

Biomedical waste management in India: Current perspective

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Abstract: The existence of diseases in human civilizations is since time immemorial. With time, advancement of technology took place and so the ways of disease diagnosis and treatment advanced. This advancement in medical field on one hand gave life and happiness to millions but on the other hand due to mismanagement of the waste reduced, it produced adverse effect on humans, animals and environment. So, it's the need of hour that the Bio Medical Waste (BMW) should be managed safely and properly such that risk from this is minimised.

Any waste generated during diagnosis, treatment or immunisation of human beings or animals is known as biomedical waste. It also includes waste produced during research or during biological testing which has toxic and infectious potential. Generally about 75%-85% biomedical waste produced by health care institutes is risk free. Only 10%-15% has potential to adversely affect humans, animals and environment. Though the percentage of risk factor is quite less as compared to risk free percent but still this can cause potent health hazards and environmental degradation. Thus, it is very crucial to ensure safe, effective and wise disposal of biomedical waste and this requires a proper biomedical waste management system.

Keywords: Disease, environment, biomedical waste, diagnosis, treatment, immunization, biomedical waste management.

1.0 Introduction- Due to adoption of sedentary lifestyle in this modern world, people all over the globe are facing health problems. Almost every person suffers a diseased condition may be acute or in some cases may be chronic. With time, technology has improved and so the healthcare facilities. The healthcare facilities have emerged to diagnose, treat and cure the disease. This is the boon of science or the magic of science that brings life n smile to millions.

But as each thing has both pros as well as cons, similarly there is problem associated with this boon and that is generation of Bio Medical Waste (BMW). The bio medical waste generated in providing healthcare facilities possess a potent threat to humans, animals and environment. The BMW generated is a potent source of disease transmission to visitors, care takers in health care centres, in-patients, out-patients, workers, general public, animals and environment. Due to less number of health care facilities in past no one paid attention to the health hazards cause by the BMW generation. But in last two decades mushroom growth of the health care facilities took place. This lead to urgent requirement for Bio Medical Waste Management. Thus, Bio Medical Waste (Management and Handling) Rules 1998, were introduced by WHO

which stated about the safe practices followed during disposal of Bio Medical Waste such that its adverse impact may be minimised (Ajmal & Ajmal, 2017; Capoor & Bhowmik, 2017; Datta, Mohi, & Chander, 2018; Joshi & Ahmed, 2016).

Bio Medical Waste can be defined as any solid, fluid or liquid waste generated during health care process like diagnosis, treatment and cure of a disease prone person.

According to the Bio Medical Waste(Management and Handling) Rules 1998, Bio Medical Waste is defined as- ‘any waste which is generated during the diagnosis, treatment or immunisation of human beings or animals or in research activities pertaining there to or in the production or testing of biological and including categories mentioned in schedule I’.

The schedule I includes human anatomical waste, animal waste, microbiology and biotechnology waste, waste sharps, discarded medicines and cytotoxic waste, soiled waste, liquid waste, incineration ash and chemical waste (A. Patil & Shekdar, 2001). The colour coding of containers for storage of different types of bio medical waste is given in figure 1.

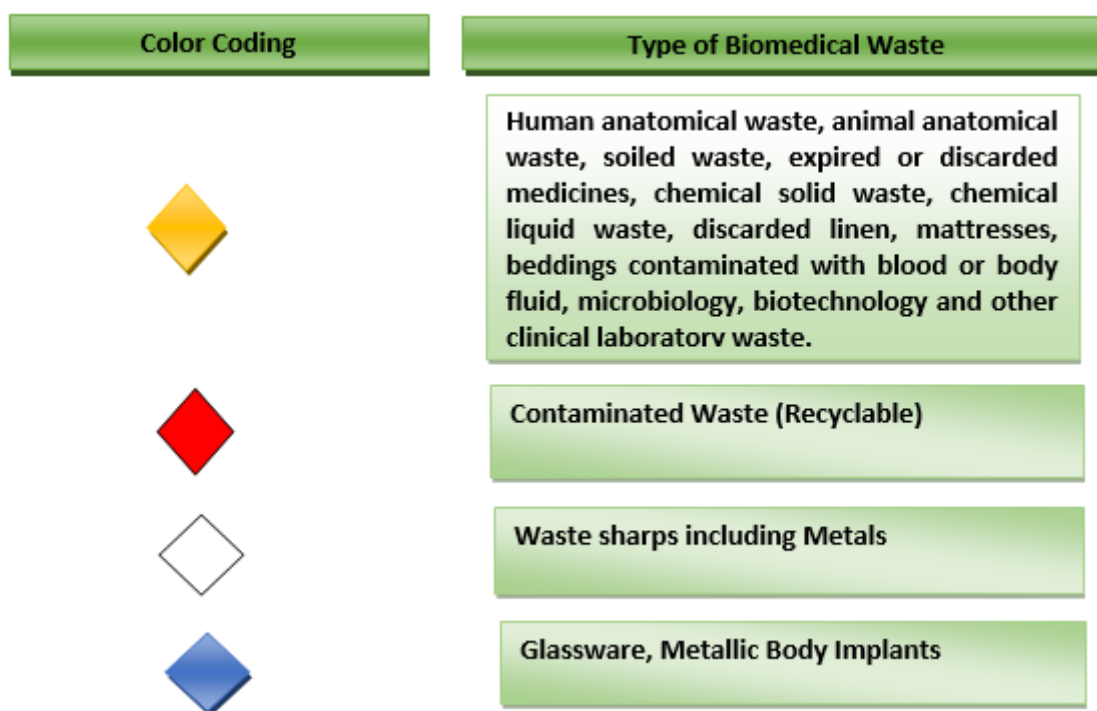


Figure 1: Colour coding of containers for storage of different types of bio medical waste.

Around 85% of Bio Medical Waste generated is a non-hazardous and non-infectious and around 10-15% is hazardous and infectious. Though the percent of hazardous and infectious biomedical waste is low but still it possesses immense physical, chemical, and/or microbiological threat to the environment and creatures in it (Hiremath et al., 2017; Joshi & Ahmed, 2016).

Biomedical waste generation has become a matter of concern, therefore essential approaches for its management it are required to be followed such as characterization, quantification, segregation, storage, transport, and treatment.

As, the fundamental of principle of any waste management process is based on the concept of 3Rs, that are reduce, recycle, and reuse. Avoidance of waste generation, reduction in production of waste and treating the waste first to recover rather than disposal should be the first step of good BMW management practices. The steps involved in the disposal should be based on the type of BMW produced. One should try to prevent, reduce, recycle, recover, and treat the waste produced. If these steps fail than one should go for disposal techniques. It will be a wise practice if the BMW is treated at the place where it is generated rather than at the end after collection of all the BMW waste generated in an area (**Mathur, Patan, & Shobhawat, 2012; Ostwal, Jadhav, More, Shah, & Shaikh, 2015**).

WHO has classified Bio Medical Waste as: general waste, pathological, radioactive, chemical, infectious waste, sharps, pharmaceuticals and pressurized containers (**Gadicherla, Thapsey, Krishnappa, & Somanna, 2016**).

The major sources identified for BMW generation are hospitals, dispensaries, research centres, medical colleges, veterinary colleges, pathological labs, blood banks, biotechnology institutes & pharmaceutical industries. Whereas the minor sources include health clinics, animal houses, slaughter houses, blood donation camps and funeral services (**Soyam, Hiwarkar, Kawalkar, Soyam, & Gupta, 2017**).

Due to improper Bio Medical Waste management, many health hazards are born. Improper Bio Medical Waste management leads to-

- Environmental pollution (air, water & soil pollution)
- Growth of vectors like mosquitoes, flies, rodents, insects etc.
- noscominal infections
- transmission of harmful diseases like HIV-AIDS, hepatitis, typhoid, cholera etc.
- unpleasant and stinky odour in surrounding areas of Bio medical waste dumps.

The mismanaged Bio Medical Waste causes spread of various communicable diseases and even has the potential to cause epidemic. The untreated or non-sterilised syringes & needles used for HIV, hepatitis patients etc. has great potential to cause such life threatening diseases to general public. Thus, an effective biomedical waste management is required (**Ajmal & Ajmal, 2017; NR, Srikantaswamy, Kumar, & Abhilash**).

The Bio Medical Waste management includes basically two steps: handling & safe disposal. The Bio Medical Waste generated should be kept safely such that it does not scatters here and there, in properly

labelled different suitable containers meant for that type of waste. For e.g. Human anatomical waste and animal waste is kept in yellow coloured plastic container while the recyclable waste is kept in red coloured plastic container. The waste after collection and segregation should be transported to a treatment plant where suitable methods are used to reduce the infectious potential of waste. This treated waste is then carefully transported to disposal site and final disposal is made (PAndey, AhujA, MAdAn, & ASthAnA, 2016; Singhal, Tuli, & Gautam, 2017). The major steps involved in disposal of bio medical waste are depicted in figure 2.

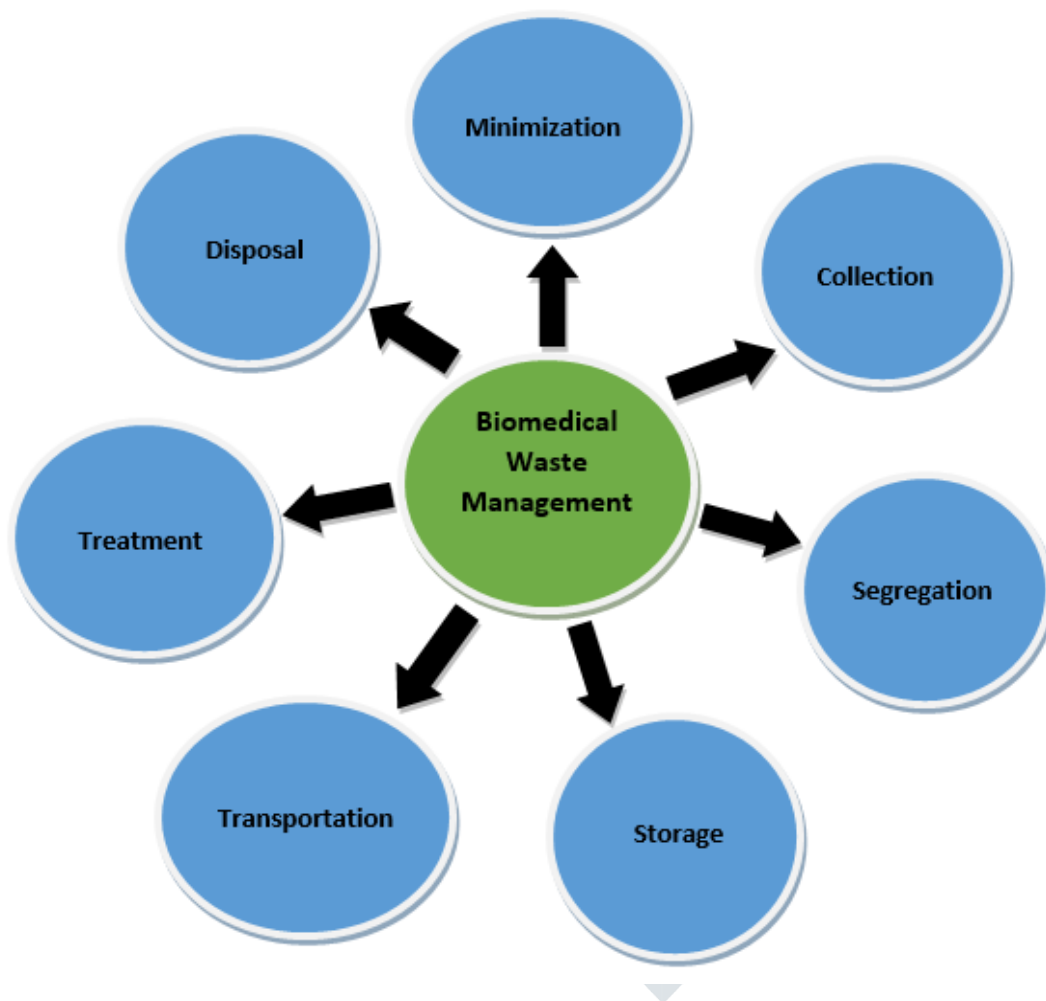


Figure 2: Steps involved in effective bio medical waste management.

The Bio Medical Waste can be treatment includes: incineration, autoclaving, microwave, irradiation, chemical treatment (1% hypochlorite solution), and pyrolysis. The waste which is biodegradable can be disposed by deep burial, glass and plastic bottles may be recycled after proper disinfection. WHO (World Health Organisation) guidelines should be followed while disposing the Bio Medical Waste (G. V. Patil & Pokhrel, 2005; Sachdeva, 2016).

Common Bio Medical Waste Treatment Facility (CBWTF) has been set up to treat the Bio Medical Waste such that its adverse effects are reduced and safe disposal can be made. The most important way of ensuring the safe and wise disposal of Bio Medical Waste is creating awareness among people related to health

profession and training them so that they may know the ways and requirement of an effective Bio Medical Waste management system (Babu, Parande, Rajalakshmi, Suriyakala, & Volga, 2009; Sarotra et al., 2016; Sharma, 1998).

2.0 Review of Literature: The BMW produced in India created more health problems to the people who used to do sorting of the generated BMW for recycling without gloves, masks and shoes. Also, the reuse of syringes without proper sterilization caused spread of many diseases. This led the Ministry of Environment and forest, government of India for the first time to bring and notify the BMW rules in July 1998.

International Clinical Epidemiology Network carried out detailed examination of the existing BMW practices, setup, and framework in primary, secondary, and tertiary health care facility (HCF) in India across 20 states during the year 2002 to 2004 and found that around 82% of primary, 60% of secondary, and 54% of tertiary HCFs in India had no proper channel for management of BMW

Due to reuse of unsterilized syringes about 240 people in Gujarat, India suffered hepatitis B in the year 2009. Many other such incidences have been reported nationwide. Therefore, these necessitate stern rules and regulations for BMW management (Hiremath et al., 2017).

The BMW 1998 rules were modified in the following years – 2000, 2003, 2011 and amended in March 2016, 2018 & 2019.

The new amendment in 2016 known as biomedical waste (amendment) rule, 2016 has increased the coverage, simplified the categorization and authorization while improving the segregation, transportation and disposal methods to decrease environmental pollution. It has four schedule, five forms and eighteen rules (Singhal et al., 2017).

Many researchers have been studying the various strategies practiced for efficient BMW management. Gupta S et.al, in 2006 presented a report on bio medical waste management practices at Balrampur hospital in Lucknow, Uttar Pradesh and also compared it with other hospitals in terms of BMW management. They concluded that though the hospital spends a handsome amount in BMW management but due to lack of education, awareness and trained personals, effective BMW management could not be done. They state that for efficient BMW management the rules and regulations should be adhered and followed strictly, new equipment with latest technology should be procured. Also, the health care staff should be educated, trained accordingly. They should have a commitment for following effective policies and work within the legislative framework (Gupta & Boojh, 2006).

Radha K.V et.al.,2009 also studied BMW in hospitals and reported that even the premier hospitals are lacking effective BMW management practices, illiteracy, unawareness and lack of funds being the root cause. They advocated for better enforcement of existing policies, training of staff and awareness about BMW (Radha, Kalaivani, & Lavanya, 2009).

3.0 Objectives of the Study: The objectives of this research study is to analyse the root causes of biomedical waste generation and finding effective ways to process, treat, handle and manage the generated bio medical waste such that its threat to environment reduces.

Also, this research study will suggest steps to minimize the risk of generated biomedical waste.

4.0 Research Methodology: This research study is based on secondary data sources. The data has been collected from various sources such as journals, newspaper reports, research articles and other published sources.

This study is deductive in nature.

5.0 Research Analysis: Though India is one of the first country to initiate safe disposal practices of BMW but still there is a need to strength and upgrade the existing BMW management system, otherwise it may turn to a manmade disaster.

The reports indicate that still our country is lacking behind to manage the BMW efficiently. The healthcare systems which are the major source of BMW generation fail to dispose BMW in safe and desired manner. The reasons as seen from the research study may be paucity of funds, incompetent, untrained and uneducated staff members, unawareness among people, and liberty in adherence to the existing regulatory framework.

Though we have many hopes from the changes bought in rules and regulations governing appropriate disposal of BMW in the form of amendment 2016. The biomedical waste rules, 2016, has expanded its scope to health camps such as vaccination camps, blood donation camps, and surgical camps, duties of the occupier of a HCFs have been revised, the segregation, packaging, transportation, and storage of BMW has been improved.

Most importantly the new rules are more stringent and elaborate and therefore should bring about a change in the way the BMW was managed. Now the ministry of Environment, Forest, and Climate change will monitor the implementation of rules yearly. And in each state a district-level committee under the chairpersonship of District Collector or District Magistrate or Additional District Magistrate will be set-up to take the responsibility checking compliance of BMW rules. Not only this, the committee is abide to submit a six-monthly report to the State Pollution Control Board.

If the practices enlisted in biomedical waste Rules, 2016 are strictly adhered than surely the management would be effective and the risk to the living components of earth will be minimized.

6.0 Findings: Many changes have been introduced in the latest rules and regulations governing bio-medical waste. These new rule are simple, easy to understand and follow. The govt. has now clearly mentioned the authorization of different steps required in good BMW management. The new changes introduced in the

laws governing BMW management if executed and implemented properly will surely bring effectiveness to dispose the BMW in right manner.

7.0 Suggestions: Worldwide, the number of people being infected with severe diseases like HIV, hepatitis B due to unsafe Bio Medical Waste management is increasing day by day. So to prevent people, animals and environment from the hazardous of Bio Medical Waste we should ensure an effective Bio Medical Waste management system. Some suggestive measures for effective bio medical waste management are:

- Waste generation should be minimized at the source itself
- Creation of awareness among people and community involvement.
- Practical institutional set-up for bio medical waste management and planning.
- Training the manpower technically.
- Incomplete community involvement
- Partial awareness creation mechanism
- Updated management system, equipment and infrastructure.
- Fund investment in bio medical waste management should be increased by the government as well as the private organisations.

8.0 Conclusion: The study concludes that bio- medical waste possess immense threat for the environment, human health and other living creature. Therefore, we should scientifically manage the generated bio medical waste such that its adverse effects are minimized. We should first of all try to reduce the generation of bio medical waste and secondly should efficiently follow the guidelines to ensure safe and effective biomedical waste management. So for the sake of human betterment, strategies to manage bio medical waste should be adhered and strictly followed.

References:

- Ajmal, S., & Ajmal, M. (2017). Knowledge and practices of biomedical waste management among Paramedic staff of Jinnah hospital, Lahore. *Biologia*, 63(1), 59-66.50.
- Babu, B. R., Parande, A., Rajalakshmi, R., Suriyakala, P., & Volga, M. (2009). Management of biomedical waste in India and other countries: a review. *Journal of International Environmental Application & Science*, 4(1), 65-78.
- Capoor, M. R., & Bhowmik, K. T. (2017). Current perspectives on biomedical waste management: Rules, conventions and treatment technologies. *Indian journal of medical microbiology*, 35(2), 157.
- Datta, P., Mohi, G. K., & Chander, J. (2018). Biomedical waste management in India: Critical appraisal. *Journal of laboratory physicians*, 10(1), 6.

- Gadicherla, S., Thapsey, H., Krishnappa, L., & Somanna, S. N. (2016). Evaluation of bio medical waste management practices in select health care facilities of Karnataka, India. *International Journal Of Community Medicine And Public Health*, 3(10), 2722-2728.
- Gupta, S., & Boojh, R. (2006). Report: biomedical waste management practices at Balrampur Hospital, Lucknow, India. *Waste Management & Research*, 24(6), 584-591.
- Hiremath, R. N., Basandra, S., Kunte, R., Ghodke, S., Edwards, T. S., Yadav, J., . . . Patil, S. (2017). Assessment of biomedical waste management of a multispeciality hospital in the light of new BMW rules 2016: what has changed from the past? *International Journal Of Community Medicine And Public Health*, 4(9), 3224-3229.
- Joshi, R., & Ahmed, S. (2016). Status and challenges of municipal solid waste management in India: A review. *Cogent Environmental Science*, 2(1), 1139434.
- 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.
- NR, P., Srikantaswamy, S., Kumar, S., & Abhilash, M. International Journal of Engineering Sciences & Research Technology Characterization of biomedical waste of mysuru city hospitals.
- Ostwal, K., Jadhav, A., More, S., Shah, P., & Shaikh, N. (2015). Knowledge, attitude and practice assessment of biomedical waste management in tertiary care hospital: It's high time to train ourselves. *International Journal of Environmental Sciences*, 5(6), 1115.
- PAndey, A., AhujA, S., MAdAn, M., & ASthAnA, A. K. (2016). Bio-Medical Waste Managment in a Tertiary Care Hospital: An Overview. *Journal of clinical and diagnostic research: JCDR*, 10(11), DC01.
- Patil, A., & Shekdar, A. (2001). Health-care waste management in India. *Journal of Environmental Management*, 63(2), 211-220.
- Patil, G. V., & Pokhrel, K. (2005). Biomedical solid waste management in an Indian hospital: a case study. *Waste management*, 25(6), 592-599.
- Radha, K., Kalaivani, K., & Lavanya, R. (2009). A case study of biomedical waste management in hospitals. *Global journal of health science*, 1(1), 82-88.
- Sachdeva, S. (2016). Biomedical waste and solid waste management draft rules India, 2015: a comment. *Int J Health Allied Sci*, 5, 129-132.
- Sarotra, P., Medhi, B., Kaushal, V., Kanwar, V., Gupta, Y., & Gupta, A. K. (2016). Health care professional training in biomedical waste management at a tertiary care hospital in India. *Journal of biomedical research*, 30(2), 168-170.
- Sharma, A. (1998). Bio Medical Waste (Management and Handling) Rules. *Bhopal: Suvidha Law House*.

- Singhal, L., Tuli, A. K., & Gautam, V. (2017). Biomedical waste management guidelines 2016: What's done and what needs to be done. *Indian journal of medical microbiology*, 35(2), 194.
- Soyam, G. C., Hiwarkar, P. A., Kawalkar, U. G., Soyam, V. C., & Gupta, V. K. (2017). KAP study of bio-medical waste management among health care workers in Delhi. *International Journal Of Community Medicine And Public Health*, 4(9), 3332-3337.

