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Biomedical Waste Management

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Usha Kiranmai*[1], Ravali J[2]

*[1,2]*University College of Pharmaceutical Sciences, Kakatiya University, India.*

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ABSTRACT

This review study involves:

Biomedical Waste, Management (BMW) rules in India.

Different categories of medical waste (MW).

Steps and process in the treatment of MW.

Practices of managing and treating MW.

BMW generation during COVID-19.

BMW and PW generation from vaccination centers.

Environmental and health hazards due to improper BWM.

INTRODUCTION

A vast amount of waste is generated in healthcare, research, testing or related procedures on human beings or animals conducted in hospitals, clinics, labs or similar establishments. This waste is called **BIOMEDICAL WASTE**. As per the World Health Organization (WHO) and the European Union (EU), Healthcare waste is defined as any by-product that is used for the diagnosis and treatment of animals and human beings in healthcare organizations and health facilities such as radioactive material, needles, blood samples, syringes, dressing, and parts of the body, acids and chemicals, pharmaceuticals. According to a WHO report, HCW in developing countries is often not adequately segregated, thereby making the actual amount of BMW much higher (WHO 2018; Nzediegwu and Chang 2020). As per WHO approximately half a kg/bed of healthcare waste is generated in high-income countries. It has a huge negative impact on public health as well as on the environment.

Daily biomedical waste (BMW) produced in India is enormous. People from all segments of society, regardless of age, sex, ethnicity, or religion, visit hospitals, which results in the production of BMW, which is becoming increasingly copious and heterogeneous. India produces 600 metric tonnes of biomedical waste every day. Approximately 1- 2kg/bed/day of biomedical waste is generated. The COVID-19 pandemic has now transformed healthy societies worldwide into diseased ones, resulting in a very high number of deaths. It also created one significant problem: improper handling of the medical waste produced in the testing and treatment of the disease. In India, BMW generated due to COVID-19 contributed to about 126 tonnes per day out of the 710 tonnes of waste produced daily.

BMW includes anatomical waste, sharps, laboratory waste, and others and, if not carefully segregated, can be fatal. Moreover, inappropriate segregation of dirty plastic, a cytotoxic and recyclable material, might harm our ecosystem. Improper disposal leads to severe hospital-acquired diseases along with an increased risk of air and water pollution. Due to open-space waste disposal practices, animals and scavengers might get infected, leading to the scattering of waste and the spreading of infections. Earlier, BMW was not considered a threat to humans and the environment. In the 1980s and 1990s, fears about contact with infectious microorganisms such as human immunodeficiency virus (HIV) and hepatitis B virus (HBV) prompted people to consider the potential risks of BMW. Very serious environmental and health hazards can be triggered if hospital waste is mixed with normal garbage, which can lead to poor health and incurable diseases such as AIDS. BMW threatens the health of medical staff, hospital-visiting patients, and people in the nearby community. Proper management of biomedical waste is of utmost public health importance. Statutory health care regulations of BMW management and careful supervision of their compliance cannot achieve the final goal unless they are supplemented by an approach of education, inspiration, and attitude change in all hierarchies of health practitioners. An effective and successful BMW management program is primarily dependent on healthcare personnel's knowledge, attitude, and practices. Management includes all steps required to ensure that biomedical waste is managed in such a manner to protect health and the environment against any adverse effects due to the handling of such waste. India has well-established rules for the proper handling and management of BMW. On July 20, 1998, BMW (Management and Handling) Rules were framed. Biomedical Waste Management and Handling Rule 1998, prescribed by the Ministry of Environment and Forest, Government of India came into force on 28th July 1998. On March 28, 2016, under the Environment (Protection) Act, 1986, the Ministry of Environment and Forest (MoEF) implemented the new BMW Rules (2016) and replaced the earlier one (1988).

EXPLANATION

Medical waste is classified as hazardous due to its radioactivity and toxicity, which amounts to around fifteen to twenty percent of all medical waste generated. However, the classification of medical waste varies in different countries, resulting in the unavailability of a specific management process for medical waste management. This lack of clarity in medical waste classification needs to be addressed to ensure proper and safe disposal of hazardous medical waste. Medical waste has direct and indirect effects on human health as well as the environment and source of pollution. This medical waste is generated in hospitals, pathology labs, and pharmaceutical industries.

On the contrary municipal solid waste is called non-hazardous medical waste **(NHMW).** Hazardous medical wastes (**HMW)** cause different infections if it is ineffectively managed. In addition, this HMW is also harmful to air, water, trees, and animals.

The quantity of general (non-hazardous) waste is 70–80% of total waste generated by healthcare facilities (HCFs). Typical BMW generators are Health care facilities (HCFs), blood banks, clinics, hospitals, nursing homes, research institutions, treatment units, etc.

Healthcare waste is a unique category of waste by its composition, source of generation, hazardous nature, and the need for appropriate protection during handling, treatment, and disposal. According to WHO, Healthcare Waste is categorized as:

1. General waste (Non-infectious waste) (80%),

2. Biomedical waste (Pathological and infectious waste) (15%) and

3. Other waste (5%) (Radioactive, cytotoxic, chemical and pharmaceutical waste 3% + Heavy metals 1% + Sharps 1%)

Although solid waste management has become one of the major topics of importance but still local bodies are unable to give proper attention to some special sources of waste out of which biomedical waste is one. The sources of biomedical waste can be categorized as primary and secondary sources according to the quantities produced (Table 1).

Table 1: Classification of Biochemical Waste

Primary sources		**Secondary sources**
Hospital	Medical College	Clinic
Nursing Home	Immunization centers	Ambulance Service
Dispensaries	Nursing Homes	Home treatment
Maternity home	Animal research centers	Slaughterhouses
Dialysis center	Blood bank	Funeral Service
Research Lab	Industries	Educational institutes

In India, BMW is managed according to BMW Management Rules, 2016.Biomedical Waste Management and Handling Rule 1998, consisted of **10 categories** of BMW. The act is now superseded by BMW Rules 2016, amended in 2018 and 2019 which classifies biomedical waste into four **color-coded categories**.

According to BMW and Handling Rules 1998 of India, “biomedical waste is any waste produced during the diagnosis, treatment, or immunization of human beings or animals or in research activities pertaining to or in the production or testing of biologicals or in health camps”. It is critical that the different professionals engaged in the healthcare sector have adequate Knowledge, Attitudes, and Practices (KAP) with respect to BMW which will help in the competent disposal of the waste in their respective organizations. Many studies across the country have shown that there are still deficiencies in the KAP of the employees in different organizations and hence it is necessary to make an appraisal for the same.

The government of India has issued guidelines for the proper management of healthcare waste However, healthcare personnel's knowledge and perceived importance are crucial for its implementation. India has well-established rules for the proper handling and management of BMW. Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016) specify that every healthcare facility shall take all necessary steps to ensure that BMW is handled without any adverse effect on human and environmental health. New rules established in India are meant to improve the segregation, transportation, disposal methods and treatment of BMW.

LEGISLATIVE ASPECTS IN RELATION TO BIOMEDICAL WASTE

Various central legislations related to biomedical waste management in India are:

- The water (prevention and control of pollution)Act,1974
- The Air (prevention and control of pollution)Act,1981
- The Environment (Protection) Act,1986
- The hazardous waste (management and handling) rules,1998
- The Biomedical waste (management and handling) rules,1998
- Municipal Solid waste (management and handling) rules,2000
- The Biomedical Waste (management and handling)Rules & Amendment,2000 and2003
- The, Biomedical Waste (Management and Handling)Rules,2011[Draft].

It may be kept in mind that any person can report any alleged negligence in the Management and Handling of Biomedical Waste to the appropriate authority.

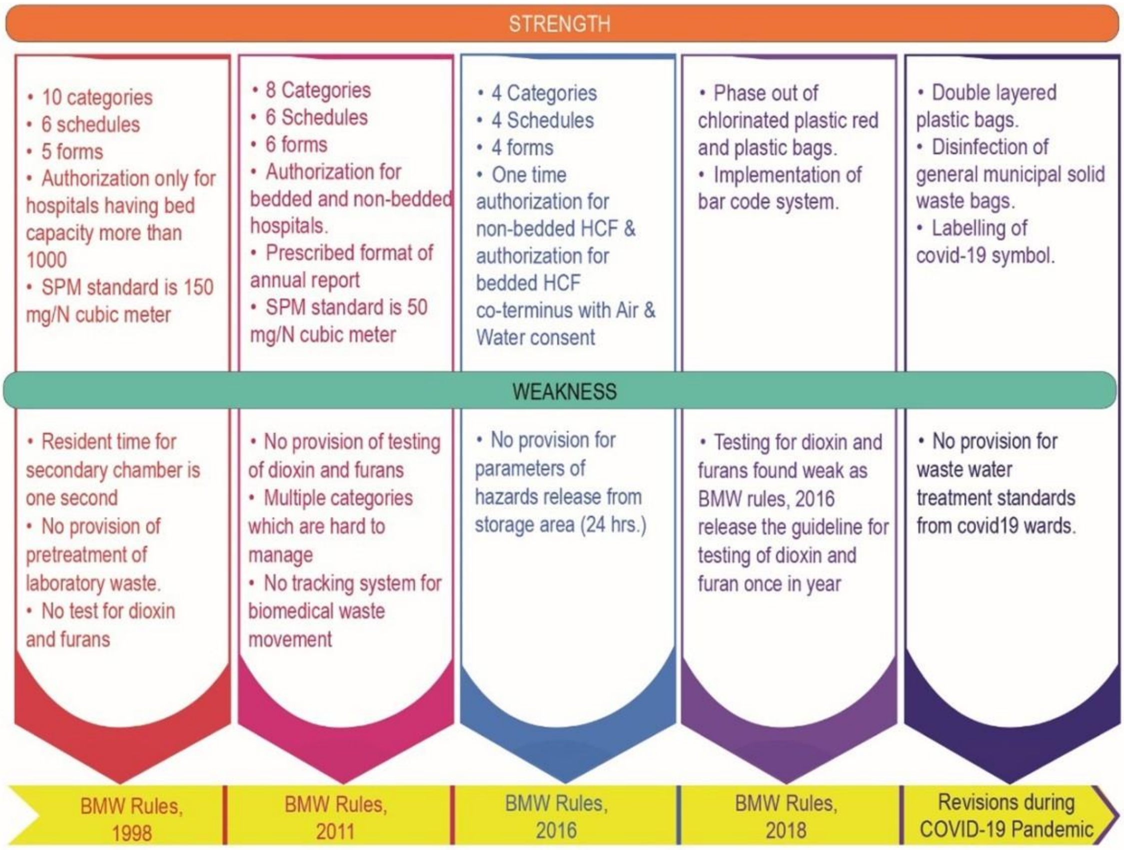

Figure 1: Progression of BMW management rules in India, including their key strengths and weakness

BMW MANAGEMENT RULES IN INDIA

On March 28, 2016, under the Environment (Protection) Act, 1986, the MoEF notified the new BMW Rules, 2016 and replaced the earlier Rules (1988). BMW goes through a new protocol or approach that helps in the appropriate management of waste, *i.e.*, its characterization, quantification, segregation, storage, transport and treatment, all of which aim to decrease environmental pollution. Problems with the improper management of BMW also shed light on the scavengers who, for recycling, segregate the potentially hazardous BMW without using gloves or masks. Strict rules have been implemented to ensure that there is no stealing of recyclable materials or spillage by some humans or animals and that it is transported to the common BMW treatment facility. The first solution to stop the spread of hazardous and toxic waste was incineration. Incineration is required in all hospitals and healthcare facilities that produce BMW. However, due to the absence of services that provide certified incinerators in a few countries, BMW has to be sent to landfills, which leads to land contamination and harms the environment. Incinerators used for disposal might also lead to environmental pollution. Numerous toxins are formed during incineration, which are the products of incomplete combustion. Thus, some new standards have been issued to resolve this problem and safeguard the environment and public health.

CLASSIFICATION OF WASTE

Different wastes are classified into different types, and therefore, they must be handled and disposed of according to their classification (Table 2).

Table 2: Category and Components of Biomedical waste

Category	Waste Content	Components	Method of treatment and disposal
Category No. 1	Human Anatomical Waste	Human tissues, organs and 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 colleges, discharge from hospitals, animal, houses	Incineration/deep burial
Category No3	Microbiology & BiotechnologyWaste	Wastes from laboratory cultures, stocks or specimens of micro-organisms live or attenuated vaccines, human and animal cell cultures used in research and infectious agents and industrial laboratories, wastes from the production of biologicals, from research toxins, dishes 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 punctures and cuts. This includes both used and unused sharps	Disinfection chemical treatment /autoclaving/microwaving and mutilation shredding
Category No. 5	Discarded Medicines and Cytotoxic drugs	Wastes comprising out dated, contaminated and discarded medicines	Incineration/destruction & drug disposal in secured land fills
Category No. 6	Solid Waste	Items contaminated with blood and body fluids including cotton, dressings, soiled plaster casts, lines, beddings, and other materials contaminated with blood	Incineration, autoclaving/ microwaving
Category No. 7	Solid Waste	Wastes generated from disposable items other than the waste sharps such as tubing, catheters, intravenous sets etc	Disinfection chemical treatment /autoclaving/microwaving and mutilation shredding
Category No. 8	Liquid Waste	Waste generated from laboratory and washing, cleaning, house keeping, and disinfecting activities	Disinfection by chemical treatment and discharge into drains
Category No. 9	Incineration Ash	Ash from incineration of any bio-medical waste	Disposal in municipal and fill
Category No. 10	Chemical Waste	Chemicals used in the production of biologicals, chemicals used in disinfection, insecticides etc	Chemical treatment and discharges into drains

Color coding for segregation of BMW

Color coding is the **first step** of BMW management. The bins used for waste disposal in all healthcare facilities worldwide are always color-coded. Based on the rule of universality, bins are assigned a specific color, according to which the waste is segregated. This step helps avoid the chaos that occurs when all types of waste are jumbled, which can lead to improper handling and disposal and further result in the contraction of several diseases. All types of waste are segregated in different colored bins and sent for treatment (Table 3).

Yellow bins: collect anatomical waste, infectious waste, chemical waste, laboratory waste, and pharmaceutical waste, covering almost all types of BMW.

Red bins: collect recyclable contaminated wastes, and non-chlorinated plastic bags are used for BMW collection.

Blue containers: Collect hospital glassware waste such as vials and ampoules.

White bins: These are translucent where discarded and contaminated sharps are disposed of Sharp wastes must always be disposed of in puncture-proof containers to avoid accidents leading to handlers contracting diseases.

Table 3: Color Coding and Type of Container for Disposal of Bio-Medical Waste

Color of container	Type of Containers	Waste Category	Treatment options as per schedule I
Yellow	Plastic bag	1,2,3,6	Incineration/deep burial
Red	Disinfected Container	3,6,7	Autoclaving/Microwaving/Chemical Treatment
Blue/White Translucent	Plastic bag/puncture-Proof container	4,7	Autoclaving/Microwaving/chemical Treatment and destruction/shredding
Black	Plastic bag	5,9,10 (Solid)	Disposal in a secured and fill

BMW MANAGEMENT

BMW management refers to completely removing all the hazardous and infectious waste generated from hospital settings. The importance of waste treatment is to remove all the pathogenic organisms by decontaminating the waste generated. This helps in the prevention of many severe health-related issues that can be caused because of the infective waste. It is a method used to prevent all environmental hazards. BMW management methods aim predominantly to avoid the generation of waste and, if generated, then recover as much as possible.

Four major functions of BMW management are applicable:

- Placement of bins at the source of generation of BMW
- Segregation of BMW
- Removal or mutilation of the recyclable waste
- Disinfection of the waste.

The basic principle of the management of BMW is to **Reduce, Reuse and Recycle (3Rs).** Out of the total amount of BMW generated, 85% is general (non-hazardous) waste and the remaining 15% is hazardous.

BMW management needs to be organized, as even a single mistake can cause harm to the people in charge. There are six steps in the management of BMW: It is the step-wise process that starts from the generating point till safely disposed of. The following Figure 2 presents the complete process of managing medical waste (MW).

Surveying the waste produced, segregating, collecting, and categorizing the waste, storing, transporting, and treating the waste. Segregation is the separation of different types of waste generated, which helps reduce the risks resulting from the improper management of BMW. When the waste is simply disposed of, there is an increased risk of a mixture of waste such as sharps with general waste. These sharps can be infectious to the handler of the waste. Further, if not segregated properly, there is a huge chance of syringes and needles disposed of in the hospitals being reused. Segregation prevents this and helps in achieving the goal of recycling the plastic and metal waste generated. The collection of BMW involves the use of different colors of bins for waste disposal. The color is an important indicator for the segregation and identification of different categories of waste into suitable-colored containers. They must be labeled properly based on the place they have been generated, such as hospital wards, rooms, and operation theatres. It is also very important to remember that the waste must be stored for less than 8-10 hours in hospitals with around 250 beds and 24 hours in nursing homes. The storage bag or area must be marked with a sign.

The waste is then collected by the vehicles daily. A ramp must be present for easy transportation. The waste collected is then taken for treatment. The loading of wastes should not be done manually. It is vital to properly close or tie the bag or the container to avoid any spillage and harm to the handlers, the public, and the environment. The transport vehicle or trolley must be properly covered, and the route used must be the one with less traffic flow. BMW handling staff should be provided with personal protective equipment (PPE), gloves, masks, and boots. BMW retrievers must be provided with rubber gloves that should be bright yellow. After usage, the importance of disinfecting or washing the gloves twice should be highlighted.

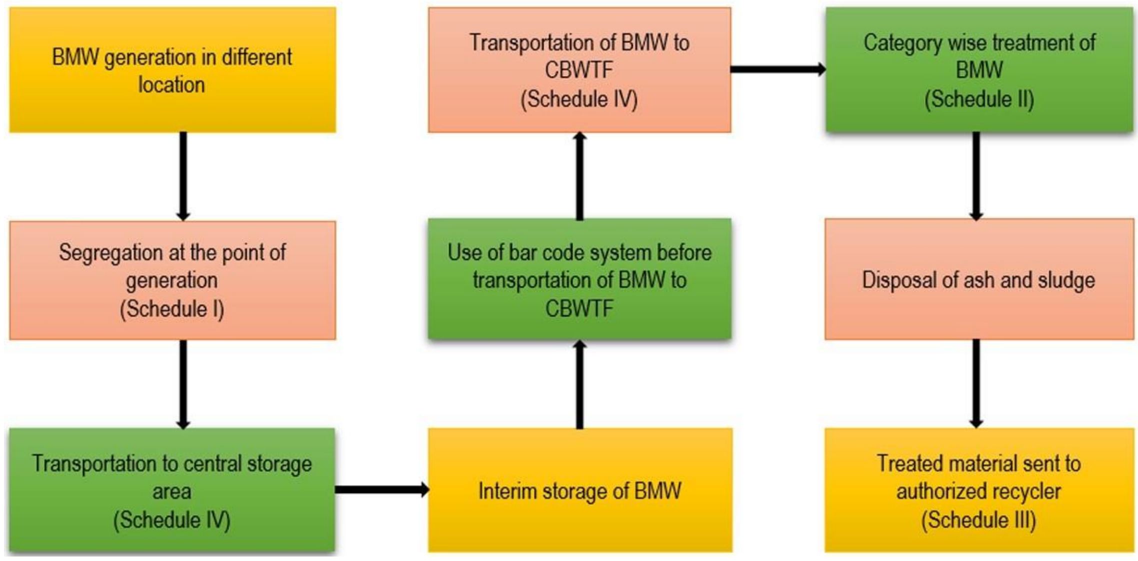

Figure 2: Steps in the management of BMW

The staff working in or near the incinerator chamber must be provided with a non-inflammable kit. This kit consists of a gas mask that should cover the nose and mouth of the staff member. The boots should cover the leg up to the ankle to protect from splashes and must be anti-skid.

According to the revised BMW management rules, 2016, it is mandatory to provide proper training to health care facility staff members on handling BMW. The training should be mandatorily conducted annually. Along with the management step of the red coding for segregation, it is also important for the staff to be trained in record keeping. This practice of record-keeping helps track the total amount of waste generated and the problems that occurred during the management process, thus helping improve segregation, treatment, and disposal.

METHODS FOR THE TREATMENT OF BMW

There are many methods that are used for the treatment of BMW.

One of the most economical ways of waste treatment is **incineration**, which is not just some simple "burning" but the burning of waste at very high temperatures ranging from 1800°F to 2000°F to decrease the total mass of decontaminated waste by converting it into ash and gases, which is then further disposed of in landfills.

Important instructions associated with the use of incinerators are as follows:

Chlorinated plastic bags must not be put inside the incinerators as they can produce dioxin. Metals should not be destroyed in an incinerator. The metals present in BMW are made of polyvinyl chloride. When these metals are burned, they produce a huge amount of dioxin. Dioxins are very toxic chlorinated chemical compounds, as dioxins, when released into the environment, can lead to environmental pollution and a higher incidence of cancer and respiratory manifestations.

Different bins and various types of sterilization methods are used depending on how hazardous the waste is. The best tools for sterilization are autoclaves. Autoclave is an alternate method of incineration. The mechanism of this process involved sterilization using steam and moisture. Operating temperatures and time of autoclaving are 121℃ for 20-30 minutes. The steam destroys pathogenic agents present in the waste and also sterilizes the equipment used in the healthcare facility. Autoclaving has no health impacts and is very cost-friendly. It is recommended for the treatment of disposables and sharps, but the anatomical, radioactive, and chemical wastes must not be treated in an autoclave.

Chemical methods are the commonest methods that include chemicals such as chlorine, hydrogen peroxide, and Fenton's reagent. They are used to kill the microorganisms present in the waste and are mainly used for liquid waste, such as blood, urine, and stool. They can also be used to treat solid waste and disinfect the equipment used in hospital settings and surfaces such as floors and walls.

Thermal inactivation is a method that uses high temperatures to kill the microorganisms present in the waste and reduce the waste generated in larger volumes. The temperature differs according to the type of pathogen present in the waste. After the treatment is done, the contents are then discarded into sewers.

REGULATORY FRAME WORK OF BMW MANAGEMENT

The BMW Management Rules, 2016 is the comprehensive regulatory framework followed by India. At HCFs, BMW is segregated into yellow, red, blue and white categories of waste. The yellow category is also called infectious waste or incinerable waste. Different treatment procedures are adopted for the four categories of waste.

The following Figure 3 shows the treatment techniques and the disposal methods adopted for the four categories of BMW.

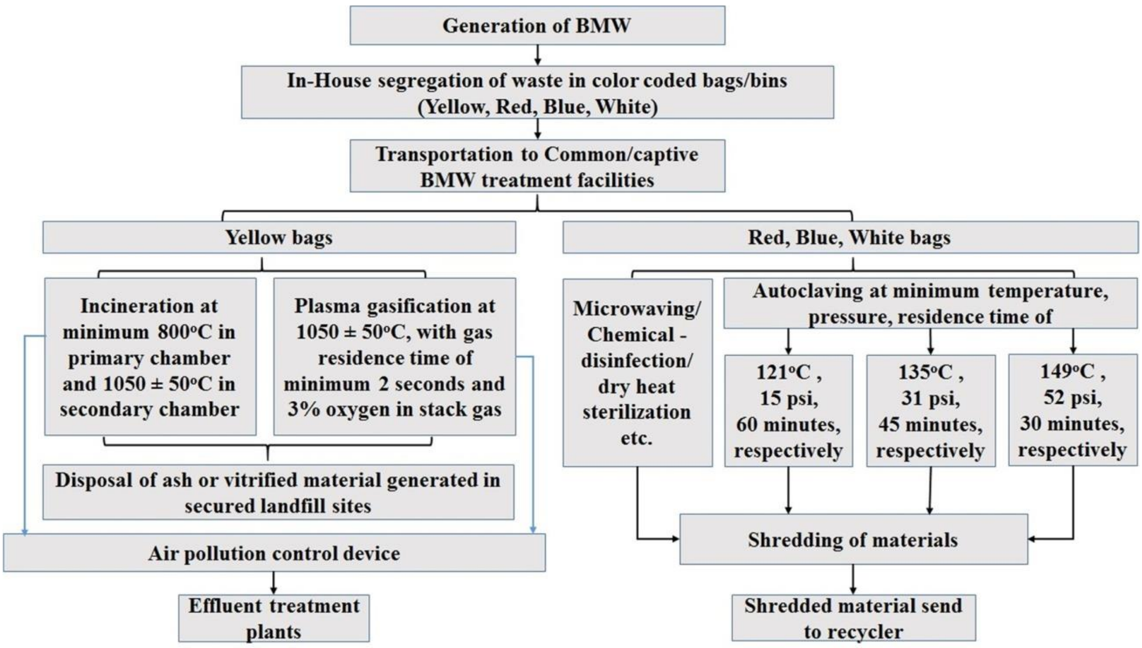

Figure 3: Regulatory framework of BMW management

COVID-19

Guidelines for the COVID-19 pandemic were introduced in 2020, emphasizing adequate BMW management to avoid community transmission of infectious diseases. On 11 March

2020, WHO declared COVID-19 as a pandemic due to global 2019 outbreak (Gowd *et al.*, 2021). During the pandemic, a sudden peak in the biomedical generation confused the authorities regarding waste management. The increase in admissions and isolation of COVID-19 patients led to an increase in the BMW generation rate. The newly revised guidelines have been issued by the Government of India regarding the COVID-19 BMW management and new framework (Kothari *et al.*, 2021).

The BMW generated during the pandemic needed safe disposal as the virus remained for 6-8 hr on plastic, 5-6 hr on stainless steel, and for 7 days on surgical masks. The study also shows that only two major cities in India, i.e., Chennai and Mumbai, had a comparatively better system for BMW management. Separate segregation, COVID-19 labeling on BMW bags, particular storage areas, and the use of 1% sodium hypochlorite disinfectant on COVID-19 BMW containers are a few highlights of new revisions related to COVID-19 BMW management (Gowd *et al.*, 2021). During the pandemic, the generation rate of BMW was reported to be more than 3.4 kg/d/ bed in India (Kothari *et al.*, 2021). Hence, this review aims to guide the steps in BMW management, including examining the factors associated with poor BMW management.

In perhaps an indication of how ferocious the pandemic has been, India generated 56,898 tonnes of COVID-19 bio-medical waste between June 2020 and June 2021, data from the Union Ministry of Environment, Forest and Climate Change shows. The waste burden correlates to some extent with infections. Maharashtra generated the maximum at 8,317 tonnes, followed by Kerala (6,442), Gujarat (5,004), Tamil Nadu (4,835), Delhi (3,995), Uttar Pradesh (3,881), and Karnataka (3,133). Data collected from Union ministry of environment forest and climate change.

BMW GENERATION DURING COVID-19

Even before the emergence and dissemination of COVID-19, many developing countries were under stress for managing biomedical waste (BMW) and plastic waste (PW) (Kulkarni and Anantharama 2020; Nzediegwu and Chang 2020). Copious use of medical technologies in hospitals and safety measures to stop the dissemination of COVID-19 have led to a tremendous increase in BMW generation. The sharp increase in personal protective equipment (PPEs), such as aprons, boots, face shields, gloves, goggles, masks, sanitizers, and other medical gear, including bandages, plastic containers, syringes, testing kits, tissues (shown in above Figure) have drastically altered the BMW composition (Das *et al.*, 2021a, b;

Praveena and Aris 2021). Thus, the pandemic generated more pressure on the existing waste management system (Benson *et al.*, 2021; Haque *et al.*, 2021; Parashar and Hait 2021; Roy and Chaube 2021). The PPEs mainly consist of polymers such as low-density polyethylene (LDPE), polypropylene (PP), polyurethane (PU), polyvinyl chloride (PVC), and polycarbonate (PC). In contrast, packaging materials primarily consist of high-density polyethylene (HDPE), LDPE, polystyrene (PS), and poly ethylene terephthalate (PET). Among these, PET and HDPE are widely recyclable polymers and the rest are difficult to recycle or rarely recycled (Klemeš *et al.*, 2020; Parashar and Hait 2021; Silva *et al.*, 2021). The sharp rise in waste generation has disrupted even the most reputed global waste management facilities (Thind *et al.*, 2021).

Plastics have driven scientific and technical advances in every field due to their flexibility, affordability, and durability. Plastic incorporates superb versatility, strength-to-weight ratio, water resistance, and insulating properties (Chen *et al.*, 2020; Klemeš *et al.*, 2020). Due to these characteristics, plastics are indispensable in the healthcare system, mainly for single-use diagnostic kits and devices. India generates about 9200 t/day of PW, with a total generation of more than 3.3 million t per year (CPCB 2019a). The major PW-generating Indian states are Maharashtra, Tamil Nadu, Gujarat, and West Bengal. To check the growing PW generation, 22 states/union territories (UTs) of India have completely banned, and seven states have partially banned SUP carry bags (CPCB 2019a). But now, the spread of COVID-19 has become an obstacle to implementing the ban on SUPs. This is seen as a compromise of the policy during the pandemic as human health is more important than anything else. Contrary to the common belief that plastic is not environmentally friendly, these SUPs have saved millions from contracting the infection. However, it is pretty common to see the littering of used PPEs due to negligence on the part of individuals that causes harm to the environment and human health (Rowan and Laffey 2021). The surge in the BMW generation during the pandemic is inevitable; however, lessons should be learned to deal with any such outbreak that increases waste in the future.

BMW AND PW GENERATION FROM VACCINATION CENTERS

The COVID 19 pandemic has already added a massive amount of PW and BMW and will continue to generate PW and BMW until it ceases. Many organizations are worked on medicines and vaccines for the novel virus to stop the pandemic. Several pharmaceutical companies have successfully launched their vaccines in the market. Bharat Biotech developed

India's first indigenous vaccine, the Covaxin. The Serum Institute of India(SII) introduced the Covishield vaccine collaboration with Oxford-Astra Zeneca.The vaccination program in India was launched on 16 January 2021. Although the vaccination drive is necessary for the current situation. It also adds a vast amount of BMW and PW such as syringes, gloves and vaccine containers. India has become the world's fastest country to administer 140M vaccine doses in just100 days (https://www.covid19india.org/). The current population of India is more than1.39billion (worldometer2021). It is estimated that the vaccination of the entire country will generate about 2.78billion syringes, gloves and vaccine containers.

Waste management facilities commonly cater to a steady-state flow of waste with moderate fluctuations in composition and quantity (Parashar and Hait 2021). The sudden change in was the quantity and composition caused by the pandemic affected the regular operations of treatment facilities. Due to the wide spread use of PPEs, medical gear and SUPs .The world is on the verge of devising a worldwide waste pandemic unless it is successfully monitored and addressed. Inadequate PW management and littering pose the threat of viral spread and pollute the terrestrial and aquatic environments (Sarkodie and Owusu 2020).

Causes

Improper handling of wastes that contaminate the environment could also because by the earthand discrepancies in current waste management processes, such as limited personnel and capacity constraints. Very serious environmental and health hazards can be triggered if hospital waste is mixed with normal garbage, which can lead to poor health and incurable diseases such as AIDS.

The needle sticks can be highly infectious if discarded inappropriately. Injury by these contaminated needles can lead to a high risk of active infection of HBV or HIV. The groups at increased risk of getting infected accidentally are the medical waste handlers and scavengers. It can also be the main cause of severe air, water, and land pollution.

Prevention

Air pollutants in BMW can remain in the air as spores. These are known as biological air pollutants. Chemical air pollutants are released because of incinerators and open burning.

Another type of threat is water pollutants. BMW containing heavy metals when disposed of in water bodies results in severe water contamination.

The landfills where the disposal takes place must be constructed properly, or the waste inside might contaminate the nearby water bodies, thus contaminating the drinking water. Land pollution is caused due to open dumping. BMW must also be kept away from the reach of rodents such as black rats and house mice, which can spread the pathogens to the people living nearby.

Many promising steps were taken to minimize the volume of waste discarded from the source, its treatment and disposal. The 3R system encourages the waste generators to reuse, reduce and recycle. Everyone must be aware of the 3Rs because this approach can help achieve a better and cleaner environment. Unfortunately, most economically developing countries cannot correctly manage BMW. Very few staff members of healthcare facilities are educated about proper waste management**.** The waste handlers are also poorly educated about the hazards of waste. Every member helping in the waste management process must be made aware of the dangers of BMW to avoid accidents that harm the environment and living beings.

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