ENVIS CENTRE, CHANDIGARH
Newsletter
Paryavaran - Patra
ISSN No. 0974-7087
Chandigarh State of Environment

BIO-MEDICAL WASTE MANAGEMENT

Introduction :

Bio-Medical Waste (BMW) is defined by the World Health Organization (WHO) as: "waste that is generated in the diagnosis, treatment or immunization of human beings or animals." Biomedical waste is infectious, cytotoxic and of chemically hazardous nature. If it is not disposed properly could have adverse effect on public health and environment. Hence, management of biomedical waste by health care facility is important in eliminating the risks due to infection with healthcare facilities as well as outside its premises during handling and disposal.

Categories of Bio-Medical Waste (Schedule-I)

As per the Bio-Medical Management Rules (2016) Schedule I, there are four types of BMW i.e., Red, Yellow, Blue and White. The brief pictorial description of the various categories of BMW with their segregation, collection, treatment, processing and disposal options is shown in Figure 1.

Figure1. Categorization of bio-medical waste

Bio-Medical Waste Management Rules, 2016

Biomedical Waste Management Rules, 2016 (BMWM Rules, 2016) notified by Ministry of Environment Forest & Climate Change on 28th March, 2016, stipulates that every Healthcare Facility shall take all necessary steps to ensure that biomedical waste is handled without any adverse effect to human health and the environment. The guidelines provided under BMWM Rules 2016 guide Healthcare Facilities as well as the industry/vendors involved in utilization of biomedical wastes in collection, transportation, utilization and disposal by ensuring adequate safeguards from the risk of spread of infection during such handling.

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Application of BMWM Rules, 2016

Ministry of Environment, Forest and Climate Change notifies that these rules shall apply to all persons who generate, collect, receive, store, transport, treat, dispose, or handle bio medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, AYUSH hospitals, clinical establishments, research or educational institutions, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs.

Guidelines for Safe Packaging of Bio-Medical Waste

The substances in bio-medical waste intended for disposal/utilization might contain viable microorganisms such as bacterium, virus, parasite or fungus that may cause disease in humans or animals. Packaging of such bio-medical waste shall be done in triple packaging system.

The First layer of triple packaging shall comprises of leak proof, puncture-proof and tamper-proof container/bottle. Each bottle containing biomedical waste shall be sealed in self-sealing plastic bags provided with absorbent to absorb the liquid in case of any leakages. The second layer of packing will be a watertight, leak proof receptacle such as a big plastic bag to enclose and protect the primary receptacle. After secondary layer packaging, the secondary receptacle shall be placed in a hard/rigid box for protection. This box shall also contain absorbent material such as foam cushioning to absorb the leakages if any. The packaging material should be labelled with the symbol of biohazard along with warning text as shown in Fig. 2. The personnel handling biomedical waste must be equipped with protective gears as shown in Fig 3.

Figure 2 Label for Bio-Medical waste container and bags.

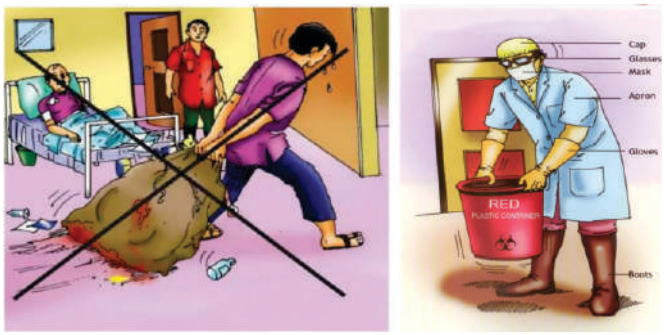


Figure 3 Handling of Bio-Medical Waste

Bio-Medical Waste Generation in Chandigarh

In Chandigarh, there are presently 876 Health Care Facilities (HCFs) in operation. 50 bedded hospitals and nursing homes, 668 small clinics/dispensaries, 14 veterinary institutions, 3 animal houses, 119 pathological laboratories, 4 blood banks, 4 research institutes, and 14 AYUSH clinics/hospitals are among the HCFs. Chandigarh has a total bed strength of 4413.

As per the BMWM Rules, 2016 "Every occupier or operator handling bio-medical waste, irrespective of the quantity shall make an application in Form II to the prescribed authority i.e. State Pollution Control Board/ Pollution Control Committee, as the case may be, for grant of authorization and the prescribed authority shall grant the provisional authorization in Form III and the validity of such authorization for bedded health care facility and operator of a common facility shall be synchronized with the validity of the consents."

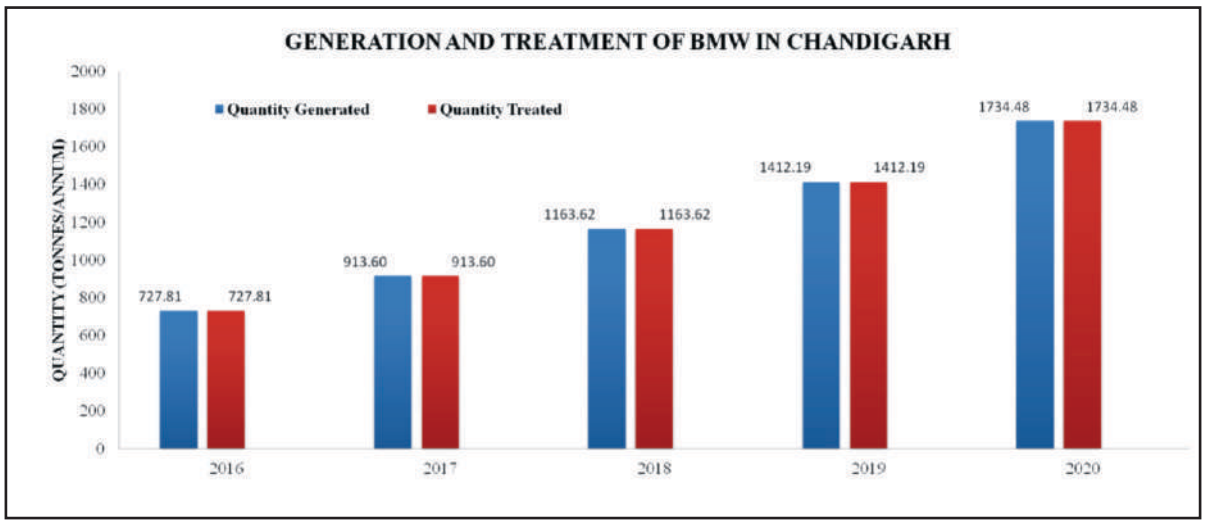
In view of above, to take authorization under the Biomedical Waste Management Rules, 2016, 65 units in year 2020 applied for the same and all 65 HCFs were granted authorization by CPCC in year 2020. The year wise data of HCFs utilizing BMW Treatment Disposal Facilities is shown in Table 1.

Table 1. No. of HCFs having BMW Treatment Disposal Facilities

Year	Total No of HCFs	Total No of HCF Utilizing BMWTF & Private Agencies	Total No of Beds	Total No of HCF Granted Authorisation
2016	775	775	4290	42
2017	788	788	4413	80
2018	809	809	4347	194
2019	890	890	4442	571
2020	876	876	4761	65

Source: Chandigarh Pollution Control Committee (CPCC).

The total amount of biomedical wastes generated each day is around 4752 kg, with 4557 kg originating from bedded hospitals and 195 kg originating from non-bedded minor health care facilities. In Chandigarh, all segregated biological waste is collected, transported to common biomedical treatment facility (CBWTF) for treatment and disposed of on a regular basis. Biomedical waste generation in Chandigarh grew from 727.81 tonnes/annum to 1734.48 tonnes/annum between 2016 and 2020, the percentage of BMW treated is consistently 100%. During the same period, number of biomedical waste generating HCFs in Chandigarh increased by 13%. The Bar Chart in Fig. 4 is showing the year wise trends of generation and treatment of BMW in Chandigarh.

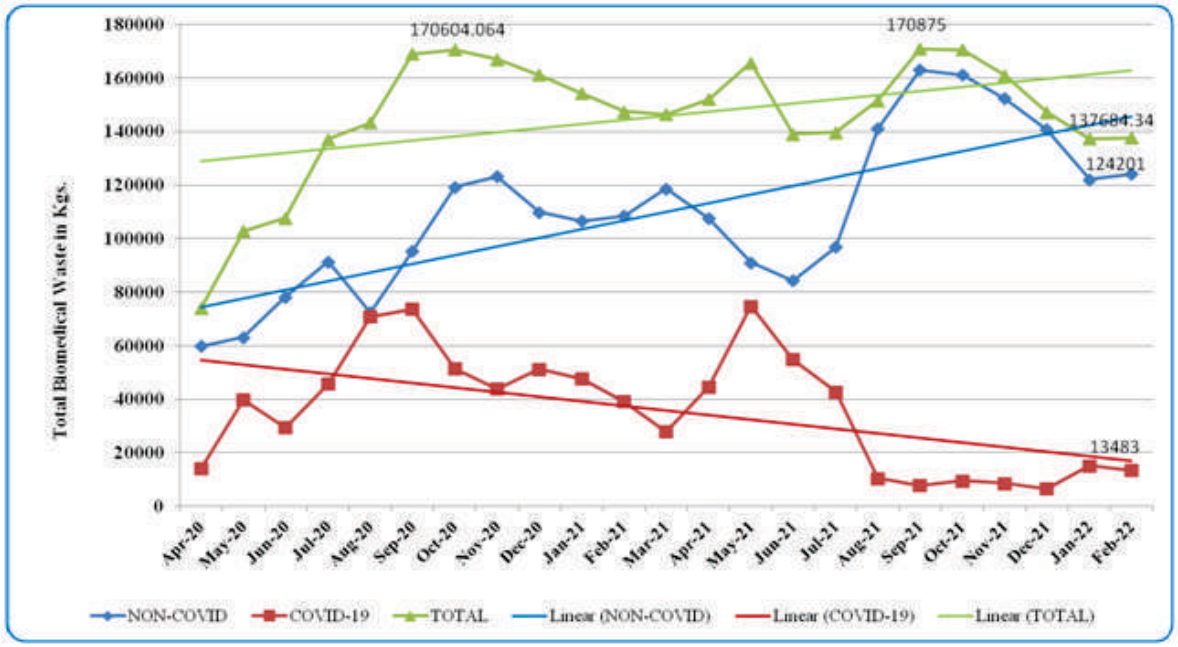


Source : CPCC

Figure 4. Yearly Generation and Treatment of BMW in Chandigarh

BMW, COVID-19 and Chandigarh

On 11th March, 2020, WHO declared the outbreak of COVID-19, as a pandemic and since then there was a substantial global-burden on management of health care system. This pandemic has inflated the health care facilities with a large number of infected patients which also, increased the generation of BMW such as, personal protective equipment (PPE) kits, chemicals, reagents and medicines etc. Such an unprecedented demand of the PPEs and other single-use medical-care equipment to counter the highly infectious nature of COVID-19 has led to enormous accumulation of the BMW*. Increment in volume and quantity of BMW in India places a high demand for additional resources and training**.Fig. 5 is showing the trends of Non Covid, Covid-19 and total biomedical waste generated in Chandigarh from April 2020 to February 2022. After May 2021, Covid-19 waste generation showed decreasing trends. Total biomedical waste generated has increased unprecedentedly over the time and shows positive slope for accumulation forecast. Covid-19 pandemic scenario also added to an unexpectedly high BMW amount from the HCFs.



Source : CPCC

Figure 5. Generation of Bio-Medical Waste in Chandigarh

*Singh, N., Tang, Y. and Ogunseitan, O.A., 2020. Environmentally sustainable management of used personal protective equipment. *Environmental science & technology,* 54(14), pp.8500-8502.. https://dx.doi.org/10.1021/acs.est.0c03022

** Chand, S., Shastry, C.S., Hiremath, S., Joel, J.J., Krishnabhat, C.H. and Mateti, U.V., 2021. Updates on biomedical waste management during COVID-19: the Indian scenario. *Clinical Epidemiology and Global Health,* 11, p.100715.

Bio-Medical Waste Management in Chandigarh

The treatment of BMW is generally carried out by Common Biomedical Treatment and Disposal Facilities (CBWTF). In Chandigarh, the BMW management is undertaken by Alliance Envirocare Pvt. Ltd. and the various steps involved in the management of BMW are: 1. Segregation; 2. Storage; 3. Collection; 4. Transportation; 5. Treatment; 6. Recycling and Disposal. A brief outline of the complete life-cycle of BMW, adopted in Chandigarh, is shown in Figure 6.

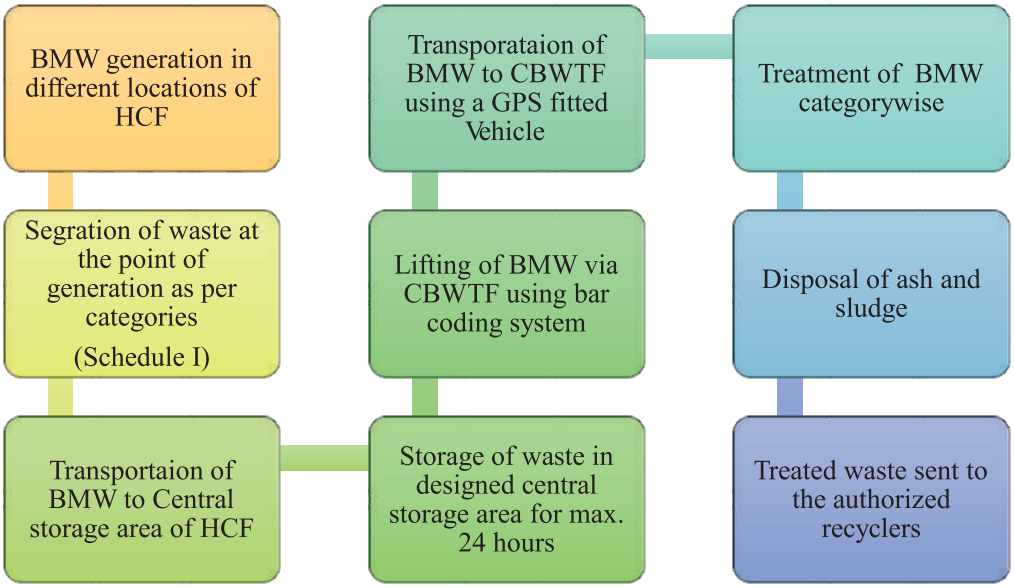


Figure 6. Layout of Bio-Medical Waste Management in Chandigarh

The CBWTF has currently deployed 13 vehicles to collect biomedical waste from all Chandigarh health care facilities and government dispensaries and transport it to common biomedical treatment facility for treatment. All of the vehicles are equipped with a Global Positioning System (GPS) and have been authorised by the CPCC (Figure 7). Tracking of these BMW Collection vehicles is done on regular basis with the help of Online Dashboard developed by CBWTF of Chandigarh.

Figure 7. BMW Collection vehicle of Chandigarh

Presently, CBWTF is operational with two incinerators having treatment capacity of 200 kg/day each. The incinerators installed by the CBWTF are as per the latest guidelines of CPCB/MoEF&CC which includes installation of online continuous emission monitoring system, 2 seconds gas residence time in secondary chamber of incinerator etc. Two autoclaves and one shredder are also operational with capacities 3000 kg/day and 14400 kg/day respectively.

Efforts Adopted to Improve BMW Management

• As per BMWM Rules 2016, no untreated bio-medical waste shall be mixed with other wastes. The bio-medical waste shall be segregated into containers or bags at the point of generation in accordance with Schedule I of BMWM Rules 2016 (Figure 1) prior to its storage, transportation, treatment and disposal. CPCC has distributed Segregation of BMW Posters (Figure 8) for awareness in HCFs of Chandigarh.

• As per BMWM Rules 2016, it is duty of Occupier/HCF to make a provision within the premises for a safe, ventilated and secured location for storage of segregated biomedical waste in colored bags or containers in the manner as specified in Schedule I, to ensure that there shall be no secondary handling, pilferage of recyclables or inadvertent scattering or spillage by animals and the bio-medical waste from such place or premises shall be directly transported in the manner as prescribed in these rules to the common bio-medical waste treatment facility. With compliance to these rules various Chandigarh HCFs have implemented the same. (Figure 9)

Figure 8. Segregation of Bio-Medical Waste Management in HCFs

Figure 9. BMW Storage area of various hospitals of Chandigarh

• As per BMWM Rules 2016, it is the duty of CBWTF to establish bar coding and global positioning system for handling of bio- medical waste. In Chandigarh, all the HCFs authorized with CBWTF are provided with the unique Bio waste QR Codes as shown in Fig 10. BMW is collected in the vehicle with the scanning of these codes and record is maintained simultaneously. This helps in tracking the route of vehicle and biomedical waste.

Figure10. Bar Code system in BMW Collection

Figure11. CPCC Official checking the collection vehicle with the help of Bar Code system.

Summary

1. Chandigarh is having only one CBWTF according to its small area of 114 km sq. Further, For contingency measures, CBWTF, Chandigarh has an agreement with Haryana Pollution Control Board authorized CBWTF in Panchkula.
2. The COVID-19 waste generated in the city is being disposed-of properly in double layered bags and taken to the CBWTF for the final disposal in dedicated authorised vehicles. There is a dedicated fleet of 13 vehicles with GPS enabled to track their routes.
3. The biomedical waste is being collected on daily basis except on Sunday from the HCFs of Chandigarh by CBWTF.
4. The staff is trained properly by the HCFs as well as the CBWTF. Refresher training courses are conducted at least once in a year.
5. CBWTF Chandigarh, has provided all the HCFs with Bar Code System..
6. The empty waste containers from the HCFs and CBWTF are disinfected regularly.
7. The CBWTF incinerates the COVID-19 generated waste following the prescribed norms. The Chandigarh PCC officers frequently inspect the units for the enforcement of the norms and check the proper compliance of rules.
8. Proper documentation and record is maintained by the HCFs and the CBWTF and regularly submitted to regulatory body i.e. Chandigarh Pollution Control Committee.

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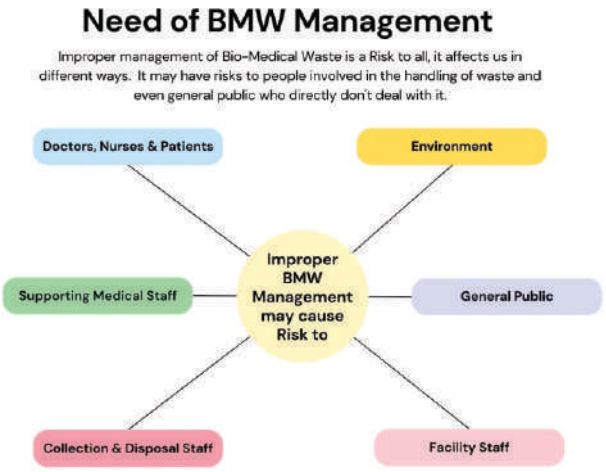

General Guidelines

1. Keep Hospitals clean and safe by identifying hazards and risks of biomedical waste.
2. Place the waste in designated colour coded bins.
3. Segregate waste at source.
4. Never mix waste during collection and transportation.
5. Segregate general waste from infectious biomedical waste as mixing of these can lead to greater spread of infections and epidemics.
6. Manage spillage of biomedical waste right away.
7. Health Care Workers must be equipped with protective gears.
8. 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.
9. Never drag filled waste liners.

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