Original Article

RFP Indian Journal of Hospital Infection
Volume 2 Number 1, January - June 2025

Biomedical Waste Management: Pre and Post Covid-19 Pandemic

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Abstract

India is a developing nation with a vast health care network, effectively managing biological waste is a significant concern. The rising demand of health care services also gives light into effective biomedical waste. Because it has so many implications as a danger factor for both the health of patients, hospital employees, and extending beyond the confines of the medical institution to the general population, hospital waste generation has thus become a top issue. By doing effective management of biomedical waste management, we secure environment, as well as human health for current and future generation. India is one of the nation's most severely affected by the COVID 19 pandemic. The immediate change in the healthcare sector compels the government to update the current biomedical waste management regulations. This paper reviews the changes occur in the management of biomedical waste in India and amendments in the law in order to improve the public health & safety during the pandemic while handling biomedical waste.

Keywords: Biomedical waste rules; Covid-19; CPCB.

Introduction

Since 2016, the healthcare sector in India has been growing at a Compound Annual Growth Rate of over 22%. Hospitals, medical equipment, health insurance, clinical trials, telemedicine, and medical tourism are all part of India's healthcare sector. In India, the hospital sector makes up 80% of the entire healthcare market.[1] The industry is going in a tremendous momentum. This rising demand of health care services also gives light into effective biomedical waste management. Human immunodeficiency virus (HIV) and hepatitis B virus (HBV) exposure worries in the 1980s and 1990s raised concerns about potential risks associated with medical waste. Because it has so many implications as a danger factor for both the health of patients, hospital employees, and extending beyond the confines of the medical institution to the general population, hospital waste generation has thus become a top issue.[2] By doing effective management of biomedical waste management, we secure environment, as well as human health for current and future generation.[3] Hospital cleanliness and infection control are impacted by how medical waste is managed. At the UN Sustainable Development Summit held in January 2015 in New York, the member states of the UN approved 17 Sustainable Development Goals that must be accomplished by them by the year 2030.[4]

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Received on: 05.02.2025 **Accepted on:** 19.04.2025

Among these 17 goals, SDG 3 is "Good Health and Well Being," and crucial since it strives to offer everyone access to the highest caliber of healthcare. One of the biggest obstacles to providing humanity with the highest quality healthcare services is biomedical waste, which has become a major issue in recent years. Biomedical Waste has been defined as is "any waste, which is generated during the diagnosis, treatment or immunization of human beings or animals or research activities pertaining thereto or in the Production or testing of biological or in health camps."[5] According to World Health Organization (WHO) 85% of the waste produced by the health care setting are non-hazardous and 15% are hazardous. The term "Health Care Waste" or "Biomedical Waste" includes all the wastes from any medical procedure in healthcare facilities, research centres and laboratories. The classification is based on presence of infectious substances, radioactivity, presence of sharps, genotoxic, cytotoxic, other toxic chemicals, and biologically aggressive pharmaceuticals.[6]

Hospital patients, healthcare staff, and the general public might become ill as a result of improper biological waste management handling and practices. A Report released by the World Health Organization (WHO, 2003) on the burden of diseases caused by needle stick injuries (NSIs) in healthcare workers, there were 3 million accidental injuries that resulted in 37% of new HBV infections, 39% of new HCV cases, and roughly 5.5% of new HIV cases.[7] This will result in 9.2 million DALYs, or disability-adjusted life years between 2000 and 2030.[8] Ultimately effective biomedical management will be able to reduce and manage these occupational dangers. A situational analysis study and performance predictors were done in 2014 by the International Clinical Epidemiology Network (INCLEN) Program Evaluation Network (IPEN) in 25 districts across 20 Indian states. According to the survey, 82% of primary care, 60% of secondary care, and 54% of tertiary care health facilities in the 25 study districts lack a reliable BMW management system or one that needs significant improvement.[9]

India is one of the nation's most severely affected by the COVID-19 pandemic.[10] The GOI also implemented many preventive and precautionary measures as a result of the increasing infectivity rate. Health care settings are seeing a significant demand for PPE from all strata of health care workers due to the fear of infection. Which led to a significant increase in the use of personal protective equipment.[11] The fear frequently leads to the overuse of PPE, which frequently intensifies the issue by producing many BMWs that are challenging to store and transport with the limited resources and manpower available during a crisis.[12] The actions taken to abolish single-use plastics quickly transitioned to a massive reliance on single-use plastics like PPEs for pandemic COVID 19 prevention and control.[13] The immediate change in the healthcare sector compels the government to update the current biomedical waste management regulations. Since India is a developing nation with a vast health care network, effectively managing biological waste is a significant concern.

BMW developments in India

Under the Environmental Protection Act of 1986, the Government of India by Ministry of Environment and Forest published the first-Bio-Medical Waste (Management and Handling) Rules in 1998.[14] Central Pollution Control Board (CPCB) the apex organization in country in the field of pollution control. It was established in 1974 under the Water (Prevention and Control of pollution) Act, 1974. By offering technical support and direction and mediating conflicts between them, it coordinates the actions of the State Pollution Control Boards.[14] In the years 2000, 2003, 2011, the BMW 1998 regulations faced amendments. Due to the lack of agreement on classification and standards, the document of the BMW guidelines for 2011 was left as a draught and was not made public.[15] The Biomedical Waste Management Rules 2016, which replace BMW rule 1998, were published by GOI in response to later revisions to the previous BMW rules.[14-15]

2016 Biomedical Waste Rules: Key Features

The intent of the rules has been broadened to cover a variety of health camps, including immunization, blood donation, and surgical camps. The occupant of an HCF's responsibilities have changed. The second major changes come in the duty of an occupier. The individual who has administrative responsibility over the HCF that is producing BMW is the occupier. According to 2016 rule the laboratory waste, microbiological waste, and blood bags must undergo mandatory pre-treatment before disposal either at CBMWTF or on-site.[16] It is recommended that the sterilization/ disinfection procedure adhere to National AIDS Control Organization (NACO) or WHO guidelines. Every HCF has been instructed to gradually stop using chlorinated plastic bags, gloves, and blood bags within the next two years in order to stop the release of dangerous dioxins and furans while burning such wastes. In addition, the new regulation mandates the inclusion of bar codes for better tracking and identification on all bags and

containers used for BMW treatment and disposal.[16] All the health care facilities instructed to immunize the health care workers against Hepatitis B and Tetanus and provide training on BMW rules and handling. In addition, all significant accidents, including those brought on by fire risks, blasts, handling BMW, and corrective action taken by the required authority, should be reported and are required to maintain and update on day-to-day basis the bio-medical waste management register and display the monthly record of BMW. To facilitate segregation and eliminate misunderstanding caused by the earlier high number of categories, the 2016 announcement further reduces the number of categories to four. The Ministry of Environment and Forests (MoEF) would examine HCFs once a year through state health secretaries, the State Pollution Control Boards (SPCB), and the Central Pollution Control Board, in contrast to the 2011 guidelines, that did not include a provision for a monitoring authority (CPCB).[16] If a Common Biomedical Waste Treatment Facility (CBMWTF) is available at a distance of 75 kilometres, no HCF may build an on-site BMW treatment and disposal facility. If no CBMWTF is available, the occupier must install the necessary BMW treatment facility, such as an incinerator, autoclave, microwave, or shredder, after obtaining prior approval from the required authority.[16]

The amendments bring more clarifications in BMWM and make improving in segregation, transport, and disposal of waste by increasing the coverage and simplified the authorization. In order to strengthen the application of environmentally sound management of biomedical waste in India and underline the effort to safeguard the environment and human health from infectious biomedical waste, the 2016 Rules have been revised once in 16th March 2018, 20th Feb 2019 and 10th May 2019. The modifications state that after March 27, 2019, chlorinated plastic gloves and bags are no longer permitted. The phase out of blood bags has been waived in compliance with the 2018 revisions to the BMW regulations.[17]

Bio Medical Waste Management Scenario in Pre Covid-19

According to the 2016 BMWM Rules, there must be enough CBWTFs put up to cover the entire state or all HCFs in order to treat and dispose of biomedical waste. 2018 Annual report states that there 200 total number of CBWTFs in the country and 12,326 captive treatment facilities installed by HCFs.[18] About 614 tonnes of bio-medical waste are produced each day overall, of which 534 tonnes are handled in CBWTFs and captive treatment facilities. It would suggest that 80 tonnes are left untreated. There are enough CBWTFs in the states of Uttar Pradesh, Tamil Nadu, Andhra Pradesh, Chandigarh, Madhya Pradesh, Punjab, and Haryana. However, the report suggests that during the period 2006 to 2018, the use of captive waste treatment incinerators was reduced from 225 to 120, and the CBWTF was increased from 155 to 200. Several states, including Andaman & Nicobar, Assam, Arunachal Pradesh, Chhattisgarh, Goa, Himachal Pradesh, Jharkhand, Karnataka, Lakshadweep, Manipur, Meghalaya, Sikkim, Mizoram, Nagaland, Odisha, Rajasthan, Kerala, Tamil Nadu, Tripura, & Uttarakhand, use deep burials to dispose of biomedical waste, which is not recommended as per CPCB guidelines. The status of Biomedical Waste Management (BMW) scenario in India before Covid-19 is shown in Table 1.[18]

Status of Bio Medical Waste Scenario in India: Before Covid-19

(CPCB Annual Report 2018)

Table 1: CPCB Annual Report 2018

No. of Health care Facilities (HCFs)	2,70,416
No. of bedded HCFs	97,382
No. of Non-bedded HCFs	1,73,831
No. of beds	22,06,362
No. of CBWTFs	200*+28**
No. of HCFs granted authorization	1,10,356
No. of HCFs having Captive Treatment Facilities	12,326
No. of Captive Incinerators Operated by HCFs	120
Quantity of bio-medical was tegeneratedin Tones / day	614
Quantity of bio-medical was tetreated in Tones/day	534
No. of HCFs violated BMW Rules	27,301
No. of Show-cause notices /Directions issued to defaulter:	16,956HCFs

COVID 19 Scenario in India

The first cases of COVID-19 in India were reported on 30th January 2020.[19] Lock down was the initial strategy taken by the GOI to prevent and control the pandemic; however, number of cases were increased and followed by this surge of cases the effective biomedical waste management become the prime concern of many developing countries including in India.[20] The Central Pollution Control Board (CPCB), has released guidelines for handling, treatment and safe disposal of BMW generated during treatment, diagnosis and quarantine of patients confirmed or suspected to have the novel coronavirus disease (COVID-19).[21] These recommendations are based on the most recent understanding of COVID-19 and procedures now in use for the management of infectious waste produced in hospitals during the treatment of viral and other contagious diseases like HIV, H1N1, etc. Number of amendments came into act referred as Revision 1, Revision 2, Revision 3, Revision 4 and Revision 5, need assessment make all these revisions.[21]

Disposal of Solid Biomedical Waste

- The instructions include using double layered bags in the COVID-19 isolation sections and color coded bins for onsite segregation. For disposable PPEs, gloves, and masks, there should be additional, temporary bins in addition to the usual containers (e.g., N95 mask for cleaning and sterilization).[22]

Source: **CPCB**

- feces should be collected in a diaper and classified as yellow category BMW, or they can be collected in a pan and The confirmed COVID-19 positive patient's flushed in the toilet. For handling the BMW at COVID-19 sites, special carrier trolley and segregation bags should be available.[22]
- For better assessment, handling, and disposal of BMW, the bags and containers should be clearly labelled as "COVID-19."

- Daily cleaning should be done with a 1-2% sodium hypochlorite solution on the exterior and interior of the containers and trolleys. A separate record should be maintained for BMW generated from COVID-19 related activities.[22]

Source: CPCB

- The necessary training and personal safety equipment should be provided to all individuals involved in the handling of BMW (COVID-19). These persons ought to abide by the standard operating procedures, practice good cleanliness and infection prevention practises, and go through routine health examinations. Education, training, and awareness should be provided alongside this on a consistent basis.[22]
- The central pollution control board's official app (COVID-19 BWM) can be downloaded by facilities, who can then register in the app and easily upload their information.
- The transportation of BMW should be done in special vehicles that are disinfected after each trip. In an effluent treatment plant, liquid waste should be treated chemically, and the disinfection procedure should guarantee the inactivation of coronaviruses.[23-24]

BMW Transport Vehicle

Source: CPCB

Disposal of liquid waste and waste water from hospitals and laboratories

Due to its physical nature, liquid trash is managed differently than solid waste, hence the procedures used to handle solid waste do not apply to liquid waste. The treatment of the liquid waste is the responsibility of every healthcare facility running a STP as well as the terminal sewage plant operators. The hospital and all involved in its handling should make sure that the coronavirus is inactivated or killed. The SOPs established by the pollution control board must be rigorously adhered to by all STP. PPE should be worn by the employees managing the wastewater treatment process. During the pandemic, it is possible to avoid using the STP's treated water.[22-24]

Annual Report Information: A Comparison with Previous year 2019 and 2020

Over time, there are more healthcare institutions than ever before. The total number of healthcare facilities was 3,22,425 in 2019; however, this figure has now climbed to 3,52,014 with increase in the number of beds. Out of the 3,52,014 HCFs, 1,60,736 HCFs are authorized, reflecting an increase in the overall number of healthcare facilities.[25] The overall amount of biomedical waste produced per day was estimated to be 774 tones, of which 656 tones per day were non-COVID biomedical waste and 118 tones per day were COVID biomedical waste. The number of common biomedical waste treatment facilities has increased from 202 to 208, while the number of captive treatment facilities has reduced from 18,015 to 17,206 for the treatment and disposal of generated biomedical waste.[25] Detailed comparison on biomedical waste management scenario is given below.[25]

CPCB Annual Report 2019 & 2020

Particulars	Year 2019	Year 2020
No. of HCFs	3,22,42	35,20,14
No. of Bedded HCFs	1,06,796	1,13,186
No. of Non-bedded HCFs	2,15,780	2,37,938
No. of Beds	24,86,327	2,5,44,116
No. of CBWTFs	202	208
No. of HCFs Utilizing CBWTFs	2,35,571	2,44,282
Number of HCFs granted authorization	1,53,885	1,60,736
No. of HCFs having Captive Treatment Facilities	18,015	17,206
No. of Captive Incinerators Operated by HCFs	136	125
Quantity of bio-medical waste generated in Tonnes/day	619	774
Quantity of bio-medical waste treated in Tonnes/day	544	708
No. of HCFs violated BMW Rules	29,062	22,261
No. of Show-Cause notices/Directions issued to defaulter HCFs	17,435	13, 389

According to information provided in the SPCBs/ PCCs' annual reports for the year 2020, there are now 208 CBWTFs operating in the nation, and 33 more are being built. There are no CBWTFs for the treatment and disposal of biomedical waste in the following states: Andaman & Nicobar, Arunachal Pradesh, Goa, Ladakh, Mizoram, Nagaland, Sikkim, and Tripura. However, CPCB asked the above mentioned State Boards to submit a proposal for the construction of CBWTFs so that they may receive funding from the Ministry of Environment, Forests, and Climate Change.[26]

Conclusion

Proper Biomedical waste management (BMWM) is not just a legal necessity but also a social responsibility. Management of biomedical wastes is one of the major social responsibilities of individuals as well as Government / State officials. For the proper management of biomedical waste there is a need for thorough sensitization of health care professionals as well as community members using behavior change and communication (BCC) and information education and communication technique (IEC) on a regular basis. Certain precautionary measures and protocols should be followed as a part of BMWM which include vaccination against Hepatitis B, provision of appropriate personnel protective equipment's (PPEs), and maintenance and managements of records. Biomedical waste, if not managed properly, will pose significant environmental and health impact. Recommend monitoring and legal action as significant steps in the management of biomedical wastes.

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