



A Scenario Of Biomedical Waste In India: Analysis Of Trends And Growth Of Waste Generated (2013 - 2023)

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ABSTRACT

Bio medical waste (BMW) causes many harmful effects to human being and environment if not disposed properly for this Government of India introduced the BMW rules in 1998 which was amended in 2011. It was introduced for safe handling of BMW and to protect public health and Environment. This paper will throw light on growth of BMW in India during 2013- 2023. The study is based on secondary sources of data which is already available on internet, government websites, and previous published journals. The study reveals that the highest production of BMW is between 2020 to 2021 during Covid-19 pandemic. As hospitals were full of patients so it is natural that the BMW will be generated more during the year 2020 to 2021. The number of healthcare facilities (HCF) increased more than two times in the period of 2013-2023 due to increase in labs and clinics in our country.

Keywords: Biomedical Waste, Waste Management, COVID-19 Pandemic, Healthcare Facilities, Environmental Impact, Public Health.

Introduction:

Bio medical waste is the waste which is collected from the laboratories, clinics and hospitals during diagnosis and treatment of patient. This bio medical waste BMW is very harmful to our environment and human health as it affects us directly and indirectly. BMW generation in our countries is increasing year by year. Improper handling of BMW can lead to serious diseases and infection. The doctor and nurses are well aware of the harmful effects of the BMW but the Health care workers and sanitary staffs are not and they are much prone to it, the reason behind is improper or lack of training about BMW.

BMW rules was brought up in India in 1998 according to this rule it is necessary for hospitals to dispose, segregate BMW in their respective bins and dispose it. The basic principle of handling BMW is Reuse reduce and recycle 3R's. The World Health Organization reports that while 10% of hospital wastes are infectious and 5% are not, they are classified as hazardous wastes. In contrast, 85% of hospital wastes are non-hazardous. Infectious waste accounts for 15% to 35% of hospital waste. Bio medical waste management and handling is emerging as new concern for the Hospitals and the health care workers now days. This paper will throw light on the BMW generated during the year 2013 to 2023.

Bio-Medical Waste Management:

The Government of India introduced the Environment Protection Act 1986. Later, the Bio-Medical Waste (Management and Handling) Rules were proposed in July 1998 and were revised in 2011. Subsequently, the Bio-Medical Waste Rules 2016 were proposed (Kumar et al., n.d). According to Bio-medical Waste Management Rules (BMW) 2016, there are four categories of biomedical waste based on their segregation: - Yellow Category, Red Category, White Category and Blue Category.

Table: - Categories of Biomedical Waste Bins

Category	Type of Waste
1. Yellow	Human anatomical waste, animal anatomical waste, soiled waste, discarded or expired medicine, chemical waste, chemical liquid waste, discarded linen, mattresses, beddings contaminated with blood or body fluid, routine mask & gown and microbiology, biotechnology and other clinical laboratory waste (pre-treated).
2. Red	Disposable products include tubing, bottles, intravenous tubes, catheters, urine bags, syringes without needles, fixed needle syringes with cut needles, vacutainers, and gloves produce waste.
3. Black	Non- Infectious waste generally Paper, Cardboard, Kitchen wastes etc.
4. Blue	Broken or discarded and polluted glass including medicine vials and ampoules excluding those contaminated with cytotoxic wastes.

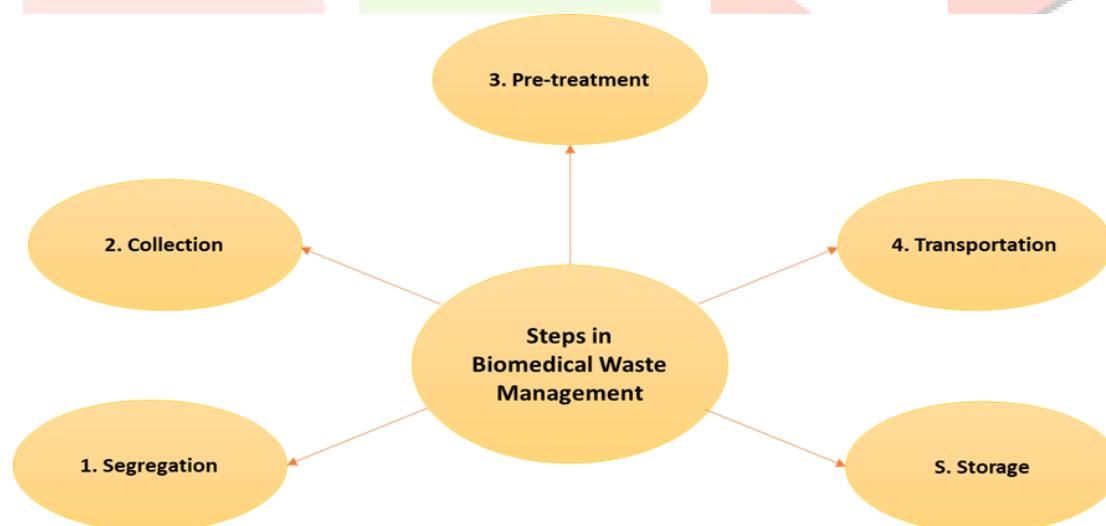
Source: - Directorate General of Health Services et al., 2016.



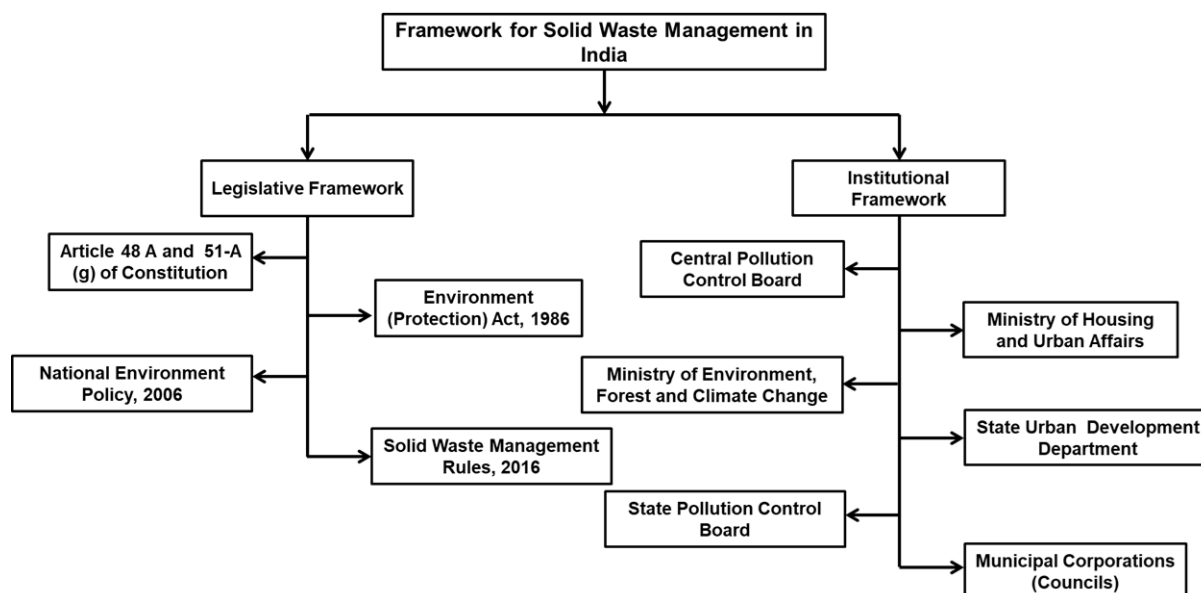
Source: Internet

BMW Rules in India - The new BMW rule replaced the old rule in 2016 which was notified by MoEF under the EPA (Environment protection Act) 1986. The first solution for BMW is using incinerators previously some countries use landfill technique to dispose the BMW which was degrading the ecology and environment very rapidly. The flora and fauna were affected by it on a large scale.

Five Steps in Biomedical Waste Management



Framework of Biomedical Waste Management in India



Source: - Compiled by Researcher

OBJECTIVE AND METHODOLOGY:

The objective of present paper is to analyse the scenario of biomedical waste in the India and analysis of trends in biomedical waste generated from year 2013 to 2023. The data related to biomedical waste has been procured form the annual reports on biomedical waste management published by central pollution control board (CPCB).

The study is divided in three parts first one deals with the Scenario of BMW management in India, this section will throw light on the increment of HCF Health care facilities and violation of BMW rules in India. **Second part** is Trend of Bio-medical Waste Generated in India (2013 – 2023) and **last part** is Annual Growth Rate of HCFs and Total Bio-medical Waste (BMW) Generated.

Scenario of Bio-medical Waste in India (2013-2023)

RESULT:**Table 1: - Scenario of Bio-medical Waste Management in India**

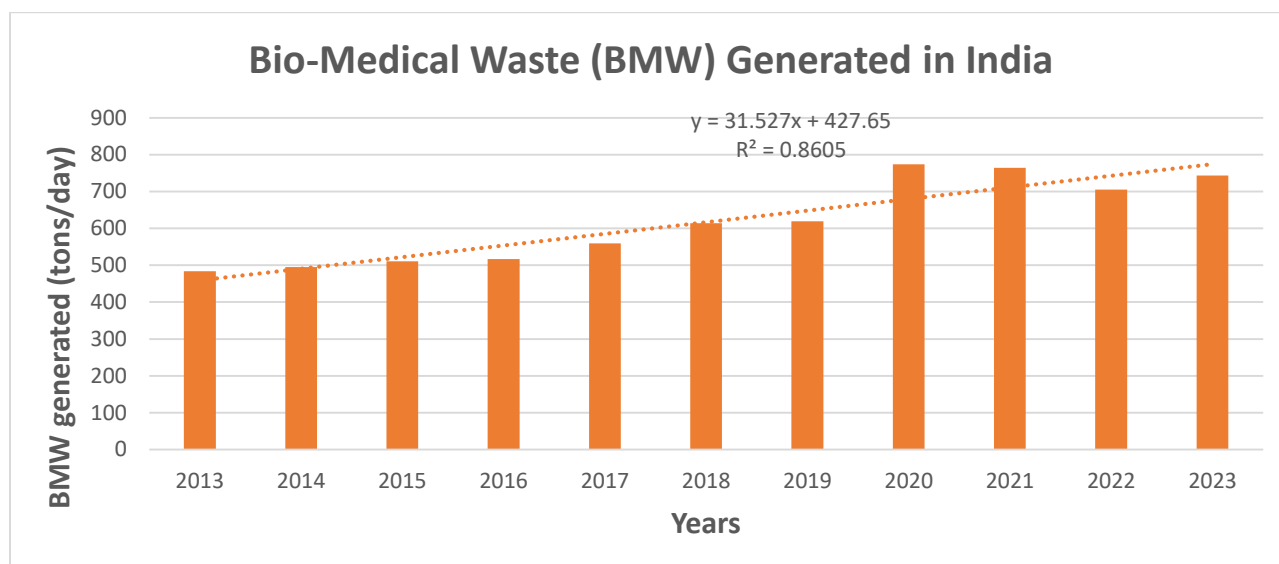
No. of Years	Total No of Health Care Facilities (HCFs)	No of Health Care Facilities (HCFs) violated BMW Rules	% of HCFs Violated BMW rules / Total HCFs	Total biomedical waste generated (tons/day)	Total Biomedical waste treated (tons/day)	Gaps in waste generation and treatment (tons/day)	% of Gaps in waste generation and treatment / Total Biomedical waste treated
2013	1,68,869	7,886	4.67	484	447	37	7.64
2014	1,69,913	5980	3.52	495	462	33	6.67
2015	1,88,098	6,074	3.23	511	496	15	2.94
2016	1,87,160	12,034	6.43	517	502	15	2.90
2017	2,38,259	23,942	10.05	559	518	41	7.33
2018	2,70,416	27,301	10.10	614	534	80	13.03
2019	3,22,425	29,062	9.01	619	544	75	12.12
2020	3,52,014	22,261	6.32	774	708	66	8.53
2021	3,75,256	23,199	6.18	764	721	43	5.63
2022	3,93,939	22,306	5.66	705	645	60	8.51
2023	4,34,966	20,081	4.62	743	694	49	6.59

Source: - Data compiled from annual reports on biomedical waste management.

The Table 1 reveals that there are gaps (about 6-14 %) present in waste generation and treatment. It also shows the 3-5 % of health care facilities have violated biomedical waste management rules in the period 2013-2023. In 2013 The number of HCF were about 1.68 lakh which increased to 4.34 lakh in 2023 which is more than double. In 2013 the cases of violation of Bio medical rules were less (7886 HCF violated the BMW rules) as the number of HCF were also less in 2013 but in 2023 the violation cases increased about triple time(20081 HCF violated the BMW rules) as compared to 2013. In the year 2018 the violation of BMW rules was highest which is about 10% and in 2023 it is about 4.6%. During Covid-19 Pandemic the waste generated were highest it is 708 tonnes per day in 2020 and 764 tonnes per day in 2021 which is highest in between 2013 to 2023. This BMW waste decreased to 645 tonnes per day in 2022 and then increased to 743 tonnes per day in 2023

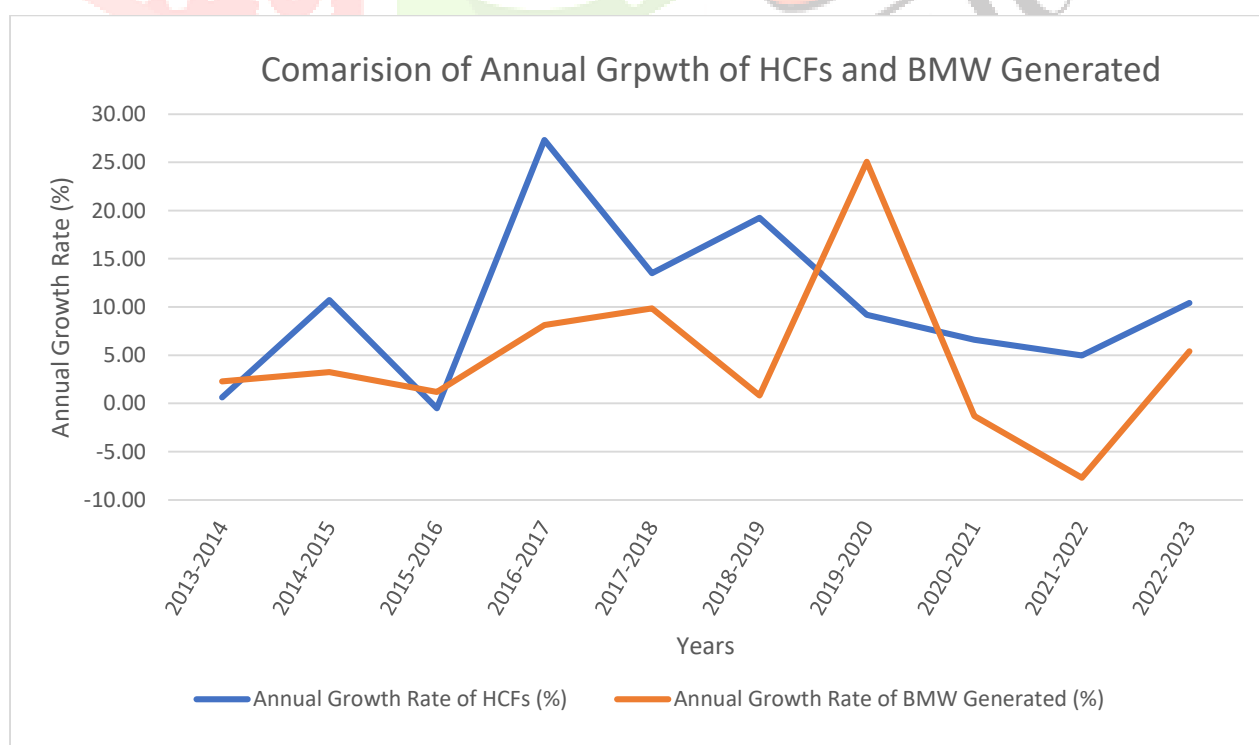
Trend of Bio-medical Waste Generated in India (2013 – 2023)

Trend analysis of biomedical waste generated from 2013 to 2023 clearly reveals that rising trend. The value R^2 (coefficient of determination) is high suggesting strong monotonic rise in waste generated. The number of healthcare facilities increased more than two times in the period of 2013-2023. Biomedical waste is increasing year after year as the number of healthcare facilities grows. Biomedical waste generated per day recorded to be high in the year 2020 and 2021 due to the covid-19 pandemic.



Source: - Data compiled from annual report on biomedical waste by central pollution control board (CPCB)

Annual Growth Rate of HCFs and Total Bio-medical Waste (BMW) Generated



The graph clearly shows that the No. of HCF is proportional to BMW generation means as the no. of HCF increased the BMW is also increased. Annual growth rate of HCF were highest in year 2016 -17 which is 25% and annual growth rate of BMW were highest in year 2019 – 2020

CONCLUSION AND RECOMMENDATION:

CONCLUSION:

The Study reveals that the highest BMW was generated between year 2020 to 2021 due to Covid 19 pandemic and the number of HCF were also increased, as the HCF increased in the country the BMW were produced in large quantity so HCF are directly proportional to BMW generation and number of HCF should be increased according to population.

The overall trend of the BMW is increasing year by year and will also in future due to increasing population and disease. If our country face any pandemic in future (like Covid) the graph will surely show the positive growth like in recent year (2019 -2020).

RECOMMENDATION:

1. There should be proper channel for disposal of BMW in hospitals and clinics
2. The BMW rules should be followed strictly and hospitals should be fined if the government Guidelines for BMW are not followed.
3. There should be proper check and balance of the BMW and register should be maintained
4. The number of beds in the hospital should be enough to handle any pandemic
5. The HCF are very less according to population so it should be increased
6. The open burning of BMW should be avoided

REFERENCES

- Directorate General of Health Services, Ministry of Health & Family Welfare, Central Pollution Control Board, & Ministry of Environment, Forest & Climate Change. (2016). *Guidelines for management of healthcare waste as per Biomedical Waste Management Rules, 2016*. <https://www.dpcc.delhigovt.nic.in/uploads/pdf/Guidelines-for-Management-of-Healthcare-Waste-as-per-Biomedical-Waste-Management-Rules> 2016June 2018pdf-e9c87a85f60621a233cb79c5eb10bec8.pdf
- Kumar, P., Reddy, K. V. R., & Mishra, S. (n.d.). *Manual for Bio Medical Waste Management*. All India Institute of Medical Sciences, New Delhi. <https://www.aiims.edu/images/pdf/BMW-Book%20final.pdf>.
- Chandra, H. (1999). Hospital waste: An environmental hazard and its management. *C. Newsletter of ISEB, India*, 5(3), 80-5.

- Singh V. P., Biswas G., and Sharma, J. J., Biomedical Waste Management - An Emerging Concern in Indian Hospitals Indian, Journal of Forensic Medicine & Toxicology, Vol. 1, No. 1. (2007-12).
- Mandal S. K. and Dutta J. , Integrated BioMedical Waste Management Plan for Patna City, Institute of Town Planners, India Journal 6-2: 01-25 (2009).
- Mathur, P., Patan, S., & Shobhawat, A. S. (2012). Need of biomedical waste management system in hospitals-An emerging issue-a review. *Current World Environment*, 7(1), 117.
- Bhalla GS, Bandyopadhyay K, Sahai K: Keeping in pace with the new biomedical waste management rules: what we need to know!. *Med J Armed Forces India*. 2019, 75:240-5.
- Lup DT, Stroe AM, Chezan PM, Pica EM: The importance of waste incineration . *Studia UBB Ambientum*. 2018, 63:43-

