



Households' Waste Scenario during COVID-19 Pandemic: An Outlook from Bangladesh

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Short Communication

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ABSTRACT

With pandemic progression and the stay-at-home situation, household are producing more dangerous medical waste. Households became the most vulnerable and unprotected sector of coronavirus transmission due to the unconsciousness and lack of guidance of hazardous waste management. Therefore, waste management is a critical concern to public health. This study examines household waste generation and waste management issues in Bangladesh during COVID-19 from March 2020 to August 2021. The study showed that adequate identification, collection, transportation, processing, separation, and disposal are the challenges of safe waste management. Each activity bears a high risk of getting infected because of lack of proper guidance and protection. Moreover, the improper disposal of hazardous waste causes immense soil, water and air pollution that might have negative effects to the human body. Some suggested guidelines to a better COVID-19 household's waste management are discussed in the context of Bangladesh.

Keywords: Household transmission; coronavirus; hazardous waste; waste management; health risk.

1. INTRODUCTION

The novel coronavirus disease 2019 (COVID-19) is a contagious disease triggered by the pathogen SARS-CoV-2, which became a global worst health crisis for its rapid spread across the world [1]. Bangladesh reported the first case of COVID-19 on March 8, 2020, and as of August 18, 2021, a total of 1,433,396 confirmed cases and 24,547 deaths are reported [2]. The outbreaks increase people's health risk for being unconsciousness of sanitation and hygienic conditions. Various safety measures like stay-at-home, travel restriction, social distance, quarantine, self-isolation, among others made the household sector more exposed to coronavirus transmission due to lack of awareness [3,4].

According to the pandemic progression in Bangladesh, the amount of hazardous waste used by households increased tremendously. As the number of patients increase, the quantity of using masks, hand gloves, facial tissues, hand sanitizer bottles, goggles or face shields, gauze pieces, saline bags, medicines, and many other items also increases for the protection from COVID-19.

Waste disposal practices are critical in preventing COVID-19 spread [3]. A study revealed that in the first month of official lockdown, about 14,500 tons of hazardous medical waste was generated which is equivalent to over 43000 tons of waste in Bangladesh [5]. Another study reported that from March 8 to November 18, 2020, a total of 13099 million face masks in the environment, equating to 392970 tons of waste per day in Bangladesh. Dhaka city (63630 tons) produced the most waste, followed by Chittagong (24086 tons), Khulna (8247 tons), Rajshahi (4302 tons), Rangpur (2108 tons), Sylhet (1456 tons), Mymensingh (1383 tons) and Barishal (1243 tons) [6]. Consequently, due to unprecedented restrictions, the essential municipality services, such as waste collection and treatment became irregular and difficult to manage. The questions arise: Are households unwittingly transmitting the infection to others and for themselves because of improper hazardous waste management? How can this increased amount of waste be properly be disposed of?

This article aims to figure out existing challenge scenarios in rural and urban areas under COVID-19 circumstances from hazardous waste generation to disposal. Due to data limitations,

we use data and information available on web platforms, news, and published articles.

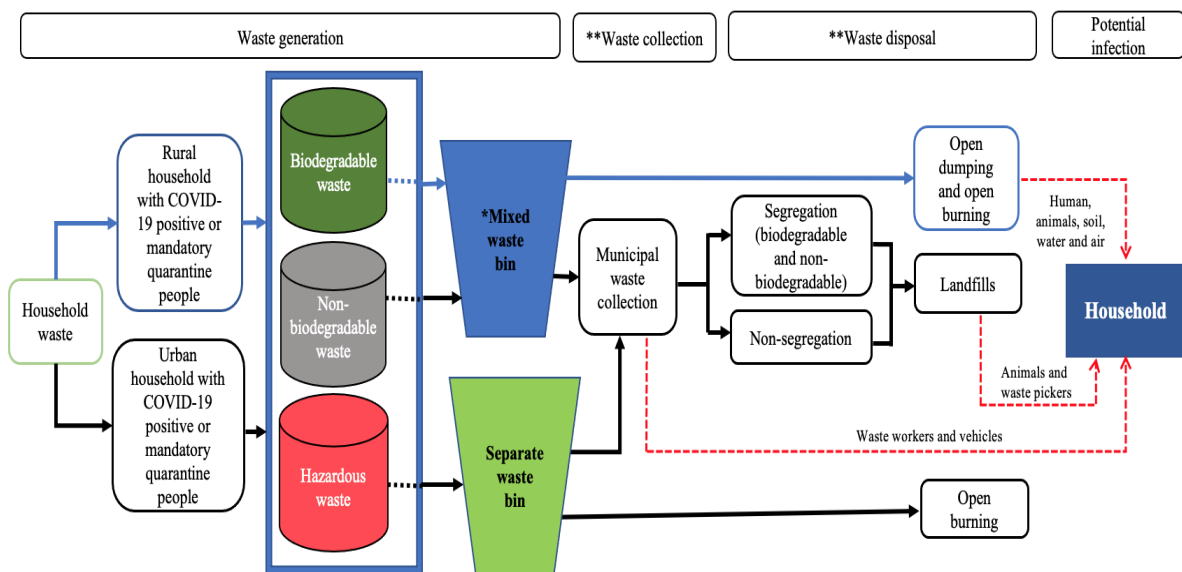
2. HOUSEHOLD'S WASTE SCENARIO DURING COVID-19

In Bangladesh, proper waste management is already a big challenge for its large population with density, unplanned settlements, and poor infrastructure [7]. The current Pandemic made the situation more critical by producing more hazardous wastes i.e. on average, 206.2 tons of Covid-19 wastes is generated per day in Dhaka city [8]. Since the covid-19 outbreak, people have been going outside wearing protective equipment (face masks, gloves, etc.) to meet daily needs and earn a living [9]. More than 50% of Bangladeshis used single-use synthetic surgical masks. Also, 30% of urban dwellers used gloves and hand sanitizers [8]. This immense quantity of infectious waste created by households and other sources is severely damaging to public health. The virus is spreading through the air or direct contact with different mediums. Data has suggested that SARS-CoV-2 remains viable for several hours to several days depending on different surfaces (Fig. 1).

In Bangladesh, the first challenge is proper waste packaging at the household level. Usually, households produce two types of waste: biodegradable and non-biodegradable (Fig. 2). In the pandemic, a household with COVID-19 positive cases or people in home quarantine produces hazardous waste related to disease management. Medical masks, tissues, and gloves have increased household trash during this pandemic [13]. There is a significant association between inefficient household waste management and corona virus outbreaks [14-16]. Direct contact with contaminated objects/surfaces and contact with airborne droplets are the main potential infection and exposure routes during the waste management phases [17-20]. Most households are unaware of the World Health Organization (WHO) waste management guidelines and mix hazardous waste with domestic garbage. A survey by ESDO [5] found that about 55.6% of surveyed people have not received any instructions or guidance from the Health Service Division on the handling of hazardous waste and the remaining 44.4% have gained a few sorts of instructions. A nationwide survey revealed that approximately 50% of respondents keep masks, gloves, and tissue at home alongside other household waste, increasing the risk of further transmission of the COVID-19 infection [3].

Medium/Surface	Lifespan
 Surgical mask	up to 7 days
 Tissue paper	3 hours
 Cloth	2 days
 Cardboard	24 hours
 Paper	3 hours
 Plastic	3-7 days
 Stainless steel	2-3 days
 Copper	4 hours
 Aluminum	2-8 hours
 Ceramics	5 days
 Glass	4 days
 Wood	4 days
 Solid faeces	3-4 days
 Air	3 hours

Fig. 1. The lifespan of SARS-CoV-2 on a different medium
Sources: [10, 11, 12]



*Household risk zone: Use of mixed waste bin.

**Community risk zone: Municipal waste collection to disposal. During this process, non-infected household waste becomes mixed with infected households in urban areas.

Fig. 2. Infection pathways for health risk from household hazardous waste during COVID-19

In the urban area, most households dispose of hazardous waste in the common trash bins and give it to the municipal waste collector instead of packing it in airtight bags and disposing of separately. According to ESDO [5], about 49% of respondents discarded coronavirus waste along with other household waste in the same bins, and another 49% placed it in different bins. Often, urban residence practice open dumping at roadsides, adjacent open spaces of buildings, and open burning without any safety measures. In rural areas, without access to formal waste collection services, households either throw away or burn all kinds of waste in their backyards [3] or open spaces, which increases the risk of disease infection.

The next challenge is the waste collection process and the safety of waste collectors. In 2020, approximately 40,000 informal waste and sanitation workers across the country were at high risk of becoming infected while collecting waste from door to door [6]. It is reported that, about 50% of the informal waste collectors were reduced due to the concern of contamination [5]. The remaining workers do not maintain health safety standards such as wearing masks, gloves, and face shields, because of no or limited supply by government authorities or workers lacking money to buy PPE [21]. As a result, they are directly exposed to the virus during the collection, handling, and transportation of hazardous wastes. If they get infected, they may spread the virus along the entire route they visit over the working day.

There are no separate hazardous waste collection vehicles from the municipality. Without regular sanitizing facilities, the waste collection vehicle is another source of disease transmission. People who handle the vehicles including drivers may have the probability of exposure to a coronavirus. Another probable risk carrier is the people involved in the segregation of mixed waste employed by the municipality. As they come to direct contact with hazardous waste from the household level, there is a direct potential for contamination.

The third challenge comes from the improper disposal of hazardous waste which causes immense environmental pollution. The country has not yet been able to establish sustainable municipal solid waste management [22]. Without

following the proper disposal procedure, solid waste is dumped into an open place or landfill even without segregation. The infectious waste may come into contact with a human again in four different ways: through waste pickers (people who make their living on sorting, collecting, and selling trash), by animals and birds (e.g. dogs, cats, crows, etc.), through the air, and affecting foods supply through mixing with soil and through rainwater drainage.

Therefore, it is an infection circle (household-via-household) showing the importance of the proper and safe collection, treat and disposal of household hazardous waste during the pandemic. Consider the following, even after a year, there has been no response to this grave issue.

3. GUIDELINES FOR POTENTIAL WASTE MANAGEMENT

The best option for disposal of medical waste is incineration and autoclave method. The autoclave method may be used for masks before final disposal. But, as Bangladesh has no such good facilities [23], effective management of households' contagious waste is crucial. It requires proper planning from waste generation to disposal, keeping personnel protection in each step to curb the spread of COVID-19 and minimize the health risk (Fig. 3). By following WHO guidelines, hazardous waste should be kept in a separate airtight bag with a proper labelling of date and wait for at least 72 hours for disposal. A massive campaign about infectious waste management is a must-do action from the public to private authorities. The public should be informed through mass media, by announcing from the administration level, displaying waste management boards at the focal points such as roads, mosques, markets, and hospitals. The local administration should strongly monitor the home quarantined household's waste management. In rural areas, burning in a safe place is an emerging suitable solution for hazardous waste although environmentally unfriendly. Urban residents should discard the waste to the municipal bins rather than open spaces. The municipality should provide hazardous bins at the public points and ensure proper disposal of hazardous wastes.

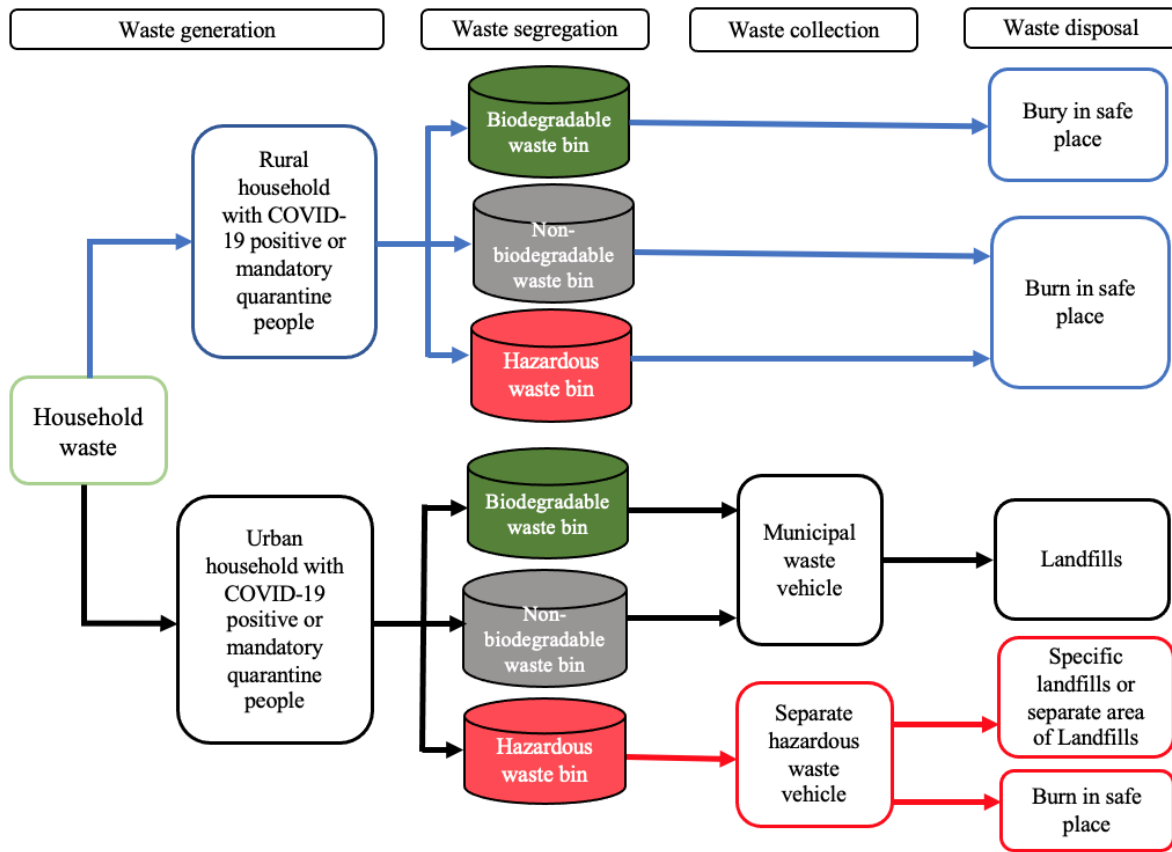


Fig. 3. Current recommendations for household waste management during the COVID-19

To prevent the rapid spread of coronavirus, local government or municipality staffs need to take series of protection and safety measures considering the health threats of both informal and regular municipal waste collectors such as: a) ensure the availability of professional clothing and protective equipment for staff, b) reduce the number of collectors and the frequency of waste collection per area so that the waste collection continues in all areas despite labor shortage, c) organize training on handling hazardous waste from source to storage among waste workers, d) open a new chamber/room of disinfection where workers' hygiene standards will be maintained after coming from works, e) check the temperature of waste collectors before and after work, f) ensure compulsory wearing of essential protective equipment by all municipal staff involved in waste management, g) inform workers to keep a minimum distance (3 feet) and avoid any direct contact while collecting waste, h) after every trip, disinfect waste collecting vehicles, i) carry the garbage of infectious households in a separate vehicle, and j) establish a monitoring and verification team for checking

each activity of the staff to ensure strict adherence to enhanced hygiene standards.

After safe handling, disposal of waste is most essential to reduce risks of coronavirus contamination. All municipal waste should be dumped immediately in the landfill sites. In landfill sites, the infectious waste should be properly and carefully be disposed of in a selected place straightaway to avoid contact with humans or animals. The collection of used masks and other safety equipment by rag-pickers and waste collectors is another dangerous practice who resell it in the local market illegally [23]. This unhealthy practice should be stopped immediately.

Considering the current situation, there is an urgent need for increased management and security of the disposal sites to prevent environmental effluence. In the long run, the government should take initiatives for sustainable waste management, such as thermal treatment, biological treatment, landfilling with energy recovery, and recycling [22].

4. CONCLUSION

Households mix Covid-19-related waste with other household waste due to a lack of waste management knowledge and services. Although this poses a risk of viral transmission, no action has been taken, even after a year. This study is a prospective scenario of household hazardous waste generation to possible management guidelines throughout the pandemic period. If household waste is not handled properly, the spread of COVID-19 will escalate with the secondary transmission, which has been obvious since March in increasing cases. Hence, active collaboration between the public and private sectors is essential to minimize the spread and adverse impact of COVID-19 on public health together with underpinning the long-term welfare of the citizens.

Considering the immediate impact of household health risk, sound and sustainable further study in pollution-free planning are required of hazardous waste reduction, treatment, and disposal. In the context of the current pandemic, this paper shows that there is the potential scope of comprehensive household waste management research by assessing the future trends in the waste production, development and dissemination of low-cost technology, alleviation of environmental risk through waste-minimization, suggestions for short- and long-term waste management solutions.

AVAILABILITY OF DATA AND MATERIAL

The data that support the findings of this study are openly available and given as the reference section.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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