category No. 2	Animal Waste (Animal tissues, organs, body parts, carcasses, bleeding parts, fluid, blood and experimental animals used in research waste generated by veterinary hospitals and colleges, discharge from hospitals, animal houses)	Incineration @/ deep burial*
Category No. 3	Microbiology & Biotechnology Waste (Wastes from laboratory cultures, stocks or specimen of live micro organisms or attenuated vaccines, human and animal cell cultures used in research and infectious agents from research and industrial laboratories, wastes from production of biological, toxins and devices used for transfer of cultures)	local autoclaving/ microwaving/incineration@
Category No. 4	Waste Sharps (Needles, syringes, scalpels, blades, glass, etc. that may cause puncture and cuts. This includes both used and unused sharps)	Disinfecting(chemical treatment@@ / autoclaving /microwaving and mutilation / shredding##
Category No. 5	Discarded Medicine and Cytotoxic drugs (Wastes comprising of outdated, contaminated and discarded medicines)	Incineration@ / destruction and drugs disposal in secured landfills.
Category No. 6	Soiled Waste (Items contaminated with body fluids including cotton, dressings, soiled plaster casts, lines, bedding and other materials contaminated with blood.)	Incineration @ / autoclaving /microwaving.
Category No. 7	Solid Waste (Waste generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets, etc.)	Disinfecting by chemical treatment@@ / autoclaving /microwaving and mutilation/ shredding# #
CategoryNo.8	Liquid Waste (Waste generated from the laboratory and washing, cleaning, house keeping and disinfecting activities.)	Disinfecting by chemical treatment@@and discharge into drains.
Category No. 9	Incineration Ash (Ash from incineration of any biomedical waste)	Disposal in municipal land fill.
Category No.l0	Chemical Waste (Chemicals used in production of biological, chemicals used in disinfecting, as insecticides, etc.)	Chemical treatment @@ and discharge into drains for liquids and secured landfill for solids.

@@ chemical treatment using at least I % hypochlorite solution or any other equivalent chemical reagent It must be ensured that chemical treatment ensures disinfection.

** Mutilations / Shredding must be such as to prevent unauthorized reuse.

@ There will be no chemical pre-treatment before incineration. chlorinated plastics shall not be incinerated.

* Deep burial shall be an option available only in towns with population less than five lakh and in rural areas.

Colour Coding and Type of Container Schedule- II

Colour Coding	Type of Container	Waste Category	Treatment options as per Schedule –I
Yellow	Plastic bag	Cat.l, Cat.2, Cat.3 and Cat.6	Incineration/ deep burial
Red	Disinfected container/plastic bag	Cat.3, Cat.6, and Cat.7	Autoclaving/Micro waving/ Chemical Treatment.
Blue/White Translucent	Plastic Bag/puncture Proof container	Cat.4 andCat7.	Autoclaving/Microwaving/Chemical Treatment and destruction/ shredding.
Black	Plastic bag	Cat.5, Cat.9, and Cat.10 (solid)	Disposal in secured landfill.

Notes:

- Colour coding of waste categories with multiple treatment options as defined in Schedule I, shall be selected depending on treatment option chosen, which shall be specified in Schedule I.
- Waste collection bags for waste types needing incineration shall not be made of chlorinated plastics.
- Categories 8 and 10 (liquid) do not require containers/bags.
- Category 3 if disinfected locally need not be put in containers /bags.

Segregation

Segregation refers to the basic separation of different categories of waste generated at source and thereby reducing the risks as well as cost of handling and disposal. Segregation is the most crucial step in bio-medical waste management. Effective segregation alone can ensure effective bio-medical waste management. The BMWs must be segregated in accordance to guidelines laid down under schedule I of BMW Rules, 1998.

How does Segregation Help?

- Segregation reduces the amount of waste needs special handling and treatment.
- Effective segregation process prevents the mixture of medical waste like sharps with the general municipal waste.
- Prevents illegally reuse of certain components of medical waste like used syringes, needles and other Plastics.
- Provides an opportunity for recycling certain components of medical waste like plastics after proper and thorough disinfection.{o Recycled plastic material can be used for non-food grade applications.
- Of the general waste, the biodegradable waste can be composted within the hospital premises and can be used for gardening purposes.
- Recycling is a good environmental practice, which can also double as a revenue generating activity.
- Reduces the cost of treatment and disposal (80 per cent of a hospital's waste is general waste, which does not require special treatment, provided it is n6t contaminated with other infectious waste)

Proper Labelling of BINS

The bins and bags should carry the biohazard symbol indicating the nature of waste to the patients and public. Schedule III (Rule 6) of Bio-medical Waste (Management and Handling) Rules, 1998 specifies the Label for Bio-Medical Waste Containers / Bags as:

Label shall be non-washable and prominently visible.

Collection

The collection of biomedical waste involves use of different types of container from various sources of biomedical wastes like Operation Theatre, laboratory wards, kitchen, corridor etc. The containers/ 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 and infection to the workers handling them.

Storage

Once collection occurs then biomedical waste is stored in a proper place. Segregated wastes of different categories need to be collected in identifiable containers. The duration of storage should not exceed for 8-10 hrs in big hospitals (more than 250 bedded) and24 hrs in nursing homes. Each container may be clearly labeled to show the ward or room where it is kept. The reason for this labeling is that it may be necessary to trace the waste back to its source. Besides this, storage area should be marked with a caution sign.

Transportation

The waste should be transported for treatment either in trolleys or in covered wheelbarrow. Manual loading should be avoided as far as for as possible. The bags / Container containing BMWs should be tied/ lidded before transportation. Before transporting the bag containing BMWs, it should be accompanied with a signed document By Nurse/ Doctor mentioning date, shift, quantity and destination. Special vehicles must be used so as to prevent access to, and direct contact with, the waste by the transportation operators, the scavengers and the public. The transport containers should be properly enclosed. The effects of traffic accidents should be considered in the design, and the driver must be trained in the procedures he must follow in case of an accidental spillage. It should also be possible to wash the interior of the containers thoroughly.

Personel Safety Devices

The use of protective gears should be made mandatory for all the personnel handling waste.

- **Gloves:** Heavy-duty rubber gloves should be used for waste handling by the waste retrievers. This should be bright yellow in colour. After handling the waste, the gloves should be washed twice. The gloves should be washed after every use with carbolic soap and a disinfectant. The size should fit the operator.
- Aprons, gowns, suits or other apparels: Apparel is worn to prevent contamination of clothing and protect skin. It could be made of cloth or impermeable material such as plastic. People working in incinerator chambers should have gowns or suits made of non- inflammable material.
- **Masks:** Various types of masks, goggles, and face shields are worn alone or in combination, to provide a protective barrier. It is mandatory for personnel working' in the incinerator chamber to wear a mask covering both nose and mouth, preferably a gas mask with filters.
- **Boots:** Leg coverings, boots or shoe-covers provide greater protection to the skin when splashes or large quantities of infected waste have to be handled. The boots should be rubber-soled and anti-skid type. They should cover the leg up to the ankle.

Cleaning Devices

- **Brooms:** The broom shall be a minimum of 1.2 rn long, such that the worker need not stoop to sweep. The diameter of the broom should be convenient to handle. The brush of the broom shall be soft or hard depending on the type of flooring.
- **Dust pans:** The dustpans should be used to collect the dust from the sweeping operations. They may be either of plastic or enameled metal. They should be free of ribs and should have smooth contours, to prevent dust from

sticking to the surface. They should be washed with disinfectants and dried before every use.

- **Mops:** Mops with long handles must be used for swabbing the floor. They shall be of either the cloth or the rubber variety. The mop has to be replaced depending on the wear and tear. The mechanical-screw type of mop is convenient for squeezing out the water.
- **Vacuum cleaners:** Domestic vacuum cleaners or industrial vacuum cleaners can be used depending on the size of the rooms.

Storage Devices

Dustbins: It is very important to assess the quantity of waste generated at each point. Dustbins should be of such capacity that they do not overflow between each cycle of waste collection. Dustbins should be cleaned after every cycle of clearance of waste with disinfectants. Dustbins can be lined with plastic bags, which are chlorine-free, and colour coded as per the law.

Handling Devices

Trolleys.' The use of trolleys will facilitate the removal of infectious waste at the source itself, instead of adding a new category of waste. Wheel barrows.' Wheel barrows are used to transfer the waste from the point source to the collection centers. There are two types of wheelbarrow-covered and open. Wheel barrows are made of steel and provided with two wheels and a handle. Care should be taken not to directly dump waste into it. Only packed waste (in plastic bags) should be carried. Care should also be taken not to allow liquid waste from spilling into the wheelbarrow, as it will corrode. These are ideal for transferring debris within the institution. Wheel barrows also come in various sizes depending on the utility.

Chutes: Chutes are vertical conduits provide, il for easy transportation of refuse vertically in case of institutions with more than two floors. Chutes should be fabricated from stainless steel. It should have a self-closing lid. These chutes should be fumigated everyday with formaldehyde vapors. The contaminated linen (contaminated with blood and or other body fluids) from each floor should be bundled in soiled linen or in plastic bags before ejecting into the chute.

Alternately, elevators with mechanical winches or electrical winches can be provided to bring down waste containers from each floor. Chutes are necessary to avoid horizontal transport of waste thereby minimizing the routing of the waste within the premises and hence reducing the risk of secondary contamination.

Treatment: Technology options for treatment

There are mainly five technology options available for the treatment of Bio-Medical Waste or still under research can be grouped as:

1. Chemical processes
2. Thermal processes
3. Mechanical processes
4. Irradiation processes
5. Biological processes

Different Types of BMW according to WHO

The World Health Organization (WHO) has classified medical wastes according to their weight, density and constituents into different categories. These are Infectious, Radioactive, Others

Health Hazards

According to the WHO, the global life expectancy is increasing year after year. However, deaths due to infectious disease are also increasing. A study conducted by the WHO reveals that more than 50, 000 people die everyday from infectious diseases. One of the causes for the increase in infectious diseases is improper waste management. Blood, body fluids and body secretions which are constituents of bio-medical waste harbor most of the viruses, bacteria and parasites that cause infection.

Hazards to the general public

- Improper practices such as dumping of bio-medical waste in municipal dustbins, open spaces, water bodies etc., leads to the spread of diseases.
- Emissions from incinerators and open burning also lead to exposure to harmful gases which can cause cancer and respiratory diseases.
- Exposure to radioactive waste in the waste stream can also cause serious health hazards.
- An often-ignored area is the increase of in-home healthcare activities. An increase in the number of diabetics who inject themselves with insulin, home nurses taking care of terminally ill patients etc., all generate bio-medical waste, which can cause health hazards.
- Bio-medical waste can cause health hazards to animals and birds too.

What you can do?

- Use only disposable syringes. After use throw the syringes after breaking them.
- Bandages, cotton and other blood stained materials should not be thrown with general garbage.
- Use black plastic bags to dispose biomedical wastes.
- Keep trash out of reach of small children and infants.
- Diapers, sanitary napkins etc. should also be disposed separately.
- Drugs that are past date of expiry must never be used.

2. Conclusion

We need innovative and radical measures to clean up the distressing picture of lack of civic concern on the part of hospitals and slackness in government implementation of bare minimum of rules, as waste generation particularly biomedical waste imposes increasing direct and indirect costs on society. The challenge before us, therefore, is to scientifically manage growing quantities of biomedical waste that go beyond past practices. If we want to protect our environment and health of community we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of community.

References

[1] Alfred, J.R.B., 1990. Conservation and Management of the environment. ZSI, Calcutta.
[2] Henning, D.H. & Mangum, W.R., 1989.
[3] Managing the Environmental crisis Durham university press, Durham & London.