

## **APPROACH TOWARDS RESOLVING BIOMEDICAL WASTE PROBLEMS IN INDIAN PERSPECTIVE - A REVIEW**

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### **Abstract**

The year 2020, the worst ever era has turned out to be fatal for our country, the continent, and the world. India, being the second largest populated country has also reported highest number of Covid-19 cases. The number of Covid-19 positive cases tremendously increased within a short span of time putting huge stress and burden on social and economic status of the people. Rise in Covid-19 cases has directly affected the medical field, leading to huge pileup of biomedical waste. As per Central Pollution Control Board (CPCB) data, the biomedical waste generated is on rise making it extremely difficult and challenging for the government as well the public health workers to manage. By means of this paper attempt is made to take a note of the grief situation pertaining to handling, legal guidelines, and management of the biomedical waste in India, best practices to be adopted in improving waste management crisis. Also, the paper intends to create awareness among the people, key elements being collection and segregation of waste.

**Keywords:** Central Pollution Control Board, Covid-19, Biomedical waste, Segregation, Regulation.

### **Introduction**

Rapid advancement in technology has changed the world improving the production and consumption processes led to generation of wastes from multisector areas (1& 5). India annually generates around 62 million tons of waste of which only 3/4<sup>th</sup> of the waste is collected and around 22-28 percent only undergoes processing and treatment leaving the rest of the waste as unresolved, which is responsible for change in the quality and the environmental degradation (2) & (3). It is estimated that India would exceed its municipal solid waste generation capacity to more than 165 million tons in 2031 and by 2050 to reach 436 million tons. Management of waste therefore is necessary to mitigate the problem of waste considering health, hygiene, and environment.

The outbreak of novel corona virus in India for the first time reported on 30<sup>th</sup> January 2020 in Kerala. It was termed as pandemic by WHO which was caused by a virus called SARS-Cov-2. The never expected pandemic rapidly spread through the entire country and within no time started reflecting its impact on human health leading to adverse effects in the form of morbidity and mortality. In fact, India has topped the list of maximum cases in Asia (4). The unprecedented situation of Covid-19 was

full of uncertainty creating wider impact not only on the socio-economic spheres but also on the physical and mental status of the people. Feeling fearfulness has led to stress and anxiety which in turn has drained emotional balance. Thousands of people were found to be infected daily, on the other side treatment along with management of biomedical waste generated from these sources was a big challenge and cause of concern. During the pandemic period on one hand everybody was trapped under the worst phase of panic situation leading a very unpredictable life, while scientists on the other hand were deeply involved in exploring new ways for identifying the solution for the same.

The enormous population size of our country has made its people more vulnerable and prone to get affected by this rapidly spreading infection. Adding to it, not many people are well versed with standard guidelines to handle the biomedical waste generated. Even the sanitary workers and staff handling the biomedical waste were initially unaware of the consequences. Therefore, the basic purpose behind waste management is anticipated to reduce adverse effects of waste on health, the environment or aesthetics. To carry out efficient management of waste, knowledge about the source of wastes, its types and classification is very much important. Also, insight into the details on collection, handling and management of waste specifically biomedical waste becomes imperative. Therefore, any type of waste produced from hospitals, medical center’s and nursing homes is called biomedical waste. (6). The source for such biomedical waste being the hospitals where a certain amount of waste is generated throughout identification and diagnosis of diseases, cure and during healing. Other such sources include research related activities like clinical trials, testing and experimentation. These wastes are highly infectious and may pose a severe threat if not managed properly (7). Biomedical wastes may be solid or liquid wastes that include discarded blood, sharps, soiled wastes, disposables, anatomical wastes, cultures, discarded medicines, chemical wastes etc. (8). Similarly, the waste produced from usage of various materials infected by covid-19 patients also is biomedical waste highly contagious and harmful unless properly managed and discarded (9). To bring down the levels of waste, reduce the conflict and chaos, Ministry of Environment, Forest, and Climate Change (MOEFCC) with other regulatory bodies and central government taking into account the significance of implementation of norms for the protection of environment and effective management of waste established Environment Protection act (1986) and the Bio-Medical Waste Management and Handling Rules (2016) and started implementing it.

**Sources of waste:**

As long as life exists on the earth, resources are required to fulfil the needs from individual level to the community at large, and for the needs to be satisfied, resources are abruptly used eventually creating huge amount of waste in numerous forms which includes household, industrial, commercial, agricultural, and other diversified sources. Out of the many such wastes, handling and management of waste generated from biomedical sources is a herculean task for the health workers specifically waste produced from Covid-19 infected patients from places such as containment zones, quarantine facilities, hospitals, isolation homes and other such places.

Table: 1 Sources of Biomedical Waste:

<b>S. No</b>	<b>Sources of waste</b>
1	Containment Zones/Red zones
2	Quarantine Facilities/ COVID Care facilities
3	Isolation homes/ Home quarantine
4	Health care facilities/ Hospitals/Labs.

**Types of Waste:** General classification of waste includes solid, liquid, gaseous, sludge and septage wherein solid waste includes biomedical, domestic, and hazardous waste. Liquid waste contains sewage/grey water and the sludge and sewage include physical, chemical, and biological impurities.

Table: 2 Types of Waste

S. No	Types of Waste		
	Solid Waste	Liquid waste	Sludge/ Septage
1	Biomedical	Biomedical	Septic tanks
2	Domestic hazardous waste	Sewage/Grey water	Household septic tanks/ Pit Latrines
3	Domestic waste		Package STPs in Gated Communities

**Safe Management of Waste:**

Collection, handling, transportation, processing, and disposal of waste material is super important to prevent potential spread of COVID-19. According to, the key to minimization and effective management of medical waste is segregation (separation) and identification of the waste. (10) As per the study carried out by them, the most preferred way-out ascertaining characteristics of medical waste would be separating the collected waste by distinguishing it with different color codes so that segregation and recognition of waste becomes easy by the use of coloured labels on the waste bags/containers.

Table: 3 CPCB Guidelines for handling COVID-19 Biomedical waste.

S. No	Guidelines Dates
1	18 <sup>th</sup> March 2020: Initial Guidelines
2	25 <sup>th</sup> March 2020: Revision 1 Guidelines
3	25 <sup>th</sup> March 2020: Advisory (CBMWTFs as Essential Service)
4	18 <sup>th</sup> April 2020: Revision 2 Guidelines

**Biomedical Waste Regulations in India:**

Biomedical Waste (Management & Handling Rules 2016) the ultimate purpose of the rules is to serve the society better by making it applicable to the facilities whichever involved in the generation of biomedical waste so that it benefits the end user protecting their health and hygiene (11). The rules are meant to bring out a systematic change in the overall lifestyle of the people by making them follow standard protocols. It mainly emphasizes the responsibilities of the occupier to take the needed steps in handling such waste and safeguard human health. It also has provisions and detailed guidelines about the operating practices of Common Bio-medical Waste Treatment & Disposal facility (CBWTF) and clearly indicates the way out for the treatment and disposal of the same. Rules pertaining to overall management (segregation, packaging, transportation, and storage) are clearly mentioned. Other aspects, including monitoring and implementation of rules, are also focused.

**Responsibilities of stake holders for implementation:**

**Health care facilities:** These are facilitation center’s where the infected patients are isolated which include isolation wards, quarantine camps, general community-based facilities, Covid care facilities etc. for the overall management (handling and disposal) of waste produced from various activities.

**Sample collection and lab facilities:** The main purpose being sample collection and reporting the actual status to the concerned State Pollution Control Boards (SPCB)/Pollution Control Committees (PCCs).

**Quarantine camps/ Quarantine Homes:** The meaning of quarantine is keeping under confined state to restrict the movement of people already exposed to certain infection. These are the places where people are kept in isolation in homes or in community-based facilities for a stipulated period of time. These facilities are largely involved in collection, segregation and handing over of waste to Urban local bodies (ULBs) and play important role in keeping the general waste separated from biomedical and other wastes and such related aspects.

**Common Biomedical Waste Treatment Facility:**

The role of Common Biomedical Waste Treatment Facilities (CBWTFs) is important as they are meant to reduce the adverse impacts of wastes generated from various health care facilities. They follow the standards prescribed by Biomedical Waste Management Rules, (2016) and the guidelines given by Central Pollution Control Board (CPCB) for further compliance criteria.

State Pollution Control Boards: State Pollution Control Boards/Pollution Control Committees are the prescribed authority to ensure implementation of Rules as well as the compliance.

### Urban Local Bodies:

Key role is being played by urban local bodies in managing the waste which involves the total process of collection, segregation, treatment and ultimately discarding the generated waste to reduce the spread of infection significantly. Significant functions of Urban Local Body's (ULBs) include looking into the waste produced specifically from Covid centres and isolation wards where in Covid-19 positive patients are taken care of, maintain and keep track of the necessary data related to Covid centers such as quarantine homes/ other such places readily available and handover the updated information to SPCBs/PCCs as and when required, Also to take care of the different types of waste is just not mingled with other biomedical waste. Therefore, the waste is handled with more care and sensitivity to see that both general solid waste and the biomedical waste are collected separately. As a matter of concern, urban local bodies (ULBs) also bring to the notice of the people who operate covid waste centers from where the biomedical waste is generated and ask them to ensure collection of the same in different color-coded bags before handing it to workers of ULBs. Urban Local bodies also ascertain that the standard protocols are followed in the collection of waste and priority is given to the color coding and also see that the unwanted (leftover) food waste and other waste generated is not collected in yellow bags. Even they keep track of management of waste by Common Bio-Medical waste Treatment & Disposal facility (CBWTFs). Many such other works are keenly observed by them for smooth functioning of the same.

Table: 4 Segregation of Biomedical waste

S.No	Category	Type of Biomedical Waste	Treatment/ Disposal
1	Yellow	Human and Anatomical waste, soiled waste, discarded linen, contaminated blood or body fluid	Incineration or Plasma Pyrolysis or Deep Burial
2	Red	Contaminated waste	Autoclaving/Microwaving/Hydro Claving
3	White	Any Waste Sharps that trigger puncture and cut including metals	Auto or Dry heat sterilization followed by shredding or mutilation/Encapsulation (BMW MR2016)
4	Blue	Glassware broken into pieces/metallic body implants	Disinfection or Autoclaving, microwaving, Hydroclaving then recycling (BMW MR2016)

### Handling of Bio-medical Waste (BMW) at Quarantine Centers:

It becomes imperative to handle the biomedical waste generated from Covid-19 Care centers and other Healthcare facilities having isolation wards including temporary Healthcare Facilities with much attention. Also Covid-19 patients need to abide to the regulations prescribed, so that unwanted threat of infection is prevented. Certain aspects gain priority at the time of handling of biomedical waste such as keeping color distinguished trash cans to represent general solid waste and biomedical waste separately as prescribed by Central Pollution Control Board (CPCB). Further to safeguard everyone, double layered bags should be used taking measures that sharp objects are not placed inside and there

is no leakage from the bags (12). Use of 1% sodium hypochlorite is important, which disinfects the bags and avoids contamination. Also, cross check that the collected and stored biomedical waste is separated prior to handing over to Common Bio-Medical waste Treatment & Disposal facility (CBWTF). Due to proper labelling of the containers, it becomes easy for the CBWTF staff to recognize the separated waste and collect it for further process i.e. treatment and disposal. 1% Sodium Hypochlorite solution should be used frequently to disinfect the containers/ trolleys used for handling of Covid-19 waste. Waste generated from these quarantine centers/ isolation wards and other health care centers such as used sanitary pads, used masks and gloves and other such materials should be sealed in double layered red- and yellow-colored bags with utmost care as per the guidelines.

**Treatment and Disposal of Liquid Waste:**

Handling of waste specifically the biomedical waste is a terrible task, however dealing with liquid wastes is equally challenging in urban sanitary conditions, failing to cope up liquid wastes, especially human waste(excreta), leads to adverse health and hygiene problems. During the Covid pandemic people are quarantined or isolated at places where there is much scope for contamination. In that case segregation of liquid chemical waste and pre-treatment or neutralization is the way out to treat liquid waste prior mingling with other wastes released from medical health care units.

**Responsibilities of State Pollution Control Boards (SPCBs):**

The State Pollution Control Board(SPCB) plays a significant role in creating guidelines on standards, assessing, release, checking and control the authorization given to waste generators. It's the duty of SPCB to give direction for safe handling of waste by receiving the data from various ULBs and waste collection centers such as quarantine homes/ isolation wards etc. and set up frame work to bring down the level of pollution in each of the states. Important functions of SPCB by and large include the complete management of waste (cradle- to-grave) by enforcing biomedical waste rules 2016. States where the CBWTFs are not available specifically the rural and remote areas, hospitals already equipped with facilities can be used for the disposal of such waste as per the provisions under BMWM Rules, 2016 wherein the treatment and disposal is done in compliance with schedule I and schedule II. Disposal of waste in rural or remote areas can be done by means of deep burial with certain limitations include selection of site and other aspects as per the guidelines mentioned by CPCB.

**Challenges & Issues:**

Due to the increased cases of novel corona virus, burden on the staff has tremendously increased ultimately raising the staff requirement. Lack of full-fledged workers reduces the efficacy of managing the waste giving potential scope for general waste getting mixed with other infected waste (Covid-19) and reduce the frequency of collection of waste from quarantine centres and other such medical facilities. Over burden of the waste also creates pressure on the working efficiency of Common Bio-Medical waste Treatment & Disposal facility (CBMWTF) to handle waste issues. Due to increased cases of covid-19, staff involved in the overall process of monitoring the waste are at high risk and more vulnerable unless proper training and awareness is provided to them by the experts to protect themselves from the spread of infection.

**Conclusions:**

The covid-19 pandemic is not yet completely over and the risk of infection through many ways and means is always there, however the implementation of laws pertaining to handling and management of solid, biomedical, and hazardous waste through the amended rules from time to time can bring some positive change in mitigating the covid-19 cases. More efforts at the government level are needed to bring out change in society by organizing awareness camps, social campaigns and other innovative ways so as to handle the haphazard menace of generated waste and avoid contamination and spread of bubonic diseases. Further Government agencies need to act smart to bring scalable changes in the practices to be adopted in maintaining standard guidelines by the citizens to segregate waste at the very initial level and use the resources judiciously. However, change is expected in the

mind-set of the people to start from individual to community at large, unless then the issue of massive waste management remains unresolved.

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