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Risk of Covid-19 Transmission due to Domestic Biomedical Waste – A Review

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Abstract: Biomedical waste is said to be a type of waste generated during treatment or diagnosis. Apart from hospitals, clinics, and laboratories it is generated domestically as well. Amount of Biomedical waste in household has increased significantly in the past year due to Covid-19 pandemic, People were effectively educated regarding usage of masks, face covers, PPEs and sanitizers, but were not acknowledged regarding waste generated and disposal methods due to usage of such disposable items in ample quantity. Awareness should be spread across regarding Covid-19 related medical waste generation and its ways of disposal. Waste which is contaminated with Covid-19 virus has certain hours on surface stability of it, due to which risk of contamination increases. Therefore, one must be always aware regarding advantages and disadvantages of the items they use, consume or throw away.

Keywords: Biomedical Waste, Hospital Waste, Covid-19, domestic Biomedical waste, Municipal Waste.

I. INTRODUCTION

As per the Biomedical Waste (Management and Handling) Rules, 1998 of India "Any waste which is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biologicals. [(14)]. Biomedical waste (BMW) includes Human and Animal anatomical waste, Microbiology and Biotechnology Waste, Sharps, Discarded medicine and Cytotoxic Drugs, Solid and Liquid Waste & Chemical Wastes [(15)]. Biomedical waste management acts like a seed for future environmental and human health. Generation sites for it are hospitals, private hospitals and clinics, laboratories, Blood banks, Medical Colleges, at times households. Biomedical waste could be hazardous (15%-20%) and non-hazardous (80%-85%) [(16)]. It poses threat due to particles of virus are hidden below Medical contaminated wastes such as human tissues, blood bags, needles, syringes or any other sharp object, dressings, plaster casts, cotton swabs, beddings contaminated with blood or body fluid [(3)]. Due to increase in medical facilities, there is rise in Biomedical waste at the management sites. As per the data published by the central pollution control board (CPCB) in 2018, in Table 1.1 amount of waste generated corresponding to the year is shown [(2)]. The country has 238,170 total healthcare facilities, out of which 87,267 are bedded and 151,208 are non-bedded HealthCare Facilities (HCFs) generating BMW [(2)].

A. Effect on amount of Biomedical waste due to Covid19

Growth of deadly fungus and bacteria has created an epidemic, in addition to it, spread of novel coronavirus (COVID-19) has given rise to a pandemic globally since 2019. To fight against which, high demand of medical appliances and care is required everywhere. Higher demand means high supply, in turn increases amount of biomedical waste tremendously. Biomedical waste which is generated while fighting against Covid19 are PPE (Personal Protective Equipment) such as, masks, gloves, face shields, boots, capes, sanitizer bottles and body covers. All these materials are non-degradable in environment, that means they cannot be broken down into smaller pieces on its own, thereby disposing them in water or bare lands would increase environmental pollution. Now the question arises on how to manage this much immense amount of Biomedical Waste.

Biomedical waste becomes a source of infection to a great extent. Several contagious viruses and germs that are antibiotic-resistant (like COVID-19), HIV and Hepatitis (B and C) can easily be transmitted from such wastes [(13)]. Infections, Injuries, toxic consequences and pollution are caused due to improper management of medical waste [(10)]. Before the COVID-19 pandemic, a hospital or private emergency clinic would ordinarily produce 500 grams of biomedical waste per bed, every day. Presently, that number rose to 2.5 to 4 kg per bed, daily [(7)].

The country does not have sufficient human resources and infrastructure to handle this immense amount of BMW. The presence of 198 CBMWFs (Common Biomedical Waste Treatment Facilities) and 225 captive Incinerators is not adequate to discard 700 tonnes of waste generated each day [(2)]. Waste collection, Sorting and Recycling is done by around 1.5-4 million workers in our country [(11)]. For example, Wuhan in China noticed a rise of waste generated in healthcare by 600% in the mid of COVID-19 outbreak [(10)]. Delhi, the capital of India too faced the issue of BMW.

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The quantity of Covid-19 Medical waste produced (monthly in the year 2020) in Delhi alone is shown in the Table 1.1 [(1)].

Month	Amount of waste
June	3025.41
July	4253.46
August	5238.45
September	5490
October	5597
November	4864.53
December	4527.55

Table 1.1 Amount of waste produced monthly in delhi in the year 2020

Amount of Biomedical waste in different month averagely is given in Table 1.2 [(4)].

State	Avg Amount of Waste (mt/month)
Maharashtra	789.99
Kerela	459.86
Gujarat	434.87
Tamil Nadu	427.23
Uttar Pradesh	371.39
Delhi	358.83
West Bengal	303.15

Table 1.2 Average amount of waste in a month in various state

II. HOUSEHOLD BIOMEDICAL WASTE

It is not only nosocomial waste which hazardous to environment and living beings, but household biomedical waste too is unsafe to surroundings and waste managers, if not managed and treated properly. It must be considered that medical waste produced at homes are similar to hospital generated waste and may contain the same virus having potential threat. [(13)] New materials have been added to the biomedical waste generated during the pandemic, especially from the quarantine centers. Hence, to overcome this alarming situation, the ministry's existing guidelines needs to be updated, the central pollution control [(2)]. For managing COVID-19, CPCB (Central Control Pollution Control Board) has published the first three revisions of guidelines waste, released on March 2020 and then is reworked and updated on April 2020 followed by June 2020 [(1)] which mentions that the ones handling COVID-19 related biomedical waste should be provided with PPE and given adequate training [(7)]. Addition to it, the public should make sure regarding the BMW generated is segregated effectively at the site of generation itself. Methodologically, gloves and masks shall be incinerated; even though, this might be unfeasible at households and so, guidelines must be followed, and such kind of waste must be discarded in yellow-colored bags separately, specifically at the time of Covid-19 outbreak currently [(11)].

The rules and regulations mentioned in the updated guidelines should be followed by the government and awareness should be spread to the people who are related to medical waste management. Biomedical waste differs from Municipal Solid (Dry/Wet) waste. Biomedical waste produced in camps & centers should be first segregated at the site of generation itself and collected in yellow bags allotted by Urban Local Bodies (ULBs) [(1)]. For self-care and precaution health care workers should wear aprons, boots, masks, gowns which are long sleeved, googles or face shields to avoid contamination, as per WHO guidelines [(1)]. Nevertheless, proper segregation, disposal, and managing remained a critical concern for health care provisions across India estimating up to 775.5 tonnes/d by the year 2022 with an annual growth rate of 7% [(6)].

A. How Household Medical Waste Becomes a Source for Transmission of Covid-19

While noticing daily, the safai karamchari who collect municipal waste from our household everyday are seen without any protective care. General waste is generated within quarantine center, but the one which is generated from suspected and confirmed cases in quarantine centers and homes should be treated as BMW [(1)]. The Medical waste generated in the quarantine centers, isolation wards, plus home-based isolation of positive patients, can mix up with general municipal waste risking lives of waste handlers and altogether increase the risk for spreading of infection [(5)].

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Additional temporary bins for disposable of PPEs, masks and gloves and containers for reusable materials should be provided separately and it should be disposed of strictly within 24hours [1]. To calculate the quantity of "COVID-19 waste" in different categories an electronic communication instrument should be placed, any breach during treatment and transportation should be notified to the organization [6]. According to stats, India's biomedical waste increased approximately by 10% making it 600 metric tonnesdaily [7] due to pandemic.

Covid-19 Biomedical waste mainly include Masks (3-ply, N-95, Three layered, cotton, etc.), Face Shields, Body Covers, Boots, Sanitizer Bottles, Syringes, goggles, Blood bags, used pints, cotton swabs, Cardboard boxes, used medicine bottles and one time used disposable items. All these wastes have chances of presence of Covid-19 virus on their surface and can be transmitted through it. If such highly contaminated waste is not segregated, labelled and disposed properly, risk of transmission increases. Disposal of syringes, needles and other medical products are only regulated when used in health care facilities, while these same products when used at home are un regulated as they are disposed in trash or flush down in the toilet [9]. While waste sorting such sharp medical waste may expose the sanitization worker to needle- stick injuries [9].

Statistics which are shown previously in tables are either calculated averagely or as a whole, which tells us that importance of domestic biomedical waste, that is, medical waste generated at home are considered to be of less importance. Sources of pathogen are found on untreated biomedical waste as literature has outlined 40 species and more of damaging micro-organism to cause human illness [1]. The existing environment of an infected person can serve as a source of communication for virus, as droplets may settle down on surfaces where virus stays in its active form [12]. Several factors include in calculating survival time of the virus, such as, type and smoothness of the surface, initial virus concentration, relative humidity and temperature [12]. Effective inactivation is achieved in 1minute by using disinfectants like, ethanol (70%) and sodium hypochlorite (0.1%) [12]. Table 2.1 shows surface stability of Covid-19 virus (8).

As one can observe, if the surfaces are not sanitized on time, chances of virus to stabilize increases. Apart from these feces from the positive COVID-19 patient should be gathered in a diaper and sorted as the yellow category waste or it can be assembled and flushed in the toilet, after which it should be disinfected properly [2]. Due to this ongoing generation of medical waste, it is tough for local authorities to manage such waste, because it adversely effects humans, and environment [1]. Therefore, Biomedical waste management is need of the hour particularly the one generated from households, as there have been cases of people using used mask or re-selling them which are thrown anywhere, due to limited supply and high demand [12]. Household medical waste should be properly segregated and disposed accordingly with utmost care and safety. Mixing of municipal and medical waste is not advisable and can result into unsafe output.

Surfaces	In hours
Glass and Banknote	96
Wood and Cloth	48
Stainless Steel	72
Copper	4
Plastics	72
Printing and Tissue paper	3
Cardboard	24

Table 2.1 Surface stability hours for various materials

III. CONCLUSION

Biomedical waste segregation has become very important step in waste management. Sorting the waste effectively will not only help the environment from getting polluted by such harmful chemicals, but also will not risk lives of people. People should know regarding such key rules mentioned, and try to follow them as much as possible. Medical waste unlike Municipal waste needs to segregated at the time of generation itself, it cannot be transported or stored without this step. Amount of medical waste my decrease and increase as time go by, but one should always keep in mind side effects of mismanagement of Biomedical waste.

IV. ACKNOWLEDGMENT

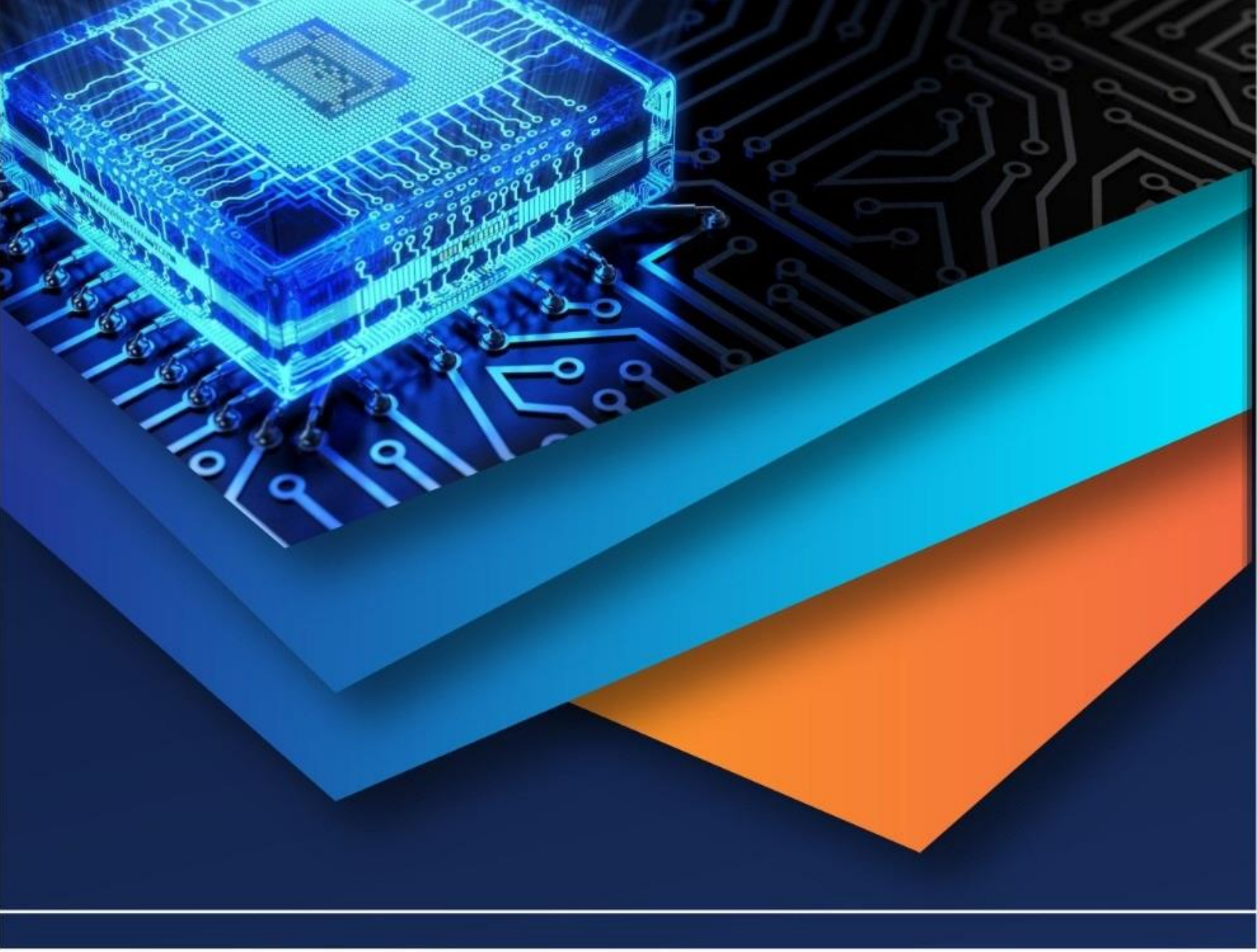
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