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# Regulatory Framework for the Disposal and Management of Personal Protective equipment (PPE) During Covid-19 in Bangladesh

**Farhana Helal Mehtab[1], Md. Safiullah[2] and Md. Arif Mahmud[3]**

***[4]Faculty of Humanities and Social Science, Daffodil International University, Bangaladesh***
***[2,3]Department of Law, Daffodil International University, Bangaladesh***

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**ABSTRACT**

COVID-19 is generating significant amounts of hazardous medical waste in Bangladesh due to the increased use of personal protective equipment (PPE) in hospitals and other professions. That is creating a heavy impact on Bangladesh's poor waste management and environmental performance. The Government has enacted the Medical Waste Management Rules in 2008 but it failed to provide an appropriate, safe, and cost-effective strategy. This paper intends to scrutinize the existing legal framework for managing abandoned Personal Protective Equipment (PPE) and medical waste. Recommendations have also been given to strengthen the regulatory framework for the effective management of abandoned Personal Protective Equipment (PPE) and medical wastes.

***Key words :*** *Personal protective equipment (PPE), COVID Waste management, Medical waste management, Waste management regulation*

## Introduction

From 2020 to the present, the outbreak of the latest flu Coronavirus (SARS-CoV-2) has paralyzed normal public life around the world (Zhou *et al*., 2020). To combat this pandemic, the new normal is to maintain social distance, wash hands frequently, and wear Personal Protective Equipment (PPE) in public places (Ngonghala *et al.,* 2020). All over the world, one of the major negative aspects of the COVID-19 pandemic is the disregard for environmental concerns and the resulting disasters of increased plastic pollution resulted from the medical wastes used to fight the pandemic. Bangaladesh is one of the foremost pollution-creating nations within the world (Haque *et al.,* 2020). COVID-19 has wreaked havoc on Bangaladesh's fragile healthcare system, as well as its socio-economic and mental well-being. Bangladesh is a developing country with a population of 165 million people (Shammi *et al.,* 2020). The significantly increased use of "single-use plastic polymers" during the COVID-19 pandemic is creating a heavy impact on the country's poor waste management and environmental performance. COVID-19 is generating significant amounts of hazardous medical waste in Bangaladesh due to the increased use of personal protective equipment (PPE) in hospitals and other professions. The Personal Protective Equipment (PPE) includes surgical face masks, medical hand gloves, face shields, goggles, gowns, as well as respirators for specific procedures, and isolation gowns/aprons. Standard PPEs, ac-

[1]Associate Dean, [2]Assistant Professor, [3]Lecturer

cording to the "World Health Organization (WHO)", are single-use items that, once used, become hazardous medical waste (WHO, 2020). It is extremely concerning that disposable face masks are made from micro sized plastic fibers (thickness of 1 to 10 micrometers), which released additional micro-sized plastics similar to plastic bags. Single-use face masks and hand gloves are listed as important sources of micro plastics in the list of "Covid waste" (Aragaw, 2020). Face masks, medical gloves, and isolation gowns contribute to microplastic pollution because they typically contain polypropylene and/or polyurethane, polyethylene, polyacrylonitrile, polystyrene, polypropylene, and so on (Akber *et al.,* 2020). Microplastics (MPs) are disposed of as solid waste in Bangladesh because they are not recycled like general plastic products (approximately 25% of which are recycled) and there are no appropriate recycling guidelines. Authorities have yet to demonstrate any concerted effort to manage coronavirus-related medical waste safely, despite the Covid-19 pandemic wreaking havoc across Bangladesh. Every day, hundreds of tons of medical waste are generated across the country, but medical waste management is unchanged and has not been adjusted to account for the pandemic. We cannot deny the importance of personal protective equipment in combating the pandemic, but a new level of medical waste pollution is endangering the lives of humans and animals. The government should formulate strengthen regulations to dispose and management of medical wastes without any delay.

**The Effect of the Personal Protective Equipment waste during COVID-19**

Bangladesh's government has declared a nationwide lockdown beginning March 26, 2020. Using PPE in public places became mandatory and enforced in late May as a non-pharmaceutical preventive measure to limit the spread of the virus, with the decision to ease so-called lockdown, except in the education sector (Ahmed and Yunus, 2020). People in Bangaladesh became very anxious and concerned as the global COVID-19 mortality rate increased (Islam *et al.,* 2020). The rising global infection rate has resulted in before April, there was widespread public use of PPE, but when the lockdown was lifted in late April, In July, the usage rate fell. The second wave of Covid arrived in Bangladesh at the end of February 2021, and people began wearing masks again due to the law enforcement agencies' strong instructions. Because there is currently no waste management mechanism in Bangaladesh, the careless disposal of covid medical waste has posed an unanticipated social risk. According to a July survey, an average of 206 tons of Covid-19 waste is produced every day in Dhaka, Bangladesh's capital. According to a May survey conducted by the Environment and Social Development Organization, at least 14,500 tons of waste were generated in Bangladesh in April. Among the items discarded were used gloves, masks, sanitizer containers, and polythene (ESDO, 2020). However, the number of waste collectors in the capital fell by half in April. It is suspected that they became ill as a result of a covid infection. According to a survey, medical waste generated outside of Dhaka is five times that generated within the city. According to previous research, 18 percent of plastic waste is reused globally, 24 percent is burned, and 58 percent is either landfilled or finds its way into the oceanic environment (Geyer *et al.,* 2017). This scenario is also similar in Bangladesh in terms of medical waste management, particularly in the case of Covid-19 Personal Protective Equipment (PPE). The plastic components of the PPE never deteriorated totally but as it were their shape changed into littler particles. After an awfully brief journey, these little particles make contact with the human body. Toxic gases are released when these particles are burned, and children and adults inhale approximately 3223 microparticles each year (Sharareh, Farid and Razegheh, 2017). To ensure the safety of hospital doctors, nurses, and healthcare workers, the PPE should be discarded following standard procedures in the doffing room, followed by removal and storage in a sealed box or biosafety bags. The COVID-19 waste bags are then moved to on-site storage. The PPE and other medical wastes are collected from the in-house storage in open drums by an NGO called PRISM Bangladesh Foundation and transported to the Matuail Landfill station in Dhaka South City Corporation (DSCC) for final disposal. This is the only option for hospital waste management in Dhaka (PRISM Bangladesh Foundation). Unfortunately, these disposal facilities are not available in many rural, urban, and semi-urban hospitals. Many hospitals and clinics either burn or mix medical waste with regular city garbage cans in their backyards. Used PPE, masks, and gloves, as well as other COVID-19 wastes, were discarded among household bins in residential areas, endangering the health and safety of waste collectors. The

used PPE wastes could be equally hazardous to one's health and infectious, and they were not labeled. Waste collectors' occupational health and safety concerns are completely ignored. Additionally, if medical waste is not properly disposed of, it may endanger the biodiversity of Bangladesh's riverine ecosystems as well as the marine ecosystem of the Bay of Bengal. (Dhaka Tribune, 2020; The Guardian 2020). The degradation rate of the PPE is slow in comparison to similar components due to its limited photooxidation and decreased light intensity capacity (Lattin *et al.,* 2004). Previously, researchers discovered microplastics (MPs) in the guts of various aquatic organisms (Teuten *et al.,* 2007). Researchers have even found it in the stomachs of several commercial fishes (Adeogun *et al.,* 2020). Microplastics (MPs) are being transmitted back to the terrestrial ecosystem by predatory birds, and humans are occasionally consuming them through seafood (Eerkes-Medrano *et al.,* 2015). Several fish, mammals, birds, and reptiles will become entangled in, and possibly consume, the soaked face masks (Caron *et al.,* 2018; Castro-Jiménez *et al.,* 2019; Gall and Thompson, 2015). The PPE or its fragments could obstruct the swimming of large and small aquatic species, as well as causing sudden suffocation by clogging their respiratory systems (Kögel *et al.,* 2020). The formation of biofilms in the plastisphere by plastic particles has the potential to degrade water and soil quality (Kirstein *et al.,* 2019).

**Existing Legal Framework for Managing Medical Waste**

The government adopted the "Medical Waste (management and processing) Rules" in 2008. The rules established an appellate authority, a licensing authority, and an advisory committee for issuing licenses, monitor waste management and punish rule violations (The Medical Waste Management Rules, 2008). However, only one organization has been granted a license to collect and manage medical waste following the rules. This rule applies to institutional waste management, but when a specific piece of media is used on a large scale by the public, it does not define individual responsibility. That is because, for the first time in Bangladesh and around the world, surgical masks, a type of medical equipment, are being used by the general public in such large numbers and regularly. As a result, all committees and authorities established by the rules are effectively irrelevant and redundant. Because no responsibilities or duties are specified for health institutions, hospitals, clinics, diagnostic centers, city corporations, and municipalities are not held accountable under the rules. Furthermore, waste management by city corporations and municipalities violates the rules (Mehedi, 2020). Rule 8 of the Medical Waste Management and Processing Rules provides for the establishment of dumping zones in seven divisions (The Medical Waste Management Rules, 2008). It is extremely concerning that Dhaka has only one specialized dumping ground, which is insufficient for the city's hospitals and medical institutions. Although Rule No. 3 calls for the establishment of seven divisional authorities in each of Bangladesh's seven divisions to oversee the management and disposal of medical waste. The Rule required such divisional authorities to be established within three months of the Rules' enactment, but these divisional authorities have yet to be formed after 11 years of enactment. Section 269 of Bangladesh's Penal Code 1860 may be applicable with remote interpretation. According to the section "any person who neglectfully or illegally does any act, which may cause the outbreak of contagious disease and harm public health shall be punished with 6 months imprisonment or fine or both" (The Penal Code, 1860). PPE is considered a medical waste as well as a plastic product due to the nature of the components. The Bangladesh Environmental Conservation Act prohibits the manufacture, use, or disposal of polythene bags less than 55 microns thick, but other variants may be produced without restriction under Rule 6ka of Clause-5 of Section-9 of the Bangladesh Environmental Conservation Act (BECA), which was revised in 2002 (The Bangladesh Environment Conservation Act, 1995). Penalty and punishment have been provided in the event of noncompliance with the provision. In the case of production, import, and marketing, the punishment could be up to 10 years rigorous imprisonment, a fine of up to 1 million takas, or both. In the case of selling, exhibiting, storing, distributing, transporting, or using for commercial purposes, the penalty could be up to 6 months rigorous imprisonment or a fine of up to 10,000 takas, or both. Due to a lack of manpower, the Department of Environment was unable to enforce the laws governing the production, marketing, and consumption of polythene bags. This perilous situation has compelled Bangladesh's High Court Division to issue an order directing the government to take action to prohibit

the use of "single-use plastic" products in coastal areas and establishments by 2020 (Holy, 2020).

**Recommendation**

The Government has enacted the Medical Waste Management Rules in 2008 to ensure standard procedures for proper waste management systems for all medical waste but it failed to provide an appropriate, safe, and cost-effective strategy. It will be extremely difficult for Bangladesh to meet the United Nations Sustainable Development Goal of "Ensuring a Poverty-Free and Peaceful Planet Earth by 2030" unless the production of plastic-based COVID equipment is controlled and proper waste management guidelines are implemented. The following suggestions are made to address this global issue sustainably:

- The government should create an efficient waste management strategy framework to protect the environment by reducing and recycling plastic waste.
- The "Bangladesh Medical Waste Management and Processing Rules, 2008", should be revised to declare individual responsibility when disposing of both hazardous and non-hazardous waste.
- The "Bangladesh Medical Waste Management and Processing Rules, 2008", require the establishment of divisional authorities as soon as possible. Protected disposal zones must be established to address the unknown but foreseeable hazard.
- Labeling waste containers/bags, source segregation, handling, transport, and disposal must be more specific and regulated.
- A lack of adequate practical training for various levels of healthcare staff, including cleaners, waste handlers, nurses, doctors, management personnel, and maintenance personnel, exists. All stakeholders should receive proper training.
- During an emergency or global crisis, the Bangladesh Environment Conservation Act, 1995, should be revised to reflect the society's changing needs and the necessity for using or disposing of polythene-based products.
- Consumers should be made aware of the importance of disposing of PPE in their homes. For safety disposal, a level of warning should be included in both the package and on the PPE.
- The "eco-friendly" 3D filament, green polymers, or wood fibers are sustainable alternatives to plastic polymer-based PPE. Reusable cloth masks are inexpensive, effective at preventing disease spread, and environmentally friendly for the general public.

## Conclusion

It is critical to remember that medical or PPE waste management during an infectious pandemic should be treated as an emergency and handled as soon as possible. However, because Bangladesh lacks adequate incineration facilities, disposing of PPE waste from hospitals and residential areas remains a major challenge. Furthermore, as oil prices fell and consumer demand for personal protection increased, the global use of single-use plastics increased significantly. This has reduced the likelihood of recycling and increased the amount of plastic waste generated. (Zambrano-Monserrate *et al.,* 2020). Furthermore, there is a risky and unhealthy practice of ragpickers and waste collectors illegally reselling used masks and PPE in the local market. This dangerous practice must be stopped and dealt with by law enforcement. We must equip our medical waste management system and overcome the challenges listed above. The Bangladesh Medical Waste Management and Processing Rules 2008 must be implemented and updated throughout the country. The disparity in residential and hospital PPE waste management in rural and urban areas must be addressed by the updated guidelines. The COVID-19 pandemic can be used to strengthen the capacity of medical waste management. Waste management operators and collectors can receive specialized training in occupational health and safety protocols for safe waste collection and management. A public awareness campaign can be planned to encourage rural and urban residential PPE users to dispose of their used PPE and masks in a labeled bag while adhering to proper safety protocols. The relevant ministry and authority may consider establishing high-capacity incineration facilities in various parts of the country for medical PPE waste management and residential PPE waste management. To improve the capacity of hazardous medical waste management, city corporations, waste management authorities, the Ministry of Health and Family Welfare, and the Department of Environment should collaborate.

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