WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Ensuring Right to Health Through Effective Biomedical Waste Management: Insights from COVID-19

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(We must recognize that the way we treat the environment has a direct impact on our health and well-being.)
- David Suzuki

ABSTRACT

(This paper examines how the right to health and the proper disposal of biomedical waste intersect, highlighting the lessons learned from the pandemic; it also examines the challenges posed by inadequate waste management systems, the consequences for the environment and public health, and the necessity of robust legal and regulatory frameworks. The COVID-19 pandemic produced an unprecedented volume of medical waste, making it even more urgent to address biomedical waste disposal. The study looks at best practices and worldwide reactions to provide policy recommendations.)

1. Introduction

Due of the COVID-19 pandemic's devastating effects on healthcare systems worldwide, biomedical waste has increased dramatically. The environment and public health, which support the right to health, depend on the appropriate disposal of this trash. This paper investigates the complex relationship between the right to health and the management of biomedical waste using the COVID-19 pandemic as a case study. This section provides an overview of biomedical waste as well as details on its varieties, sources, and issues related to improper disposal. The pandemic of COVID-19 has led to an unprecedented surge in the production of biomedical waste, placing strain on existing waste management systems and arousing worries over possible environmental and public health ramifications.[1]

2. Definition and Protection of Right to health under international law

The right to health is acknowledged by international law as a fundamental human right, ensuring that everyone has access to the highest standard of bodily and mental well-being. Two international treaties and publications that support this idea are the 1948 Universal Declaration of Human Rights and the 1966 International Covenant on Economic, Social, and Cultural Rights. Article 25 of the UDHR asserts the right to a standard of living adequate for health and well-being, while Article 12 of the ICESCR requires states to take action for the improvement of all aspects of environmental and industrial hygiene, prevention and treatment of diseases, and creation of conditions for the provision of medical services to all.[2]

The protection of this right depends on making sure that health services, goods, and facilities are available and accessible to everyone without facing any kind of discrimination. A person's state of health is defined by the Committee on Economic, Social, and Cultural Rights as anything from the absence of sickness to underlying conditions such having access to clean, safe drinking water, adequate sanitation, and a well-balanced diet. International agencies such as the World Health Organization play a critical role in guaranteeing the realization of health rights, monitoring their advancement, providing directives, and handling public health crises. To respect, preserve, and uphold the right to health, states must guarantee equitable health policies, put an end to violations, and take proactive measures to enhance public health services and infrastructure.

[1] V. S. Kanwar, A. Sharma, "An overview for biomedical waste management during pandemic like COVID-19", *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9167668, (Last Visited on June 6, 2024).

[2] Zahara Nampewo, Jennifer Heaven Mike & Jonathan Wolff, "Respecting, protecting and fulfilling the human right to health", *available at* https://equityhealthj.biomedcentral.com/articles/10.1186/s12939-022-01634-3, (Last Visited on June 6, 2024).

3. Major challenges in biomedical waste management during the COVID-19 pandemic

The COVID-19 pandemic presented significant challenges for biomedical waste management due to the sharp increase in medical waste, which included diagnostic kits, disposable medical supplies, and personal protective equipment. The amount of garbage produced in hospitals and other healthcare facilities is increasing, placing pressure on the current waste management system. One of the primary problems was the insufficient capacity for garbage treatment and disposal. Many of the plants were not equipped with enough autoclaving or incinerator power to prevent environmental contamination and health risks. Another challenge was ensuring that contaminated and non-infectious things were kept firmly segregated. Insufficient segregation increases the risk of viral transmission for both the general public and garbage personnel. The unanticipated rise in waste created practical issues, such as a lack of transportation and storage space, which made timely rubbish processing even more difficult.[3]

Concerns were also expressed over the waste management staff's security. PPE was always required, and shortages frequently put workers at peril. To ensure that safety protocols were followed, more training was required on safe handling and disposal methods. The pandemic revealed the lack of robust legal frameworks and standard operating procedures for managing biomedical waste during a health emergency, necessitating swift legislative changes and the construction of more robust waste management infrastructure.

4. International Conventions Governing Biomedical Waste

The COVID-19 pandemic presented significant challenges for biomedical waste management due to the sharp increase in medical waste, which included diagnostic kits, disposable medical supplies, and personal protective equipment. The amount of garbage produced in hospitals and other healthcare facilities is increasing, placing pressure on the current waste management system. One of the primary problems was the insufficient capacity for garbage treatment and disposal. Many of the plants were not equipped with enough autoclaving or incinerator power to prevent environmental contamination and health risks. Another challenge was ensuring that contaminated and non-infectious things were kept firmly segregated. Insufficient segregation increases the risk of viral transmission for both the general public and garbage personnel. The unanticipated rise in waste created practical issues, such as a lack of transportation and storage space, which made timely rubbish processing even more difficult. Concerns were also expressed over the waste management staff's security. PPE was always required, and shortages frequently put workers at peril. To ensure that safety protocols were followed, more training was required on safe handling and disposal methods. The pandemic revealed the lack of robust legal frameworks and standard operating procedures for managing biomedical waste during a health emergency, necessitating swift legislative changes and the construction of more robust waste management infrastructure.

4.1 The Basel Convention: Addressing the Transboundary Movements of Hazardous Wastes and Their Disposal, 1989[4]

The Basel Convention, which deals with the transboundary movement and disposal of hazardous waste was adopted in 1989 and put into effect in 1992, the Basel Convention is a comprehensive international environmental agreement. Among its objectives are the control of transboundary trafficking in hazardous waste, particularly biomedical waste, and the application of environmentally sound management. Protecting the environment and general public's health from the negative effects of hazardous wastes is the primary objective. Hazardous waste cannot be shipped to countries without the infrastructure necessary to handle it safely, according to this agreement. Prior informed consent from recipient nations is also required before any rubbish is transported across international borders. The Basel Convention also includes infectious materials, pathological wastes, sharp objects, chemicals, and biomedical waste as additional types of hazardous waste. The convention emphasizes how important it is to manage hazardous waste close to its source, to support ecologically appropriate methods of treatment and disposal, and to reduce waste generation at the source. Additionally, it provides a platform for international cooperation and capacity-building, helping developing countries enhance their waste management capabilities.

4.2 The Stockholm Convention: Targeting Persistent Organic Pollutants, 2004[5]

The Stockholm Convention entered into force in 2004 with the goal of eliminating or severely restricting the production and use of persistent organic pollutants, which include some types of biomedical wastes. POPs are chemicals that are harmful to both human health and the environment. They have the capacity to proliferate in the fatty tissues of living beings, disseminate locally, and endure long periods of time in the environment. POP compounds can be found in many different products, such as disinfectants, medical equipment, and even pharmaceuticals. Annexes B, A, and C of the convention list and categorize specific POPs as either restricted, eliminated, or regulated in terms of production and consumption. The Stockholm Convention mandates that Parties create and carry out action plans for the detection and management of persistent organic pollutants, including those that are

[3] Anuradha Kunal Shah, "Challenges Faced in Biomedical Waste Management by Waste Handlers amidst the COVID-19 Pandemic in a Tertiary Care Hospital: A Qualitative Study", *available at* https://www.researchgate.net/publication/370543728_Challenges_Faced_in_Biomedical_Waste_Management_by_Waste_Handlers_amidst_the_COVID-19_Pandemic_in_a_Tertiary_Care_Hospital_A_Qualitative_Study, (Last Visited on June 1, 2024).

[4] The Basel Convention, *available at* https://www.basel.int, (Last Visited on June 4, 2024).

[5] Stockholm Convention on Persistent Organic Pollutants

unintentionally created. This means that in order to separate, process, and dispose of waste in a way that prevents POPs from entering the environment, the proper biomedical waste management techniques must be used. For example, care must be taken while burning medical waste to minimize the release of POPs such dioxins and furans.

5. Lessons Learned from the national legislations of different countries regarding biomedical waste management during COVID-**19**

The analysis extends to national legislations from various countries, highlighting their approaches to biomedical waste management.[6]

5.1) Biomedical Waste Management Rules in India

The Biomedical Waste Management Rules, 2016 (amended in 2018 and 2019) regulate the management, treatment, and disposal of biomedical waste (BMW) in India. These regulations set strict standards that treatment facilities must follow, categorize trash, and require segregation protocols. The COVID-19 pandemic resulted in a notable increase in biomedical waste, which presented issues for the existing infrastructure. Different states have tackled the implementation of COVID-19 waste in spite of the laws requiring separation. Temporary laws that gave double-layered bags and disinfection first priority were implemented in an effort to stop the spread. However, noncompliance and insufficient infrastructure exposed flaws in other domains. The standards set forth by the World Health Organization for the management of infectious waste align with the laws of India pertaining to BMW, with a particular focus on treatment, containment, and segregation. On the other hand, the outbreak did highlight the need for more capacity-building and stricter control in order to manage abrupt increases in waste volume.

5.2) Medical Waste Tracking Act in the United States

The Medical Waste Tracing Act of 1988 established a two-year demonstration program to develop guidelines for the processing and disposal of medical waste, including tracking the waste from generation to disposal. The Act established the foundation for state-level legislation that is supervised by the Environmental Protection Agency even though it expired in 1991. Effectiveness during the Pandemic: A variety of reactions were generated by the decentralized structure in the United States, which placed major responsibility on the states. In order to handle COVID-19 trash, some jurisdictions, including California and New York, swiftly altered their legislative frameworks. Even though some locations presented logistical challenges, the infrastructure and existing procedures allowed for the extra rubbish to be managed. Waste segregation, labeling, and tracking are highly prioritized by the MWTA and subsequent state regulations. These criteria mostly adhere to global guidelines that have been set by the WHO and other organizations. However, due to state-specific legal quirks, there might be differences in how these rules are applied.[7]

5.3) Waste Framework Directive in the European Union

The Waste Framework Directive 2008, which lays a major focus on recycling, safe disposal, and waste hierarchy, serves as the primary framework for waste management in the EU.

Effectiveness during the epidemic: The EU's robust legislative framework and well-established waste management infrastructure allowed it to respond to the garbage increase generated by the epidemic with efficiency. The regulation prioritized recycling and safe disposal while highlighting the hierarchy of waste. However, due to capacity issues at other places, interim measures were needed to handle expanding rubbish quantities.[8]

Alignment with International Standards: The WFD and the directives that go along with it are closely connected with standards that have been created by the WHO and the Basel Convention on Hazardous Waste, in particular. The EU's comprehensive policy, which integrates environmental sustainability and waste management, raises the bar globally.

Effectiveness During the Epidemic: In the US, India, and EU, biomedical waste management was not as successful during the epidemic. Different reactions resulted from India's regional diversity and the efficacy of the U.S. state-centric strategy, whilst a more uniform approach was possible due to the EU's well-organized plan and robust infrastructure. Alignment with International Standards: The three areas' adherence to international standards varies in different ways. The Waste Framework Directive of the European Union, which combines strict international regulations with comprehensive waste management concepts, may set the highest level. State legislation in the US and India's BMW rules both largely follow international norms, despite challenges in implementation. The pandemic made clear how crucial it is to handle biomedical waste properly. Although the US, India, and EU already had frameworks in place that provided a solid foundation, the notable rise in waste highlighted areas that required improvement. To ensure that these

[6] Atanu Kumar Das, Md. Nazrul Islam, Md. Morsaline Billah, Asim Sarker, "COVID-19 pandemic and healthcare solid waste management strategy – A mini-review", *available at* https://www.sciencedirect.com/science/article/pii/S0048969721012882, (Last Visited on June 3, 2024).

[7] The Medical Waste Tracking Act of 1988, available at http://www.velj.org/the-medical-waste-tracking-act-of-1988.html, (Last Visited on June 4, 2024).

[8] What Is the Waste Framework Directive?, available at https://www.assent.com/resources/knowledge-article/what-is-the-waste-framework-directive, (Last Visited on June 4, 2024).

systems are capable of managing public health catastrophes in the future, they will require improved infrastructure, ongoing enforcement, adaptable capacity-building, and the maintenance of international standards.

6. Case Laws

This study looks at significant case laws that have influenced protocols for managing biomedical waste.

Enforcing waste management laws strictly is necessary to safeguard the environment and public health. Take, for example, the cases of *Indian Medical Association v. Union of India*[9], *Earthlife Africa Johannesburg v. Minister of Environmental Affairs,*[10] *and Occupational Knowledge International v. State of California*[11].

The validity of biomedical waste management laws in India was contested in the well-known 2003 case *Indian Medical Association v. Union of India*[12]. The Indian Medical Association (IMA) wanted the Bio-Medical Waste (Management and Handling) Rules, 1998 to be applied as much as possible, but this was not the case. The Indian Supreme Court mandated strict adherence to these requirements, stressing how important it is to properly separate, handle, and dispose of biomedical waste in order to prevent health concerns. This ruling reinforced the requirement that healthcare facilities follow regulatory guidelines, ensuring safer handling of hazardous waste.

Earthlife Africa Johannesburg v. Minister of Environmental Affairs[13] is a 2017 South African case in which the group challenged the government's approval of a new coal-fired power station without considering the plant's possible environmental implications, particularly with regard to waste management. It is evident from the High Court's decision in Earthlife Africa's favor that potential harm to waste management systems must be taken into account in environmental evaluations. This ruling made clear how crucial it is to include comprehensive environmental impact assessments (EIAs) in decision-making processes to guarantee that waste management techniques do not have an adverse effect on the environment or the health of the general public.

Occupational Knowledge International v. State of California (2020): The removal of COVID-19-related trash and regulatory compliance were the main issues in this litigation. Occupational Knowledge International (OK International) claims that in order to manage the rise in biomedical waste generated during the pandemic, California's regulatory system must be reinforced. The court recognized that waste management procedures needed to be promptly strengthened in order to prevent environmental contamination and protect public health. This case showed how adaptable waste management laws can be, especially when dealing with cutting-edge health concerns. When taken as a whole, these examples demonstrate the significance of stringent legislation and aggressive enforcement in mitigating risks to public health and the environment, as well as the worldwide issues and legal obligations surrounding waste management.

7. Challenges in Biomedical Waste Disposal

Biomedical waste management is an important issue that is made worse by a number of institutional and legal deficiencies. Owing to antiquated infrastructure and technologies, many nations find it difficult to handle the increasing volume of waste generated by healthcare operations. Biomedical waste is managed and disposed of inappropriately due to a lack of infrastructure, posing a risk to the environment and human health. One major issue is that many sectors lack rules. When there are weak regulatory frameworks and inefficient enforcement methods, waste management regulations are not adhered to. In the absence of stringent regulations and effective oversight, waste handlers and healthcare facilities may resort to unsafe disposal methods, such as open burning or uncontrolled landfilling of hazardous waste, which would worsen the issue.[14] The health risks associated with inappropriate disposal of biomedical waste might be severe. Workers in the public sector, those who handle trash, and medical professionals may come into touch with hazardous materials, poisonous compounds, or contagious diseases. Needlestick injuries, respiratory problems from cremation fumes, and the spread of infectious illnesses are a few of the direct health implications. Strong waste management systems are necessary to ensure the safe handling, processing, and disposal of biomedical waste, as these hazards make clear.[15]

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[9] Indian Medical Association vs Union of India & Ors AIR 2011 SC 2365

[10] Earthlife Africa Johannesburg v. Minister of Environmental Affairs 2017

[11] Occupational Knowledge International v. State of California 2020

[12] *Supra n*. 11

[13] *Supra n.* 12

[14] Neelam Saba, Walied Khawar Balwan, Wahied Khawar Balwan, "Facing Challenges of Biomedical Waste Management Strategies in India" 2 *Saudi Journal of Medical and Pharmaceutical Sciences* 544 (2023).

[15] Komal S Dhole, Sweta Bahadure, "Navigating Challenges in Biomedical Waste Management in India: A Narrative Review", *available at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10985054, (Last Visited on June 8, 2024).

An additional crucial factor to consider is the impact on the environment. Inappropriate biomedical waste management exacerbates pollution and harms the environment. Contaminants that leak into the soil and water can have an effect on ecosystems and wildlife. Because contaminated water supplies and food chains can have an effect on human populations, pollution acts as a reminder of the connection between environmental health and public health. To solve these difficulties, a variety of strategies are required, including investing in waste management infrastructure, strengthening regulatory frameworks, enhancing enforcement mechanisms, and increasing public and professional awareness of the proper disposal of biomedical waste. Comprehensive and coordinated actions are needed to effectively reduce the health risks and environmental effects of biomedical waste.

8. Recommendations for Legal and Policy Reforms

Drawing on experiences learned, this section offers recommendations for enhancing legal and regulatory frameworks. Waste management, especially in the healthcare sector, is a challenging issue that necessitates a multifaceted solution. Waste management across borders is common, particularly with regard to hazardous and medical waste. A coherent waste management policy can only be developed through international cooperation. By coordinating standards, nations may ensure consistent and secure waste management across international borders. This can be accomplished with the aid of international treaties and agreements that set minimum standards for waste management practices. While the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal is an excellent framework, additional work is required to ensure that new problems are addressed and that it is properly implemented.[16]

Regulations need to have strict enforcement and monitoring procedures in place to ensure that waste management rules are followed. This calls for regular audits and inspections in addition to employing technology such as GPS monitoring and computerized waste manifests to track the movement and disposal of waste. Strict penalties should be implemented by the authorities to deter noncompliance. Creating unbiased oversight agencies can also aid in upholding transparency and accountability. Legislative frameworks should support creative and long-term approaches to lessening the harm that rubbish does to the environment. This entails promoting waste material minimization, recycling, and reuse. Governments have the authority to provide incentives to companies that use eco-friendly technologies and waste management practices. Innovations such as waste-to-energy technologies, advanced recycling methods, and biodegradable materials require research funding and subsidies.

For waste management to be successful, significant infrastructural investments are required. Governments must ensure that adequate funding and resources are available to support the construction and maintenance of waste management infrastructure. This includes safe disposal sites, treatment facilities, and recycling centers. Public-private partnerships leverage the resources and expertise of the private sector while maintaining public oversight and responsibility. A program for managing solid waste needs to incorporate both instruction and training. Medical staff members and waste handlers need to be trained on safe disposal procedures to prevent accidents and environmental contamination.[17] It should be mandatory to conduct regular training sessions on topics such waste segregation at the source, protective equipment use, and emergency response techniques. Public awareness campaigns can also help to inform and involve the neighborhood in waste management programs.,

Technological and methodological advancements in waste management are achieved through ongoing research and development, or R&D. Governments should encourage research and development initiatives aimed at producing more ecologically friendly and effective garbage disposal solutions. Collaborations between companies, research teams, and academic institutions can spur innovation. The establishment of innovation hubs and research funding can stimulate the generation of novel approaches to waste management-related issues. To improve the legislative and regulatory environments surrounding waste management, a thorough and well-coordinated approach is required. By encouraging international cooperation, enforcing stringent oversight and enforcement measures, promoting innovation and education, ensuring adequate funding, and promoting sustainable practices, governments can build a robust system that can handle the growing challenges in waste management. These suggestions, which are based on the lessons discovered, aim to build a sustainable future in which waste is managed sensibly and efficiently to protect the environment and public health.

9. CONCLUSION

As the COVID-19 pandemic has demonstrated, appropriate biomedical waste management is necessary to safeguard public health. Biomedical waste, which includes potentially infectious items, reached previously unheard-of levels during the outbreak. If this garbage is not properly managed, it could seriously harm public health. This situation threw into sharp relief the notion of the right to health as provided by international law and the importance of effective BMWM in preserving this fundamental right.

The right to health is recognized as a fundamental human right by a number of international legal treaties, including the Universal Declaration of Human Rights (UDHR) and the International Covenant on Economic, Social, and Cultural Rights (ICESCR). Article 12 of the ICESCR obliges state parties to recognize that every person has the right to the highest standard of physical and mental health. This entails putting into practice the laws necessary for

[16] Michael Young; Mark A. Smith., "Standards and Evaluation of Healthcare Quality, Safety, and Person-Centered Care", *available at* https://www.ncbi.nlm.nih.gov/books/NBK576432, (Last Visited on June 6, 2024).

[17] Justice Kofi Debrah,Diogo Guedes Vidal and Maria Alzira Pimenta Dinis, "Raising Awareness on Solid Waste Management through Formal Education for Sustainability: A Developing Countries Evidence Review", *available at* https://www.mdpi.com/2313-4321/6/1/6, (Last Visited on June 6, 2024).

the prevention, management, and control of occupational, endemic, and other diseases. Effective BMWM primarily aims to provide a safe environment and halt the spread of infectious diseases.

For BMWM, the epidemic presented a variety of challenges. At first, the massive volume of waste produced was more than the waste management systems that could handle it. For hospitals and other healthcare facilities, the increasing demand for waste segregation, storage, and disposal proved to be too much to handle. Secondly, there was insufficient staff qualification and a deficiency of personal protective equipment (PPE) to manage the rubbish in a secure way. Third, a lack of infrastructure and logistical support hindered the effectiveness of garbage collection and transportation. Not to add, the problem was exacerbated by a dearth of precise instructions and a lack of collaboration amongst different governmental and non-governmental actors, leading to holes and anomalies in waste management protocols.

International agreements such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal offer a framework for the management of hazardous waste, including biomedical waste. The Stockholm Convention on Persistent Organic Pollutants and the Rotterdam Convention both regulate hazardous substances that may arise from biomedical waste. The aforementioned agreements aim to protect the environment and public health from the detrimental effects of hazardous waste by the implementation of stringent control measures, promotion of safe disposal techniques, and cultivation of global cooperation.

Several countries have taken different actions in reaction to the issues caused by business and consumer mismanagement (BMWM) during the COVID-19 pandemic. India, for example, established norms that prioritized source isolation, timely collection, and safe disposal in order to control COVID-19 waste. Germany improved its existing waste management infrastructure to accommodate the increased load, and Japan implemented state-of-the-art waste treatment and disposal systems. This national legislation stressed the importance of creating robust and adaptable BMWM systems, the need for continuous training for healthcare workers, and the significance of public awareness and community involvement in waste management activities. Despite the advances, there are still a lot of challenges in getting rid of biomedical waste. One of the primary concerns is disposing of waste in an environmentally responsible and safe manner. If not managed correctly, a common process called incineration could let hazardous chemicals escape. In addition to significant financial requirements, alternative methods such as chemical treatment and autoclaving also require advanced technological know-how. In addition, the unregulated recycling sector—which is widespread in developing countries—endangers garbage workers as well as society at large. In addition, the requirement to ensure compliance with rules calls for the establishment of effective oversight and execution mechanisms.

Successful BMWM is required, as the COVID-19 pandemic has shown, to safeguard the right to health. It has drawn attention to the need for thorough laws, well-coordinated domestic and international initiatives, and stringent waste management guidelines. Investing in education and capacity building, strengthening the BMWM infrastructure, and raising public awareness of the importance of efficient waste disposal will all be critical in the future. Treaty adherence and international collaboration will be crucial in addressing the issues surrounding the disposal of biomedical waste. Through the analysis of other countries' experiences and optimal methodologies, we can establish resilient establishments that protect the environment, public health, and the fundamental right to health for all.

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