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Biomedical Waste Management: The World COVID-19 Scenario

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Abstract

The reason of most spreading virus of SARS-CoV-2the medical waste suddenly increased twenty five percent compare than regular waste. In generally Biomedical waste handling is a challenging job and COVID-19 pandemic makes it a more challenging. Insufficient human force and infrastructure made the situation worst. Improper treatment may cause of this fatal disease as waste acts as a vector for SARS-CoV-2, which survives up to 7 days on COVID-waste. In this situation require a safe handling and disposal or treatment of waste timely manner. The government also takes various measures biomedical waste management (BMW). Furthermore, the policy has been reviewed and government established the BMW guidelines for disposal and treating to reduce an environmental and health risks in the world. The article is an attempt to explain about the guidelines of biomedical waste management during the pandemic of COVID-19.

Keywords: COVID-19 pandemic, Biomedical waste, Health risk, world scenario.

Introduction

The main instance of the novel coronavirus was accounted for on December 30, 2019, in Wuhan city China. The WHO briefly named these pathogens 2019 novel coronavirus (2019-nCoV). During December 2019, a novel Beta-coronavirus temporarily named 2019 novel coronavirus (2019-nCoV), and along these lines authoritatively renamed extreme intense respiratory disorder coronavirus 2 (SARS-CoV-2) by the International Committee on Taxonomy of Viruses (ICTV), causing coronavirus ailment 2019 (or COVID-19). In India, the principal research centre affirmed instance of COVID-19 was accounted for from Kerala on January 30, 2020 (Kerala State Pollution Control Board (2020). As per the data of www.COVID19 india.org on April 2021, have the second-highest number of confirmed cases in the world (after the United States) with more than 15.061 million reported cases of COVID-19 infection and more than 178,769 deaths as of April 19, 2021.

The Biomedical waste (BMW) differs from general municipal waste as it poses various health hazards. BMW management rules 2016 and the amendment rules 2018 are the latest guidelines from the ministry of environment, forest & climate change to regulate the handling of BMW activities in the country (MoEF, 2016). India is the second-most populous country after China and the second worst-hit nation by the coronavirus disease 2019 (COVID-19) after the United States of America (As of November 9, 2020). Due to the flawed biomedical waste management system

and lack of resources, India faces severe consequences during the COVID-19.5 Untreated and improperly managed BMW is a potential source of infection (Chand *et al.*, 2020) The diligent handling and management of BMW can prevent the occurrence of hospital-acquired infection and lower the rates of disease transmission.

The effects of biomedical waste on the environment and on human health are highly dangerous. The animals can get a hold of material contaminated with bacteria and could spread to humans. If someone has illegally disposed of medical waste in a landfill, deadly microbes could get into the water supply and infect an entire community (Singh *et al*., 2007). So that, Biomedical waste has been increasing more compare than regular days nearly 146 tonnes of bio-medical waste is generated per day in the country due to diagnostic activities and treatment of COVID-19 Patients, the Ministry of environment informed parliament on march as per the figures from the central pollution control board (CPCB).This includes personal protective equipment (PPE), gloves, face masks, head cover, plastic coverall, hazmat suit, syringes among other gears and medical equipment used by both healthcare providers and patients. The India already had Bio Medical Waste Management (BMWM) Rules, 2016 and its amendment rules 2020 are the latest guidelines to regulate to handling of BMW. Accordingly, State pollution control boards and pollution control committees (SPCBs/PCCs) have authorized 202 common Bio medical waste treatment and disposal facilities (CBWTFs) to collect and dispose the BMW, including COVID- 19 waste. Therefore, the present review is an attempt to understand and importance of biomedical waste management in world during COVID-19 pandemic.

Universal Perspective of Bio Medical Waste Handling During The COVID-19 Curfew

Some countries are adopting bio medical waste handling during the period of COVID 19 in following various strategies.

India

Biomedical waste is not handled like a municipal waste. The central pollution control board, India is the apex body to monitor the country's BMW management activities under the ministry of environment, forest, and climate change (MoEFCC, 2016). There are separate state pollution control boards in each state to monitor and regulate the BMW activities within the state and report the findings to the CPCB. The segregated waste is stored in a well-ventilated area and the stored waste is carried to the disposal facility (commonly known as common biomedical waste disposal facilities) for further treatment and disposal. The treatment of solid waste at the site of generation or storage is prohibited according to the updated guidelines. The waste should be transported in a designated closed vehicle that is equipped with the global positioning system tracker. The BMW in the CBMWFs is then treated, sterilized, and sent for recycling, incineration, or land filling based on the waste category (CPCB, 2018,2019). The qualitative process and quantitative data on the generated and disposed off BMW should be accurately documented and reported to the state pollution control board. Violating these guidelines by healthcare facilities and disposal facilities will subject them to penalties. Despite stringent rules and liability, the country reports a high degree of non-adherence to these guidelines. According to the annual report, 2018/19 published by the CPCB, 23,942 HCFs violated the BMW rules 2016, and 18,210 HCFs were issued a warning for their violation. The report shows the massive amount of BMW generation per day and around 13% of HCFs have violated BMW rules, which show the poor biomedical handling and management in India.

China

The China disposal of medical waste generated from COVID-19 patients undergo a strict treatment protocol to contain the spread of the virus. Medical waste is being disposed at safe sites quickly to limit any possibility of the viral spread. Firefighters have been deployed to ensure quick disposal at waste designated sites where the environment protection department safely disposes off the waste. The treatment facilities for medical waste should be more automated and based on the technology of the Internet of Things (IoT), with a minimum of workers involved. Through the technology of IoT, the whole process of the medical waste disposal was made a real-time tracking and controlling process in the city of Wuhan. The goals of making automatic processes and the use of minimum workers for the infectious waste were also realized through the technology of IoT that includes sensing equipment information, location system, scanning devices and video surveillance, and Internet access with each device.

Larger capacities of mobile facilities should be maintained, particularly during the pandemic, which can be very important for the developing countries where the medical waste disposal facilities are limited. The mobile facilities are not only convenient for the emergency situation but can also be used as a strategic backup capacity for a state in the future as well.

America

The US Environment Environmental Protection Agency (EPA) has been quick to release a ‘temporary policy’ for the industries generating hazardous waste (including the generation of medical waste) in the times of COVID-19. The EPA has accorded special thrust on ‘proper labelling’ for easier identification and safe disposal of the waste. The applicable regulations require segregation of regulated medical waste from ordinary solid waste and a special treatment process to render it non-infectious before final disposal. Moreover, the Occupational Safety and Health

Management guidelines, under the United States Department of Labour, advise the use of typical engineering and administrative controls, safe work practices, and Personal Protective Equipment (PPE), such as puncture-resistant gloves and face and eye protection, to prevent worker exposure .

France

In France, the government decided to ensure door-to-door collection of waste as per usual frequency, with sorting instructions to citizens. Objects (masks, glasses, gloves, tissues, etc.) that are likely to present an infection risk for both the environment and professional in charge of treating them, must be disposed in a hermetically sealed bag. Any pungent, cutting, or puncturing waste must be collected in airtight containers adapted and managed by the specifically designated organization. Self-treatment patients have the option to obtain a waste collection-box free of charge from the pharmacy upon presentation of their prescription. Once filled, the box must be closed and returned to a collection point, after which the waste is adequately disposed.

Germany

The German government has accorded highest priority to the protection of waste management workers and the containment of COVID-19. Significant measures have been taken for handling waste from private households where there are confirmed or suspected cases of COVID-19. Handkerchiefs, tissues, and similar waste fractions are required to be disposed as residual waste and limited use of separate waste collection systems (e.g., paper bin, bio bin, yellow bag) is recommended. The residual waste is then treated in the Bavarian waste incineration plants to ensure safe destruction at very high temperatures of up to 1,000 °C

Malaysia

The appropriate handling and disposal of CW generated from hospitals and other healthcare institutions and facilities are essential. This will avoid any unwanted infection and adverse health and environmental consequences as the CW possibly contains infectious and contaminated human tissues, blood, body fluids, excretions drugs, needles, and other related materials. The practice is the same for COVID-19 related waste whereby with a proper management and disposal system any unwanted infection or spreading of the virus can be avoided. In Malaysia, CWM is regulated by the Federal Government and DOE. The Environmental Quality Act 1974 with recent amendments is currently being implemented in Malaysia. The composition of CW from the healthcare facilities is about 20% to 40%. The amount of CW generated in Malaysia increased by 17% in February 2020 as compared to the previous month, a figure which is sourced from various healthcare facilities, hospitals, and clinical and research activities during the COVID-19 pandemic. From the case study it is well established that CWM and COVID-19 related management waste is properly regulated according to the Malaysian Schedule Waste Regulation (2005) under the Environmental Quality Act 1974 by the management team of Seberang Jaya Hospital (Agamuthu and Barasarathi. 2021).

Bangladesh

In this COVID-19 pandemic situation, safe disposal of MW is now a legal requirement in Bangladesh but lacks in practice. This report discusses current challenges associated MW management strategies in relation to the international guidelines and proposes some strategies to overcome the problems during COVID-19 pandemic. In Dhaka, MW is mainly collected, transported, and managed by municipal agency, hospital authorities, and NGOs. However, the capacities of these stakeholders are not sufficient to comply with the present challenges associated with waste collection, transportation, and environment-safe waste disposal mechanism. A concerted and prompt effort from hospital administration, municipal authorities and other NGO's is needed to adopt new ways of state-of-the-art, safe and cost-effective MW management system in Dhaka city. Future research should be directed towards the application of the waste-based epidemiology approach, and to find out other potential sources (e.g., inanimate objects or aquatic bodies) of SARS-CoV-2 infections to track the spatial and temporal dynamics of this pandemic, and also to get early warning in case of future outbreaks (Faisal *et al*., 2021).

Alberta

Biomedical waste does not include any waste generated from someone's home (including waste that has been in contact with COVID -19 such as tissues). Alberta's Waste Control Regulation defines biomedical waste as waste that contains or may contain pathogenic agents that may cause disease in humans exposed to the waste specifically generated from:

- Human health care facilities;
- Medical research and teaching establishments;
- Clinical testing or research laboratories; and
- Facilities involved in the production or testing of vaccines.

Processing and Managing of Bio Medical Waste

The hospital waste handling is not easy compare than other municipal waste. The ministry of environment overlooking the CPCB to monitor the BMWM. The government given guidelines for the hospitals, nursing homes, clinic, dispensary, animal house and pathological lab to processing of bio medical waste. Handling, segregation, mutilation, disinfection, storage, transportation and final disposal are vital steps for safe and scientific management of bio-medical waste in any establishment. There are various categories of Biomedical Wastes. The guidelines also sought those bags/containers used for collecting biomedical

waste from COVID-19 wards should be labelled as COVID-19 waste to enable CBWTFs to identify the waste easily for priority treatment and immediate disposal after getting it (Shammi *et al.*, 2020). The State pollution control board has prepared qualitative process of disposal of BMW. Breaking the policy of guidelines by healthcare facilities and disposal facilities are to be punished (Arya and Mandavkar, 2020). Accordingly, State pollution control boards and pollution control committees (SPCBs/PCCs) have authorized 202 common Bio medical waste treatment and disposal facilities (CBWTFs) to collect and dispose the BMW, including COVID- 19 waste. Further, there are about 18178 captive disposal facilities installed by individual HCFs for pre-treatment and final treatment of BMW.

Course of Action Taken by Safe Handling and Removal of Bio Medical Waste

- Healthcare Facilities having isolation wards for COVID-19 patients need to follow these steps to ensure safe handling and disposal of biomedical waste generated during treatment
- Keep separate bins/bags/containers (yellow colour) in isolation wards and maintain proper segregation of waste as per BMWM Rules, 2016 as amended and CPCB guidelines for implementation of BMW Management Rules.
- As precaution double layered bags (using 2 bags) should be used for collection of waste from COVID-19 isolation wards so as to ensure adequate strength and no-leak.
- Collect and store biomedical waste separately prior to handing over the same to CBWTF. Use a dedicated collection bin labelled as “COVID-19” to store COVID-19 waste and keep separately in temporary storage room prior to handing over to CBWTF. Biomedical waste collected in such isolation wards can also be lifted directly from ward into CBWTF collection van.
- In addition to mandatory labelling, bags/containers used for collecting biomedical waste from COVID-19 wards, should be labelled as “COVID-19 Waste”. This marking would enable CBWTFs to identify the waste easily for priority treatment and disposal immediately upon the receipt.
- Mixing of COVID-19 waste with the biomedical waste from other wards, general waste etc. should be avoided.
- General waste other than bio medical waste should be disposed as per SWM Rules, 2016 only after proper disinfection.
- Maintain separate record of waste generated from COVID-19 isolation wards.
- Use dedicated trolleys and collection bins in COVID-19 isolation wards. A label “COVID-19 Waste” to be pasted on these items also.
- The (inner and outer) surface of containers/bins/trolleys used for storage of COVID-19 waste should be disinfected with 1% sodium hypochlorite solution.
- Report opening or operation of COVID-19 isolation ward to SPCBs
- Depute dedicated sanitation workers separately for BMW and general solid waste so that waste can be collected and transferred timely to respective temporary waste storage area.

Proceedings for the Isolated Places

The less quantity of biomedical waste is expected from quarantine centres. However, quarantine camps/centres/home-care for suspected COVID-19 cases need to ensure safe handling and disposal of waste (WHO, 2020). Quarantine camps/centres shall inform CBWTF operator as and when the waste is generated so that waste can be collected for treatment and disposal at CBWTFs. Quarantine camps/centres are divided into various colour code.

The biomedical waste generated in the quarantine centresmust be disposal in 24 hours and however, used PPEs like masks and gloves generated in Common Households, Commercial Establishments, Institutions, etc., are required to store separately for minimum 72 hours for disposal along with solid waste after cutting or shredding. The BMW should be transported to the common disposal facilities (CBMWFs) for the final treatment (European Commission, 2020). The following colour coding are classified for waste bins.

- Red Colour: It includes all syringes (without needles), soiled gloves, IV tubes, etc. With the autoclave technology, the red waste is disinfected before being sent for treatment.
- Blue colour: All such waste consists of glass, broken or intact.
- White colour: Metal wastes, needles, guide wires, etc, are put under the category.
- Yellow colour: The waste is incinerated at high temperature.

Roles of Authorities and Responsibilities of Public

The BMW gave guideline for general people and authorities. The people are generally mixing the BMW with general waste due to the lack of knowledge or less awareness these activities are making work hard. So, every individual take responsibility and try to reduce the work

load of authorities and the authorities also be follow a proper guideline of BMW management (Scheinberg et al., 2020). The Common Biomedical Waste Treatment Facility (CBWTF) duties are described below.

- Report to SPCBs/PCCs about receiving of waste from COVID-19 isolation wards/quarantine camps/quarantined homes/COVID-19 testing centers.
- Operator of CBWTF shall ensure regular sanitization of workers involved in handling and collection of biomedical waste.
- Workers shall be provided with adequate PPEs including three-layer masks. Splash proof aprons/gowns, nitrile gloves, gum boots and safety goggles;
- Use dedicated vehicle to collect COVID-19 ward waste. It is not necessary to place separate label on such vehicle.
- Vehicle should be sanitized with sodium hypochlorite or any appropriate chemical disinfectant after every trip.
- COVID-19 waste should be disposed-off immediately with high priority upon receipt at facility.
- In case it is required to treat and dispose more quantity of biomedical waste generated from COVID-19 treatment, CBWTFs may operate their facilities for extra hours, by giving information to SPCBs/PCCs.
- Operator of CBWTF shall maintain separate record for collection, treatment and disposal of COVID-19 waste.
- Do not allow any worker showing symptoms of illness to work at the facility. May provide adequate leave to such workers and by protecting their salary.

Conclusion

The untreated Bio medical waste is affected health, micro and macro-organism and also is an environmental. Now a day the spikes of COVID-19 spread higher than previous year of 2020 because of that BMW also increasing more. The segregation of waste at source is the key step and reduction reuse and recycling should be considered in proper perspectives. The growing of population, biomedical waste is also growing in quantity in world. Management of this waste is a rising concern in India and other country. The general person and authorities has to follow the proper guidelines of bio medical waste management to ensure the good environment not only for humans and animals also for living organism.

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