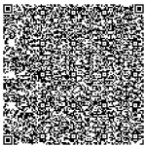

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Management of Biomedical Waste in India: A Holistic Approach Towards Environmental Protection, Human Rights, and Judicial Oversight with reference to the Pandemic

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Abstract

The management of biomedical waste in India has implicit critical significance, especially in the context of the global pandemic. The management of biomedical waste involves a multifaceted nuance, including sensitizing healthcare professionals, establishing robust waste disposal facilities, and adhering to stringent guidelines. As the pandemic has intensified the generation of biomedical waste, there has to be a paramount emphasis on the implementation of environmentally responsible practices, considering the potential impact on ecosystems. Furthermore, this research paper delves into the legal dimensions of biomedical waste management, examining the role of the judicial approach in enforcing regulations and the accountability of the regulatory authorities. The interplay of environmental protection, human rights, and legal frameworks provides a nuanced understanding of the challenges posed in the management of biomedical waste in India. This paper advocates for a collaborative approach that harmonizes the imperatives of environmental sustainability, ensuring human rights, and effective judicial perspectives, offering a comprehensive and adaptable model for the management of biomedical waste in India and globally as well.

Keywords: Infectious diseases, Regulatory authorities, Right to Life, Stockholm Convention, Sustainability

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1. Introduction

Humanity has explored the uncharted territories of science and technology, and this exploration has turned out to be a blessing. However, with the passage of time and with the growth of human activities in various fields it is been realized that every human activity has generated various by-products. At times, these by-products are useful and thus can be recycled and reused or else they are completely useless and are termed as 'waste'. As per the Oxford Advanced Learner's Dictionary, "Waste means materials that are no longer needed and are thrown away."[1] Therefore, waste is an inevitable outcome of every human activity.

The medical processes undertaken by the hospitals or clinics are perceived as life-saving measures but in reality, the by-products of such processes *viz.* Biomedical Waste (BMW) can be life-threatening. BMW can be construed as any unwanted residual matter arising from the hospital or activities related to the hospital. Therefore, BMW may be broadly defined as any solid or liquid waste that is generated in the diagnosis, treatment, or immunization of human beings or animals in research pertaining thereto, or in the production or testing of biological or health camps.[2] It can be observed that BMW covers a wider spectrum affecting flora, fauna, and human health, directly and/or indirectly. According to World Health Organization (WHO), 85% of hospital waste is non-hazardous and around 10% is infectious while the remaining 5% is non-infectious but consists of hazardous chemicals like

[1] Oxford Univ. Press, Oxford Advanced Learner's Dictionary 8.0 (7th ed. n.d.), http://oxford-advanced-learner-s-dictionary.software.informer.com/8.0/.

[2] P. Datta, G.K. Mohi & J, *Chander, Biomedical Waste Management in India: Critical Appraisal*, 10 J. Lab. Physicians 6, 6-14 (2018), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5784295/ (last visited Jan. 13, 2024).

methyl chloride and formaldehyde.[3] Biomedical waste is waste that is either putrescible or potentially infectious.[4] BMW's main concern is that it contains disease-spreading pathogens, which can lead to the transmission of life-threatening diseases such as AIDS, Hepatitis, Tuberculosis, Plague, and Cholera. In addition, it also poses a serious threat to the fragile ecological balance. This translates into a risk of Air, Water, and Soil pollution due to the release of toxic substances. The irresponsible dumping of untreated BMWs in vacant plots or landfills leads to the degradation of the quality of soil. If BMW is discharged into water resources, then the hazardous substances present therein contaminate the available fresh water resources which itself is scarce in nature. Furthermore, it has a deep and far-reaching impact on aquatic life. Disposal techniques of BMW such as incineration are contributing heavily to air pollution as it releases carcinogenic substances into the air. This renders the surrounding habitat unsuitable for living beings. Moreover, the COVID-19 pandemic exerted substantial pressure on global healthcare systems and facilities, putting the lives of countless individuals at risk. In addition, the treatment of patients during the pandemic resulted in an unprecedented increase in the volume of medical waste generated, including biomedical waste (BMW) or healthcare waste (HCW), which poses a risk of infectious disease transmission.[5] Hence, one can't deny the impact of BMW on the health of individuals as well as the environment.

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[3] World Health Organization, *Medical Waste Management*, World Health Organization (2022), http://www.who.int/topics/medical_waste/en/ (last visited Jan. 23, 2024).

[4] P.A. REINHARDT & J.G. GORDON, INFECTIOUS AND MEDICAL WASTE MANAGEMENT (CRC Press, Taylor & Francis), (1991).

[5] W.A. Bagwan, *An Investigation of the Bio-Medical Waste Produced in India During the COVID-19 Pandemic and Maharashtra State (Pre-COVID-19 and post-COVID-19) Analysis: A GIS-Based Approach*, Res. Health Serv. & Regions (2023), https://doi.org/10.1007/s43999-023-00023-9 (last visited Jan. 23, 2024).

The BMW disposal is part and parcel of environmental concerns of the modern world. This research undertakes the evaluation of such Rules and Regulations which regulate the management and handling of BMW.

The biomedical waste disposal problem has been an issue of concern for a few decades and the main cause of concern is that biomedical waste disposal has reached a new height which has started to affect not only human health but also the environment. The impact of bio-medical waste has resulted in the violation of Human Rights such as the right to life, the right to health, right to a safe and healthy environment. Biomedical waste ports disease-causing pathogens, hazardous materials, and mildly radioactive substances. Due to its non-biodegradable nature, proper disposal is essential. Although legislation exists to regulate biomedical waste disposal, administrative inefficiencies, and uncertainties in executing the legal provisions pose a threat to both the environment and human rights. The harmful impact extends way beyond human health to the ecological system.

2. Conceptual Evolution of Biomedical Waste in India

The nexus between human health and the environment is increasingly evident, with deteriorating environmental quality posing inevitable health risks. The surge in human activities has amplified waste generation including Biomedical Waste (BMW), presenting a complex disposal challenge.[6] BMW, a hazardous waste found in liquid, solid and gaseous forms, stems from hospital-related activities, posing threats to both human life and the environment.

[6] Ashish Dehal, Atul Narayan Vaidya & Asirvatham Ramesh Kumar, *Biomedical Waste Generation and Management during COVID-19 Pandemic in India: Challenges and Possible Management Strategies*, 29 ENVIRON. SCI. POLLUT. RES. INT. 14830 (2022).

BMW encompasses liquid waste (biological, chemical, expired medicines, radioactive) and solid waste (perforating, non-perforating, clinical, and laboratory waste). India regulates BMW through an extensive legislative framework, including the Environment (Protection) Act, 1986, and the Biomedical Waste (Management and Handling) Rules, 1998 and 2016. [7] Despite existing regulations, the effective management of BMW remains a distant goal due to administrative inaction. The definition of BMW has evolved, with the 2016 rules broadening it to include health camps and refining categories. According to WHO, most non-hazardous healthcare waste comes from hospitals, laboratories, and other sources. In India, BMW is categorized as Yellow (anatomical waste), Red (contaminated disposable items), White (sharp waste), and Blue (glassware). Specific disposal methods for each category are crucial for public health and environmental safety.

3. Impact of Bio-Medical Waste on the Environment

Globally, environmental protection principles emphasize effective waste management, incorporating the Precautionary, Polluter Pays, Generator's Responsibility, Sustainable Development, and Inter-Generational Equity principles. In managing biomedical waste, the 'Duty of care' principle stresses ethical responsibility, while the 'proximity' principle promotes local treatment to minimize risks. The 'prior informed consent' principle aims to inform communities and obtain consent for waste management.[8]

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[7] Priya Datta, Gursimran Kaur Mohi & Jagdish Chander, *Biomedical Waste Management in India: Critical Appraisal*, 10 J. LAB. PHYSICIANS 6 (2018).

[8] Grantham Research Institute on Climate Change and the Environment, *'What is the Polluter Pays Principle?'*, https://www.lse.ac.uk/granthaminstitute/explainers/what-is-the-polluter-pays-principle/ (last visited Jul. 30, 2024).

In India, the Judiciary incorporates these principles into environmental law, recognizing the state's role in safeguarding a clean environment and health. The Ministry of Environment and Forest has issued rules under the Environment (Protection) Act, 1986, Biomedical Waste (Management and Handling) Rules, 2016, and the Bio-Medical Waste Management (Amendment) Rules, 2018 to regulate biomedical waste.[9] Poor management of bio medical waste poses risks in causing infection and injuries. Adhering to the regulatory framework on BMW is crucial to protect human health, flora-fauna, and the environment.

4. Human Rights and Environmental Perspective of Biomedical Waste in India

As we all know 'Health is wealth' and thus, the right to health has been interpreted as part and parcel of the right to life. Indian Supreme Court has emphasized that a healthy body is the very foundation of all human activities.[10] Along with the right to health, the right to a clean environment also forms part of the right to life and it is not just the Indian Constitution which recognizes these rights. Many International Instruments dealing with Human Rights also assert the same.

Every day, relatively large amounts of potentially infectious and hazardous waste are generated in healthcare institutions and facilities around the world.[11] Biomedical waste is generated in all conventional medical units where patient treatment is provided, such as hospitals, clinics, dental offices, and dialysis facilities, as well as in analytical laboratories,

[9] The Environmental (Protection) Act, 1986, Environmental Law and Policies, https://ebooks.inflibnet.ac.in/esp13/chapter/the-environmental-protection-act-1986/ (last visited Jul. 30, 2024).

[10] Vincent v. Union of India, AIR 1987 SC 990.

[11] E.C. Cole, Internal Medical Waste Management (1995), cited in N.E. Mastorakis et al., Environmental and Health Risks Associated with Biomedical Waste Management, pgno.287 (2006) (ISBN: 978-960-474-253-0).

blood banks, and university laboratories. Healthcare waste refers to all materials, biological or non-biological, that are discarded in any healthcare facility and are not intended for any other use.[12] About 25% of biomedical waste is hazardous, which adversely affects the environment worldwide, particularly in developing countries. The main reason they are in danger is because of inadequate waste management. Healthcare facilities in urban areas are intended as a place for patients for diagnosis, analysis, and treatment of medical problems. But it also houses several complex activities where the generation of solid waste is unavoidable. This solid waste is referred to as 'healthcare waste,' which includes all waste, biological or non-biological, that is discarded and will never be used again.[13] Medical waste can be classified into three groups: medical, infectious, and domestic. 'Medical waste' refers to materials accumulated as a result of patient diagnosis, treatment, or immunization of patients. 'Infectious waste' refers to the portion of medical waste that has been in contact with a patient who has an infectious disease and is capable of transmitting that disease. In the majority of instances if medical garbage and general waste are not collected separately, then medical waste is regarded as contagious waste. Hospital garbage is considered to be infectious waste if it is all mixed.[14]

One or more of the following traits contribute to the hazardous nature of medical waste: presence of radioactivity, the presence of used sharps, the presence of hazardous or toxic compounds or biologically

[12] Himani S Bansod & Prasad Deshmukh, *Biomedical Waste Management and Its Importance: A Systematic Review*, 15 Cureus, doi: 10.7759/cureus.34589, https://pubmed.ncbi.nlm.nih.gov/36874306, (last visited 23rd January, 2024)

[13] Acharya, A., Gokhale, V. A., & Joshi, D, *Impact of Biomedical Waste on City Environment: Case Study of Pune*, IOSR Journal of Applied Chemistry (IOSR-JAC), 6(6), 21-27. e-ISSN: 2278-5736, www.iosrjournals.org

[14] *Id.*

aggressive medications, the presence of infectious pathogens, or a chemical composition that is genotoxic or cytotoxic.[15]

The Right to a Healthy Environment is frequently violated due to indiscriminate medical waste management. While hazardous waste is often generated outside residential areas, healthcare facilities, clinics, and pharmacies in municipal areas are major disposal sites. On the other hand, rural areas often lack infrastructure for on-site disposal, including simple pit systems and small-scale incinerators, which are common in other regions. However, open dumping and burning are prevalent, especially in cities overwhelmed by municipal waste. Limited resources lead to medical waste being disposed of inadequately, even in unregulated landfills. Incineration poses environmental risks, emitting pollutants like dioxins and furans globally. The cheaper and easier option of avoiding proper disposal systems contributes to the widespread issue. Cement kiln incineration is potentially even more hazardous, as they usually lack the air pollution control devices necessary to deal with the sorts of emissions produced by waste. This technology is not recommended for medical waste processing under Stockholm Convention BAT/BEP guidelines.[16] The US regulations, the European Union, and the Stockholm Convention are all examples of tight regulation of the amount of pollution that is allowed to enter the atmosphere from incineration. Pollutants are instead caught in air pollution control devices (APCDs) and add to the quantity of incinerator ash, which needs to be treated as hazardous waste.

Global standards for medical waste management are often violated, leading to pollution through the burning or

[15]Yves Chartier et al., *Safe management of wastes from health-care activities*, World Health Organisation, 2nd edn (2014)

[16] Stockholm Convention, BAT/BEP Guidelines, Convention on Long-Range Transboundary Air Pollution, (2021) http://chm.pops.int/Implementation/BATandBEP/BATBEPGuidelinesArticle5/tabid/187/Default.aspx (last visited 23rd January, 2024).

incineration of biomedical waste. Incineration releases hazardous and carcinogenic substances like mercury and numerous toxic by-products into the atmosphere and ash, often containing sharps and toxic substances. Various incinerators fall short of acceptable environmental standards, contributing to dioxin emissions surpassing international limits[17]. Non-incineration waste treatment technologies should be promoted to mitigate environmental hazards. The disposing of bio-medical waste, especially in healthcare facilities, remains a significant source of dioxin pollution in developing countries. Polyvinyl chloride (PVC) in medical waste, along with mercury from healthcare devices, further contributes to environmental pollution. Despite improvements, mercury is still widely used in some healthcare settings. Proper disposal of pharmaceutical waste is crucial to prevent harm, and manufacturers are recommended to take back waste pharmaceuticals. Healthcare facility wastes, often neglected, carry a burden of pathogens, chemicals, and pharmaceuticals, contributing to environmental contamination and the spread of drug-resistant bacteria.[18]

5. Bio-Medical Waste Management in India- Judicial Overview

Public awareness of hospital waste hazards led to litigations against officials, leading to recent landmark decisions for appropriate waste management. The Apex Court of India consistently directed the State and Union Governments, encouraging concrete action on biomedical waste. Multiple court judgments stress the need for effective waste management. In the prominent case of *B.L. Wadhera v Union of India*[19], the petitioner had sought judicial intervention by way

[17] Edyta Janik-Karpinska et al., *Healthcare Waste – A Serious Problem for Global Health*, 11 HEALTHCARE 242 (2023).

[18] *Id.*

[19] B.L. Wadhera v Union of India, (1996) 2 SCC 594

of a writ petition to ameliorate the situation concerning pollution in the city of Delhi. The Court order categorically reprimanded the Municipal Corporation of Delhi as well as the New Delhi Municipal Council for not discharging their duties under the law.

The Supreme Court in its order stated, "the historic city of Delhi-the capital of India is one of the most polluted cities in the world. The authorities responsible for pollution control and environmental protection have not been able to provide a clean and healthy environment to the residents of Delhi. Apart from the air and water pollution, the city is virtually an open dustbin. Garbage strewn all over Delhi is a common sight."[20] While delivering its judgment, the Court directed the MCD, DDA, and NDMC to place on record the list of all garbage dumping places and city garbage collection centers. The court observed that the collection and disposal of garbage in the city of Delhi is causing serious problems. It is pertinent to note that this judgment was delivered before Bio-medical Waste Management Rules, 1998. Thus, while deliberating the issue, the Supreme Court took recourse to Articles 21, 48-A, and 51A(g) of the Constitution of India among other relevant legislations. River Yamuna - the main source of drinking water supply - is the free dumping place for untreated sewage and industrial waste. Apart from Air and Water pollution, the city is virtually an open dustbin. Garbage strewn all over Delhi is a common sight. The Municipal Corporation of Delhi (the MCD) constituted under the Delhi Municipal Corporation Act, 1957 (Delhi Act) and the New Delhi Municipal Council (the NDMC) constituted under the New Delhi Municipal Council Act, 1994 (New Delhi Act) are wholly re-miss in the discharge of their duties under the law. It is no doubt that rapid industrial development, urbanization, and regular flow of persons from

[20] Delhi world's "most polluted" capital: report, BBC NEWS (Mar. 20, 2024), https://www.bbc.com/news/world-asia-india-68613502 (last visited Jul. 30, 2024).

rural to urban areas have made a major contribution towards environmental degradation but at the same time the Authorities entrusted with the work of pollution control cannot be permitted to sit back with folded hands on the pretext that they have no financial or other means to control pollution and protect the environment.[21]

The Court referred to the judgment of *Ratlam Municipality*[22] and in the said judgment Krishna Iyer J. had stated, "Why drive common people to public interest action? Where Directive Principles have found statutory expression in Do's and Don'ts the court will not sit idly by allowing municipal government to become a statutory mockery." Through this judgment, Krishna Iyer J. had reminded the State Government of its duties under the Constitution of India. Given this discussion, the Supreme Court issued many directions concerning waste disposal and management. In the case of hospital waste, two of its directions are important to note. The MCD and NDMC were directed to issue notices to all the private hospitals/nursing homes in Delhi to make arrangements for the disposal of their garbage and hospital waste, and they are also asked to construct their incinerators. If these hospitals are permitted to use facilities (for collection, transportation, and disposal of garbage) provided by the MCD and NDMC then they may be asked to pay suitable charges for the service rendered in accordance with law. The All-India Institute of Medical Sciences, New Delhi was directed by its Director to install a sufficient number of incinerators, or an equally effective alternative, to dispose of the hospital waste. This landmark ruling predates BMW rules, directing hospitals to manage their waste. Unlike the rules, it places the duty of waste disposal facilities on hospitals or nursing homes, not just Local Self Governments.

[21] Dr. B.L. Wadehra v. Union of India & Ors., (1996) 2 SCC 594
[22] Municipal Council, Ratlam v. Vardhichand (1980) AIR SC 1622

Further in the leading case of *Almitra H. Patel v. Union of India*[23] which relates to the legal aspects of Waste Management in India the major concern was to stress the magnitude of the problem of waste in Indian cities. This case also relates to poor waste management in the city of Delhi. The court referred to its wording in the judgment of *B.L. Wadhera*[24] and reiterated that the city is virtually open garbage. The constant apathy of the authorities towards this situation, even after the judgment of 1996, forced Almitra Patel to file a petition against the municipal authorities of Delhi. The major concern was that the public of Delhi was suffering from many diseases. Also, the water of the river Yamuna was getting contaminated due to improper treatment of waste. The issues involved in this case were that the Municipal Corporation of Delhi (MCD) was responsible for the mismanagement of waste, which negatively impacted the residents of Delhi. There was also a need for the recommendations provided by the Committee, and the implementation of those recommendations, once accepted, will fall under the responsibility of designated officers. Given these issues, the Court thought it appropriate to set up a committee and it went further and constituted a committee for Class 1 Cities (population over one lakh). The committee was to look into all aspects of urban solid waste management. The committee was assigned the task of examining the situation and suggesting solutions according to the status of waste.[25] This case again highlighted the issue of waste management and the lackadaisical approach of the concerned authorities was brought to notice. As a result, the Court appointed an independent Committee to look into the matter. Thus, stricter implementation of waste management rules was made

[23] Almitra H. Patel v. Union of India (2000) 2 SCC 166

[24] *Id.*

[25] Compliance of Municipal Solid Waste Management Rules, 2016 v. Union of India & Ors., (2019) (India).

possible. Thus, this case has contributed to a very large extent in fixing the liability of the authorities.

The case *C.S. Prakash and others v. The Huda and Ors.*[26] is regarding the construction of a multi-storied hospital in the residential area of the city. The Andhra Pradesh High Court, while considering the question as to permission to construct a hospital, observed that environmental laws also need to be given due importance. The Andhra High Court emphasized that before permitting the construction of a large hospital, it is crucial to consider not only the convenience of local residents but also to ensure that the competent authority has granted permission for the disposal of biomedical waste. The Court highlighted that protecting the environment and public health falls under the scope of Article 21 of the Constitution. Consequently, the Andhra Pradesh Pollution Control Board must strictly enforce the relevant laws, including the rules, regulations, and standards it has established.[27]

Thus, it is evident from these cases that the judiciary is sensitive to the issue of disposal of waste including biomedical waste. This emphasizes the critical importance of considering both environmental and public health concerns before permitting the construction of a large hospital. It stresses that the convenience and well-being of local residents must be a priority, particularly in relation to the hospital's management of biomedical waste (BMW). Compliance with legal and regulatory frameworks is essential, and obtaining permission from the competent authority for BMW disposal is a crucial step. The reference to Article 21 of the Indian Constitution underlines the fundamental right to life, which includes the

[26] C.S. Prakash and others v. The Huda and Ors, ILR (2001) A.P 323 (328) (DB)

[27] Subornadeep Bhattacharjee, *Bio-Medical Waste: Rampant Mismanagement, Lackadaisical Implementation of Legislations, Flouting of Constitutional Rights, Solutions to Tackle Effects on Ecology and Health - The Indian Scenario*, The Environment, vol. 12, pp. 35-48 (2014).

right to a healthy environment. This places a legal and ethical obligation on both developers and regulatory bodies, such as the Andhra Pradesh Pollution Control Board, to enforce environmental laws and ensure that hospital projects do not harm the environment or public health. Failure to adhere to these standards could be seen as a violation of constitutional rights, making it imperative that all necessary precautions are taken before construction begins. It had pointed out the need to govern the same with utmost sincerity.

Again, in the case of *Environment Monitoring Forum and Anr. v. Union of India and Ors.*[28] it was held that the duty of the institutions generating biomedical waste to take all steps to ensure that such waste is handled without any adverse effect on human health and environment. Further, a writ petition was filed by *Common Cause v. Union of India*[29] in the Supreme Court, assailing the usage of incinerators for the disposal of bio-medical waste to the detriment of the environment. It was contended in the petition that the present method used for the disposal of Bio-Medical Waste by incineration is causing serious environmental pollution.[30] These incinerators consume human fossil fuels and high amounts of electrical energy and their operating costs are very high and it involves occupational health hazards. According to the petitioner, incineration destroys the waste it produces many other chemicals and ashes which will cause atmospheric pollution. The petitioner also alleged incineration contributes to global warming, apart from causing serious effects on soil and water resources.[31] The court, in its order dated 22.10.2008, stated that incinerators for the disposal of Bio-Medical Waste must be installed in accordance

[28] Environment Monitoring Forum and Anr. v. Union of India and Ors, MANU/KE/0894/2003

[29] Common Cause v. Union of India, W.P. No 160/2005 unreported in Supreme Court

[30] Common Cause, https://www.commoncause.in/environment.php (last visited Jul. 30, 2024).

[31] *Id.*

with the Rules established by the Central Government under the authority granted by Sections 6, 8, and 25 of the Environment (Protection) Act, 1986. The court noted that the Bio-Medical Waste (Management and Handling) Rules, 1998, provide detailed procedures for the operation of these incinerators and specify the categories of Bio-Medical Waste in Schedule I. It further mentioned that occupiers or operators who wish to utilize alternative, state-of-the-art technologies can approach the Central Pollution Control Board to have standards established, enabling the prescribed authority to consider granting authorization.[32]

The Court further held that the petitioner had not provided any scientific evidence or research findings to support the claim that the existing incinerators were causing serious environmental pollution as alleged in the petition. The Court also noted that the petitioner is free to approach the relevant authorities if they believe that the current technology is inadequate or unsuitable and that an alternative technology should be implemented. Additionally, the Society is free to submit its suggestions to the appropriate authority.[33] Hence, the writ petition was disposed of accordingly. This is a disputable decision, as the Court has not considered the public interest which was pleaded by the society. The court discussed the legal framework for disposing of Bio-Medical Waste (BMW) in India, focusing on incinerators as specified in the Bio-Medical Waste (Management and Handling) Rules, 1998, under the Environment (Protection) Act, 1986. These rules detail incineration procedures and categorize BMW types. The Court notes that the petitioner failed to provide scientific

[32] Central Pollution Control Board, https://cpcb.nic.in/bio-medical-waste-rules/ (last visited Jul. 30, 2024).

[33] India - Research Foundation v. Union of India & Others, WP 657/1995 (2003.10.14) (Hazardous Wastes), ELAW: ENVIRONMENTAL LAW ALLIANCE WORLDWIDE, https://elaw.org/resource/india-research-foundation-v-union-india-others-wp-6571995-20031014-hazardous-wastes (last visited Jul. 30, 2024).

evidence showing that existing incinerators cause significant environmental harm. However, it emphasizes that if concerns arise, the petitioner or any party can approach the Central Pollution Control Board with suggestions or requests for alternative technologies. This highlights the importance of evidence-based claims and openness to innovation in environmental practices. The Court confined itself to the rules laid down in the Rules of 1998 and refused to look beyond.

The case of *Qualified Medical Practitioners and Hospitals v. Union of India and Ors.*[34] is concerning the use of incinerators for the disposal of degradable medical waste. It was argued in this case that, throughout the world, for the treatment of bio-medical wastes, incinerators are unsafe as they cause pollution. It is not recommended by the CPCB or the Ministry of Environment and Forests. However, the Bio-Medical Waste (Management and Handling) Rules, 1998 insists on the treatment of incinerators for human anatomical waste. CUSAT has developed a Placenta Anaerobic Bio-Reactor (PAB) and Body Parts Anaerobic Bio-Reactor (BPAB) for the treatment of Bio-Medical Wastes. The same is installed in many of the hospitals of the petitioner organization. CPCB inspected the same and rejected the proposal because of some deficiency, which was later on cured. A request for reconsideration of the request is pending consideration.[35] It was also contended that the incineration technology will create air pollution due to the emission of toxic gases. Therefore, it is contrary to Art.21 of the Constitution of India. The case referred to the judgment of

[34]Qualified Medical Practitioners and Hospitals v. Union of India and Ors, (2006) 4 KarLJ 81

[35] Xincheng Zhao et al., *An Optimized Approach: Anaerobic dynamic membrane bioreactor for the co-digestion of toilet blackwater and kitchen waste*, RESEARCHGATE (2024),

https://www.researchgate.net/publication/382487355_Anaerobic_dynamic_membrane_bioreactor_for_the_co-digestion_of_toilet_blackwater_and_kitchen_ waste (last visited Jul. 30, 2024).

1996,[36] in which hospitals which are having beds above 50 beds or more were required to provide incinerators or other alternate treatment systems for safe disposal of hospital wastes.

The petition was filed on several grounds: First, it argues that the treatment of bio-medical waste by incineration has adverse effects on the environment and public health, constituting a clear infringement of Article 21 of the Constitution of India.[37] Second, despite the CPCB experts inspecting the reactors and making recommendations for modifications, they only reviewed records submitted by the petitioners afterward and did not conduct a subsequent site inspection after improvements were made. This close-minded approach of the CPCB is deemed arbitrary and illegal.[38] Third, municipal authorities have a duty, following the amendment of the relevant Rules in 2000, to establish common treatment facilities (CTF), as mandated by an order from the Ombudsman for Local Self Government institutions. However, no steps have been taken for the implementation of this order.[39] Lastly, a public interest litigation challenging the installation of incinerators was filed before the Supreme Court of India under Writ Petition (Civil) No. 160 of 2005, which remains pending and also seeks recognition for new technologies for bio-medical waste disposal. Given this pending status, the second respondent should have awaited the Court's decision before making a final determination on the matter.[40] Based on the petition filed by Qualified Medical

[36] *supra note* 25.

[37] Bhattacharjee, *supra note* 27.

[38] CPCB | Central Pollution Control Board, *supra note* 32.

[39] Ombudsman For LSGI | Local Self Government Department, https://lsgkerala.gov.in/en/lsgd/allied-institutions/ombudsman (last visited Jul 30, 2024).

[40] WP 160 of 2005, Date 22-Oct-2008, https://commoncause.in/uploadimage/case/1901307490WP%20160%20of%202005%20Date%2022-Oct-20--08.pdf (last visited Jul. 30, 2024).

Practitioner & Hospitals (QMPH) and the report of CUSAT, the court passed the following orders; The present methods of incineration or deep burial are not suitable to implement, Incineration causes air pollution, the hospitals cannot adopt their methods of disposing of biomedical waste. There has to be some uniformity and thus the Court ordered that the authorities shall consider PAB and BPAB as valid methods for disposal, i.e. efforts should be made to include them in the Rules. Thus, this judgment also criticized the improper implementation of Bio-medical Waste (Management and Handling) Rules, 1998. The court commented upon the ignorance of authorities towards R. 14 of the said Rules.[41] The Court observed that there has to be adoption of new eco-friendly technology for waste disposal.

About improper practices in the case of *Maitree Sansad v. State of Orissa and Ors*.[42] It was held that improper practices such as dumping bio-medical waste in municipal dustbins, open spaces, water bodies, etc., lead to the spread of diseases. Emissions from incinerators and open burning also lead to exposure to harmful-gases-which can cause cancer and respiratory diseases. Exposure to radioactive waste in the waste stream also causes serious health hazards. An often-ignored area is the increase of in-home healthcare activities. An increase in the number of diabetics who inject themselves with insulin, home nurses taking care of terminally ill patients, etc., all generate bio-medical waste which can cause health hazards. Also, the court held in *P.K. Nayyar & Ors. v. Union of India & Ors.*[43] that, it is not in dispute that bio-medical waste is a hazardous waste that can be highly injurious to human life precisely appeared to be the reason for it being included in the list of prohibited/negative list of industries. 30 meters or it is

[41] Common Disposal / Incineration Sites, Bio-medical Waste (Management and Handling) Rules, 1998, rule 14 (Accessed Jan. 23, 2024).

[42] Maitree Sansad v. State of Orissa and Ors, 103 (2007) CLT 191

[43] P.K. Nayyar & Ors. v. Union of India & Ors, 198(2013) DLT689

40 meters could not be said to be a safe distance in the sense that it was not unlikely to adversely affect the health of residents of nearby complexes and/or nearby habitats. The decision by the Government of NCT of Delhi, a partner in the venture, to shift the facility from its current location acknowledges that its proximity to residential colonies could harm the environment and negatively impact the health of nearby residents. Furthermore, the right to live in a pollution-free environment is a fundamental aspect of the right to life and liberty guaranteed under Article 21 of the Constitution.[44]

The National Green Tribunal Principal Bench *New Delhi in the case of Krishan Lal Gera v. State of Haryana and Ors* [45] highlighted several potential adverse impacts on the human environment due to improper handling of bio-medical waste. Incorrect handling can lead to physical harm for hospital staff and waste handlers, with sharps posing the greatest risk, particularly when mixed with other bio-medical wastes, increasing the likelihood of HIV and hepatitis infections. Chemical injuries may arise from hazardous wastes that are toxic, corrosive, flammable, reactive, or genotoxic, potentially causing chemical burns or toxicity to cells. Nosocomial infections can result from inadequate infection control policies and poor waste management practices. The increasing use of disposables in hospitals generates substantial amounts of infectious waste, which, if not managed properly, could be reused. The growing business of repacking and selling disposables without proper washing presents significant life-threatening risks. Furthermore, improper disposal of such waste in open areas can contaminate the land and water through percolation or surface runoff. Subsequently in the case of *Haat Supreme Wastech Pvt. Ltd. &Ors. Vs. State of Haryana and*

[44] MGCLR, https://mgclr.in/Welcome/OnlineDetails/6 (last visited Jul. 30, 2024).

[45] Krishan Lal Gera v. State of Haryana and Ors, MANU/GT/0140/2015

Ors.[46] Hon'ble Swatanter Kumar, J. (Chairperson) of National Green Tribunal Principal Bench, New Delhi held that, "Units which are carrying on activity of handling bio-medical waste treatment plants shall be required to obtain environmental clearance in as per provision of law."

These judicial decisions show that there is a need for a more proactive approach toward fixing the liability of erring pollution control officials, medical professionals as well as local self-government. If the law is not being followed properly, then it's the task of the judiciary to step in and enforce the law.

6.BMW: Post-Covid Scenario

The COVID-19 pandemic has significantly impacted biomedical waste management globally. The surge in infected patients and the increased use of personal protective equipment (PPE) led to a dramatic rise in hazardous medical waste. Although the pandemic's peak has passed in many regions, its legacy continues to influence biomedical waste management in the post-COVID era.

6.1 Key challenges

The pandemic caused a 30-40% increase in biomedical waste generation globally, placing immense pressure on existing waste treatment and disposal facilities. This significant rise in waste volume potentially compromised the efficiency and safety of waste management systems, highlighting the need for enhanced capacity and improved practices.[47]

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[46] Haat Supreme Wastech Pvt. Ltd. & Ors. Vs. State of Haryana & Ors, MANU/GT/0089/2015

[47] R. Khosla et al., *Upsurge in Biomedical Waste Due to COVID-19 in India: A Statistical Correlation, Challenges and Recommendations*, 10 FRONT. ENVIRON. SCI. 1022098 (2022), https://doi.org/10.3389/fenvs.2022.1022098.

The influx of COVID-19 waste, often consisting of contaminated PPE and infectious materials, necessitates proper segregation and handling to prevent the spread of pathogens. However, inadequate training and infrastructure lead to mishandling, posing significant risks to healthcare workers and the environment. Ensuring proper procedures and sufficient resources is crucial for safe waste management.

Managing expired Personal Protective Equipment (PPE) is crucial, as large stockpiles of unused or expired PPE accumulated during the pandemic must be properly disposed of to prevent environmental contamination and public health risks. Traditional incineration methods can release harmful pollutants, making it necessary to explore alternative treatment options.

The additional costs associated with managing the increased volume and complexity of COVID-19 waste place a strain on healthcare facilities and waste management companies. This financial burden can hinder the proper implementation of safe and sustainable waste management practices, posing challenges to maintaining effective waste handling and disposal standards.[48]

6.2 Strategies for improvement

Strengthening regulations and ensuring their effective enforcement are vital for the proper segregation, treatment, and disposal of biomedical waste (BMW). Robust regulatory frameworks, coupled with stringent enforcement measures, play a pivotal role in maintaining compliance across healthcare

[48] Sang M. Lee & Don Hee Lee, *Effective Medical Waste Management for Sustainable Green Healthcare*, 19 INT. J. ENVIRON. RES. PUBLIC. HEALTH (2022), https://www.ncbi.nih.gov/pmc/articles/PMC9690095/ (last visited Jul. 30, 2024).

facilities. [49] Regular inspections and proactive awareness campaigns are essential to bolster adherence to these regulations. To streamline grievance redressal and oversight, granting the National Green Tribunal jurisdiction over matters related to biomedical waste management and disposal would establish a centralized authority to address concerns and ensure accountability in this critical area.

Investing in infrastructure and technology is crucial for improving the management of biomedical waste (BMW). Upgrading treatment facilities with advanced technologies like autoclaving and microwave sterilization presents safer and more efficient alternatives to traditional methods such as incineration. These technologies not only ensure effective sterilization but also reduce harmful emissions. Furthermore, there is a pressing need to establish biomedical waste treatment plants in every district to handle waste locally and minimize transportation risks. Embracing waste-to-energy technologies can also turn BMW into a valuable resource, promoting sustainability while addressing waste management challenges. By investing in these advancements, communities can enhance their environmental stewardship and public health outcomes.

Environmental Impact Assessment (EIA) is essential for gathering quantitative data on biomedical waste (BMW) generation during the pandemic and for comprehensively evaluating its environmental consequences. By conducting thorough assessments, we can quantify the scale of BMW generated and understand its specific impacts on the environment. This data will inform the development of sustainable waste management practices, including recycling initiatives and the adoption of waste-to-energy technologies,

[49] M. Mofijur et al., *Impact of COVID-19 on the Social, Economic, Environmental and Energy Domains: Lessons Learnt from a Global Pandemic*, 26 SUSTAIN.PROD. CONSUM. 343-359 (2021), https://doi.org/10.1016/j.spc.2020.10.016.

aimed at mitigating adverse environmental effects. Embracing these practices not only promotes environmental sustainability but also enhances the resilience of waste management systems during health crises like pandemics. Thus, integrating EIA into BMW management strategies is crucial for safeguarding public health and the environment alike.[50]

When comparing Biomedical Waste (BMW) management strategies, several nations offer valuable examples that India could adopt to enhance its practices. Germany, for instance, is renowned for its stringent environmental regulations and highly effective waste management systems. BMW management in Germany involves meticulous segregation at the source, the use of advanced waste treatment technologies like autoclaving and microwave treatment, and strict enforcement of regulations. The country also focuses on waste minimization by encouraging the use of reusable materials wherever possible.[51]

Similarly, Japan excels in BMW management through the use of advanced technology and precise waste segregation practices. The country has implemented high-efficiency incinerators that minimize emissions and convert waste into harmless by-products. Additionally, Japan places significant emphasis on public awareness and comprehensive training programs for healthcare workers, ensuring that all involved are knowledgeable about proper waste management procedures.[52]

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[50] Akansha Mehta & Samrat Ray, *Impact of Medical Tourism on Indian Healthcare Sector*, International Journal of Research in Marketing Management and Sales, doi: 10.33545/26633329.2023.v5.i2a.133 (last visited Jul. 30, 2024).

[51] *supra note* 12.

[52] Climate Adaptation Platform, *Can Japan's Waste-to-Energy Technology Shape Global Waste Management?* CLIMATE ADAPTATION PLATFORM (Nov. 13, 2023), https://climateadaptationplatform.com/can-japans-waste-to-

Sweden is another example, known for its environmentally-friendly approach to waste management, including BMW. The country prioritizes waste reduction at the source and employs advanced recycling techniques. While incineration is used, it is coupled with energy recovery systems that convert waste into electricity or district heating, minimizing environmental impact and maximizing resource utilization. [53]

In Singapore, BMW management is characterized by a combination of strict regulatory frameworks and the use of advanced technology. The city-state operates high-tech incineration plants equipped with pollution control systems and maintains rigorous monitoring and enforcement to ensure compliance with waste management laws. Public-private partnerships have also played a crucial role in improving the efficiency and sustainability of waste management practices in Singapore.[54]

Promoting waste reduction and resource recovery is essential for effective waste management. Implementing strategies to reduce waste generation at the source, such as using reusable or biodegradable alternatives to single-use PPE, can significantly lessen the burden on waste management systems. Additionally, exploring methods for recycling or repurposing certain waste streams can contribute to a circular

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energy-technology-shape-global-waste-management/ (last visited Aug 17, 2024).

[53] Chan Kim & Renée Mauborgne, *Turning Waste To Energy: Sweden's Recycling Revolution*, BLUE OCEAN STRATEGY (Aug. 27, 2021), https://www. blueoceanstrategy.com/blog/turning-waste-energy-sweden-recycling-revolution/ (last visited Aug 17, 2024).

[54] DA ZHU ET AL., IMPROVING MUNICIPAL SOLID WASTE MANAGEMENT IN INDIA: A SOURCEBOOK FOR POLICYMAKERS AND PRACTITIONERS (2007), https://documents.worldbank.org/en/publication/documents-reports/documentdetail/682051468267572634/improving-municipal-solid-waste-management-in-india-a-sourcebook-for-policy-makers-and-practitioners (last visited Jul 30, 2024).

economy. These initiatives can help create a more sustainable and efficient waste management system, ultimately reducing environmental impact and conserving resources.

Capacity building and training are crucial for ensuring the safe handling, segregation, and disposal of biomedical waste (BMW). Providing healthcare workers and waste management personnel with adequate training is essential to prevent occupational hazards and environmental contamination. The government should establish expert mechanisms to train medical and paramedical staff in proper BMW management practices. Such initiatives will equip them with the necessary skills and knowledge to handle biomedical waste safely and efficiently, thereby contributing to a safer and healthier environment.[55]

To ensure compliance with biomedical waste regulations in medical institutions, it is recommended that the Pollution Control Board authorities establish a separate committee dedicated to conducting surprise inspections of hospitals, laboratories, and clinics. This approach will help ensure that biomedical rules and regulations are properly observed by medical and paramedical institutions. Regular and unannounced inspections by this committee can significantly improve adherence to waste management protocols, thereby enhancing overall public health and environmental safety.[56]

The growing sector of medical tourism in India, driven by cost-effectiveness and high-quality treatment from accredited facilities comparable to those in developed countries at a much

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[55] Solomon Tsebeni Wafula, Julian Musiime & Frederick Oporia, *Health Care Waste Management among Health Workers and Associated Factors in Primary Health Care Facilities in Kampala City, Uganda: A Cross-Sectional Study*, 19 BMC PUBLIC HEALTH (2019), https://www.ncbi.nl m.nih.gov/pmc/articles/PMC6380052/ (last visited Jul. 30, 2024).

[56] FAQ | Maharashtra Pollution Control Board, https://mpcb.gov.in/faq (last visited Jul. 30, 2024).

lower cost, has a significant impact on biomedical waste management. [57] The influx of medical tourists directly leads to an increase in the generation of biomedical waste. Therefore, it is crucial to consider this factor when managing biomedical waste. Effective strategies must be developed to handle the additional waste generated by the medical tourism industry, ensuring that the management systems are capable of addressing the increased demand and maintaining high standards of hygiene and safety.

Establishing an independent authority dedicated to the management of biomedical waste (BMW) is crucial for overcoming the current challenges posed by the division of power and duties between the Pollution Control Board and Local self-government. This division often confuses and hinders the effective implementation of waste management rules. To address this issue, it is proposed that a new, autonomous authority be established with the responsibility of overseeing the management, handling, and disposal of all types of waste, including BMW. [58] This authority should be equipped with adequate human resources and the necessary infrastructural facilities to operate efficiently. The government must take proactive steps towards the creation and empowerment of such an authority to ensure the effective management of biomedical waste.

7. Conclusion

Medical procedures generate life-saving measures, but its by-product the Biomedical Waste, poses life-threatening risks.[59] It includes waste from diagnosis, treatment, immunization,

[57] *supra note* 50.

[58] Datta, Mohi, and Chander, supra note 7.

[59] Health-care waste, https://www.who.int/news-room/fact-sheets/detail/health-care-waste (last visited Jul. 30, 2024).

research, and production/testing of biological substances, as specified in Schedule I.[60]

It can be observed that there is a chronic lack of awareness about the ill effects of improper management and disposal of BMW. Thus, the efforts to overcome the problem are half-hearted. There is inadequate awareness among health professionals, including the medical and para-medical staff, about the Bio-Medical Waste (Management and Handling) Rules, 2016, and Amendment Rules 2018. The hospital staff which works at the point of generation, for segregation and packing is not well trained and aware of the categorization of BMW. There is non-applicability of 2016 and 2018 Rules to certain wastes like radioactive, hazardous chemicals, solid waste, hazardous micro-organisms, genetically engineered micro-organisms, and cells covered under the various other legal enactments of the Government. Thus, disposal of such waste is not regulated under Rules which amounts to a great lacuna. There are no changes in the operational parameters of effluent treatment and deep burial. Deep burial is permitted only in rural or remote areas where there is no access to a common biomedical waste treatment facility.

There exist various Central and Pollution Control Board guidelines concerning different aspects of BMW management. But neither the medical professional nor the Service Providers seem to be aware of such guidelines. Incinerators without pollution control devices contribute to increased pollution from these facilities. No penalty or punishment has been mentioned under BMW Rules for the occupier or operator of a health care facility liable for damages caused to the environment or public due to improper handling of BMW. Judicial response has been positive so far, but not proactive.

[60] Bio-medical waste and its segregation, https://energy.vikaspedia.in/viewcontent/energy/environment/waste-management/bio-medical-waste-management/bio-medical-waste-and-its-segregation?lgn=en (last visited Dec 3, 2024).

For instance, in the case of *Common Cause v. Union of India,*[61] the Supreme Court has not passed any order reviewing or banning the installation of incinerators. The fact that incinerators cause more damage to the environment is known to all. There is a lack of coordination and communication between the Pollution Control Boards and Local Self Governments. And thus, there isn't any effective mechanism in place. The role of professional organizations like the Indian Medical Association, Medical Council of India, accreditation agencies like Joint Commission International, National Accreditation Board for Hospitals and Healthcare Providers needs to be more active as they can contribute constructively towards implementation and awareness part of the process. There is no accountability and provision providing checks and balances between any of the parties involved in the process of management and disposal of BMW. Many hospitals and small clinics aren't registered under The Bombay Nursing Home Registration Act (1949).[62] Hence many hospitals are not bound by biomedical rules. There is no appointment of a special BMW officer under any provisions regarding BMW. An increase in the number of diabetics who inject themselves with insulin, home nurses taking care of terminally ill patients, and other households in BMW, all generate bio-medical waste which causes health hazards is an untouched topic under the legal arena of BMW.[63]

Based on the lacunae found in the area of biomedical waste management, there is an urgent need to raise awareness among doctors, service providers, and authorities about the hazards of Biomedical Waste (BMW). Training for all involved in BMW management is vital. The Ministries of Health and

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[61] *supra note*.30

[62] Bombay Nursing Home Association, https://www.bnha.in/bnharules.html (last visited Jul. 30, 2024).

[63] Anindo Majumdar et al., *Improper Sharp Disposal Practices among Diabetes Patients in Home Care Settings: Need for Concern?*, 19 INDIAN J. ENDOCRINOL. METAB. 420 (2015).

Environment should collaborate to promote BMW awareness through NGOs and all types of media including social media. Granting the National Green Tribunal jurisdiction over BMW grievances would enhance lapses. Awareness drives by professional organizations and accreditation agencies shall be of great help. Proper interpretation and implementation of rules, periodic reviews, and the constitution of an independent authority for waste management oversight are recommended.

Existing biomedical waste treatment facilities must meet revised standards and install continuous monitoring equipment. Granting licenses for deep burial pits by State Pollution Control Boards should be efficient.[64] Mandatory reporting on waste disposal for hospitals, and clinics is necessary. Provision for expert training mechanisms in BMW handling is warranted. Encouragement for alternative waste treatment methods and separate funds for BMW segregation are needed. Separate committees for inspections by Pollution Control Boards are recommended. Encouraging judicious reprocessing of equipment and material reuse in medical facilities and setting standards for reprocessing are crucial. Providing dedicated transport for biomedical waste is necessary. These measures aim to enhance BMW management, safeguard public health, and promote environmental sustainability.

Given the above criticism and recommendations, it is concluded that biomedical waste does have an impact on the health of human beings as well as the environment. Thus, it should be regulated to protect the right to life of individuals and the environment. The Rules are extensive and quite clear about the steps involved in the process and have also appointed authority as well as laid down standards for waste disposal techniques. The Rules are sufficient when read on paper but they are not effective. For the law to be effective, it

[64] CPCB | Central Pollution Control Board, *supra note* 32.

must be followed in both letter and spirit. Thus, when we see that there still are lacunae in the machinery of biomedical waste management, it is not due to a lack of legislative mechanism. Such failure can be attributed to the lackadaisical approach of the authorities. Thus, the implementation of such rules is a weak link.

The post-COVID scenario presents an opportunity to rethink and improve biomedical waste management practices. By adopting a comprehensive approach that prioritizes safety, sustainability, and efficiency, we can ensure the responsible management of medical waste, protecting both public health and the environment. The long-term implications of COVID-19 variants and potential future pandemics must be factored into waste management planning. Decentralized waste treatment solutions closer to healthcare facilities can improve efficiency and reduce transportation risks. Collaboration between governments, healthcare institutions, waste management companies, and research bodies is crucial for developing and implementing effective waste management strategies.[65] By addressing these challenges and implementing effective solutions, we can build a more resilient and sustainable biomedical waste management system for the future.[66]

Furthermore, it can be said that innovative and radical measures are needed to address the distressing lack of civic responsibility among hospitals and the government's lax enforcement of basic regulations, as waste generation, particularly biomedical waste, imposes increasing direct and indirect costs on society. The challenge before us, therefore, is to scientifically manage growing quantities of biomedical waste that go beyond past practices. If we want to protect our

[65] Harpreet Singh et al., *Harnessing the Foundation of Biomedical Waste Management for Fostering Public Health: Strategies and Policies for a Clean and Safer Environment*, 6 DISCOV. APPL. SCI. 1 (2024).

[66] *Id.*

environment and the health of a community, we must sensitize ourselves to this important issue not only in the interest of health managers but also in the interest of the community.