

# Personal Protective Equipements usage and its disposal by the residents of Dhaka city during the COVID-19 pandemic: a mixed method enquiry

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## Research Article

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# Abstract

Context: COVID-19 has caused unprecedented hazard not only to the health and economy but also to the environment worldwide. In absence of an effective vaccine to the mass people, practice of preventive measures against coronavirus can only save the health and economy of a poor nation like Bangladesh. In one hand, poor practice of protective behavior against the novel coronavirus has been reported among the general population and on the other hand, sudden rise of Personal Protective Equipements (PPEs) use are causing massive damage to the environment of the cities like Dhaka.

Aims: This study aims to understand the perception and practice of use and disposal of PPEs against COVID-19 by the residents of Dhaka city. Methods and Material: A cross-sectional study was designed with a mixed method approach with an online survey and key informant interviews of the residents of Dhaka city

Results: About 44% respondents were regular mask users and 3% used gloves regularly while staying out of home. Confusion, discomfort, hot weather and unaffordability were commonly reasoned for not regular use. About 40% of the respondents disposed their used masks or gloves to open places in the streets at some point of their life during the pandemic. Lack of proper disposal facilities in the city was evident throughout the study.

Conclusions: A proper health education program along with government initiatives enhancing disposal facilities around the city can improve the situation.

## Key Messages

A comprehensive multi-sectoral approach is needed to combat COVID-19 in Bangladesh with emphasis on infrastructural development to manage biomedical wastes. Health promotion programs should not only educate people about importance of PPEs against COVID-19, but also their proper disposal.

## Introduction

Soon after the birth of COVID-19 in China, it spread like a wildfire and World Health Organization (WHO) declared a pandemic within a short time.<sup>[1]</sup> Till now the disease has infected millions of people around the world, taken huge death toll around the world and the counts are still going on. Not only health but the economy of the world is also in a staggering situation and Bangladesh is no exception.<sup>[2]</sup> Soon after the inception of COVID-19, a sudden burst of cases was reported in China and rest of the world following few initial cases.<sup>[3]</sup> Soon studies confirmed the human-to-human transmission of the virus and travel instructions were imposed around the world.<sup>[4],[5]</sup>

The first case of COVID-19 appeared in Bangladesh on 8<sup>th</sup> March, 2020 and within few weeks, cases started to emerge all around the country.<sup>[6]</sup> No doubt the novel coronavirus got the entry into Bangladesh through the biggest international airport at the capital city of Dhaka. As of 14<sup>th</sup> December, Dhaka division

reported highest number of cases.<sup>[7]</sup> As the industrialization and production houses are still highly centralized in the capital city of Bangladesh, the Dhaka city is highly vulnerable to this situation with its high population density. Soon after the detection of its first, the Government of Bangladesh took preventive and restrictive measures with screening at airports, lockdowns and mandatory use of masks for people leaving home.<sup>[8]</sup>

However, considering the poor economy and job security of the people, government showed leniency over economic activities while promoting respiratory hygiene practices and social distancing. Although some effective vaccines have arrived, preparation of proper cold chain storing, transporting and distributing the mRNA vaccine to the 180 million population is the challenges ahead and might take a long duration.<sup>[9]</sup> In such situation, centuries old concept of public health- personal hygiene, etiquette, social distancing etc can save the community and the country. However, reluctance in use of PPEs has been significantly reported across the country especially in Dhaka.<sup>[10]</sup>

Not only did COVID-19 damage health and economy around the world, but also serious environmental hazard by sudden rise of use of personal protective equipment (PPEs).<sup>[11]</sup> Bangladesh being positioned at 162<sup>nd</sup> rank out of 180 in Environmental Performance Index [12], is hardly hit by the sudden outburst of medical waste generation.<sup>[13]</sup> The capital of Dhaka could be the worst scenario with its highest population density in the country. Around 206 tonnes of medical waste are generated per day in Dhaka city because of COVID-19.<sup>[14]</sup> However, there is no proper execution of medical waste management rule in Bangladesh and the National Preparedness and Response Plan for COVID-19 failed to address the residential and hospital waste management issue.<sup>[15]</sup> This study is first of its kind providing an insight into the preventive healthy practice of using PPEs against COVID-19 and their disposal by the urban residents of Dhaka city.

## Methods And Materials

A cross-sectional mixed method study was designed consisting of a quantitative online survey and in-depth interviews (IDIs) for qualitative data. Both qualitative and quantitative data were collected concurrently, and used to describe the PPE usage and its disposal by the respondents in support of each other. The study was conducted in between August to October of 2020.

For the online survey, a questionnaire was developed following literature review on the present crisis. The questionnaire was pretested with handful of residents of Dhaka city to check the meaningfulness and clarity of responses. A brief description was given about research objectives at the beginning of the questionnaire with proper consent. Authors' network with residents of Dhaka city were used for the final online survey using a structured questionnaire circulated via shareable link connected to Google form with email verification. To get respondents from wider social groups, a 10-member research team was formed who shared the survey link in social platforms like Facebook, Messenger, WhatsApp and LinkedIn

considering respondents from different age, occupation, education and area of residency. About 650 respondents were approached, among them 638 participated in the survey.

Ten IDIs were taken over phone using an IDI-guideline. The key informants were recruited from different social strata. The conversations were recorded with prior permission and transcribed for subsequent data analysis. Thematic analysis was done and the findings were triangulated with quantitative findings for better validity.

## Results

Among the 638 respondents took part in the online questionnaire survey, 608 responses were included for analysis after the excluding the responses for healthcare worker and incomplete responses. From the final sample, about 60% of the respondents were male and rest were female. Majority respondents (65.95%) were in the age group 18-25 years, followed by respondents from 26-35 years (30.59%), and rest were above 36 years. The majority of the respondents completed higher secondary (57.45%), followed by 32% having a bachelor degree or above and rest had primary education completed. More than 1/3<sup>rd</sup> of the respondents were students, about 27% were businessmen, around 7% were housewives and rest were involved in other occupations (**Table 1**).

Less than half of the respondents (44.25%) were regular in using mask while going out of home and rest were irregular in using mask. More than 2/3<sup>rd</sup> of the respondents never washed hands with sanitizer/soap before and after using masks, and rests were irregular with the etiquette. Only about 3% were regular in using gloves while going out of their homes whereas just about less than 1/4<sup>th</sup> of the respondents rarely used or never used gloves (**Table 2**). Mean weekly number of masks needed by the respondents was 2.69 and majority needed 2-3 masks weekly on average. Mean weekly number of gloves required by the respondents was 1.2 and majority required 1-2 gloves weekly on average. Key informant interviews revealed mixed attitudes, confusion, ignorance and reluctance in using masks even among the educated people. Discomfort, hot weather, unaffordability and not a scientifically proved method were commonly reasoned by the majority key informants for not using mask regularly. One of the graduate students from an educational institute of Dhaka city said-

“Wearing mask could be unhealthy and unnatural. It can harm your body due to lack of oxygen, especially among the people with asthma. However, health experts are not discussing these things. Even in China, it's not a law to wear masks all the time.”

In another key informant interview, a job holder in a private company in Dhaka city stated-

“Majority people don't use masks even after imposition of a law with fines, many don't know the proper way to use. Everybody keeps their nose open with a hanging mask over their mouth. Everybody remove their masks while coughing and sneezing, so it is meaningless. People are like wearing masks outside and remove it when entering shops and offices.”

About 2/3<sup>rd</sup> of the respondents used medical mask and 1/3 respondent used cloth masks. However, contrasting information was revealed through key informant interviews. A cloth mask was preferred over surgical mask, as it is more comfortable in a hot and humid weather, can be reused after washing. Many times, surgical masks were also reused many days before disposal. A middle-aged housemaid said-

“I am using this cloth mask for many days. Often, I clean it with soap water and dry in sunlight.”

About the disposal of the PPEs, more than 90% of the respondents disposed the used PPEs at their house, about half of the respondents informed that they disposed the used PPEs at their workplaces and around 40% of them disposed on open places in the streets (**Table 2**). About 47% the respondents always disposed the used PPEs in the nearby dustbins, whereas majority disposed often in open places and few of them always disposed the used PPEs in open places. About 2/3<sup>rd</sup> of the respondent disposed the used PPEs along the normal garbage, and about 1/3<sup>rd</sup> among them disposed in a plastic bag. The majority respondents (58.21%) perceived that the inappropriate disposal of COVID-19 masks and gloves was considerably alarming and about 23% anticipated the situation highly alarming; whereas about 1/4<sup>th</sup> believed the situation was under control. Qualitative finding suggested similar finding too. Sewage and drainage system at many places had been reported to be clogged by the COVID-19 masks and gloves, and the used PPEs could be easily seen here and there. Lack of awareness and adequate roadside dustbins were reasoned for the situation. A waste handling worker said-

“Countless masks and gloves are in the streets and we don’t have adequate safety while picking wates. Many of my co-workers have been affected by this corona disease.”

Majority respondents (55.39%) didn’t have proper facility of dustbins to dispose the used PPEs at their workplace. Key informant interviews further revealed, although there were existing dustbins in the offices or other work places but no special initiative had yet been taken to dispose these highly infectious items separately from general garbage.

## Discussion

This cross-sectional study found poor practice and perception of usage and disposal of PPEs in general among the residents of Dhaka city during the pandemic. Majority respondents were reluctant in regular use of masks and gloves, and the reason could be attributed to poor perception about the matter and confusion. The study further portrayed poor disposal facilities in the city regarding disposal of these highly infectious items and in many instances, respondents disposed their used PPEs in open places.

This study indicates lack of awareness and knowledge regarding protective role of PPEs against COVID-19. In spite of imposition law against the non-users of masks, majority people can be seen without masks in the streets. This suggests a proper health promotion program can be more beneficial than stricter laws. Moreover, reluctances in government indications at the beginning of the pandemic can also be attributed to the current confusion.<sup>[16]</sup>

Multiple sites of disposal of used PPEs were found in this study. About 40% of the respondents disposed their used PPEs in open places in the streets at some point of their life and majority respondents perceived the situation to be alarming. A news article reported similar findings- piling up of COVID-19 medical wastes like masks and gloves in the streets of Dhaka city during the pandemic can cause severe threat to the environment in Dhaka clogging water drainage system with contaminating water bodies with the monsoon around.<sup>[17]</sup> This poses further threat to the pandemic situation as the new coronavirus can survive on inanimate objects for longer duration.

Dhaka has already been struggling hard with the proper management of its medical wastes,<sup>[18]</sup> and the current pandemic situation has put huge burden to the existing situation. This study found waste handling workers were at high risk in this situation. Studies have found higher risk of being exposed to the airborne microbes (Kiviranta et al, 1999), and higher prevalence of respiratory symptoms and decrease of lung function among the waste handling workers.<sup>[19],[20]</sup>

This study shed lights further into the institutional factors related to the inappropriate waste disposal. Lack of special disposal facilities for highly infectious COVID-19 medical wastes at the workplaces and inadequate number of street dustbins were revealed in this study. Even at home COVID-19 masks/gloves were disposed along with household wastes. Majority workplaces didn't have any special disposal arrangement for disposal of these medical masks as reported by the respondents.

This cross-sectional study was primarily designed to understand the behaviour of the residents of Dhaka city regarding usage and disposal of the PPEs during the pandemic and results should be interpreted considering its limitations. Respondents were not randomly selected limiting the generalizability, but recruitment of respondents was contemplated for a wider mass. Moreover, the study is purely descriptive in nature and no causal relation could be plotted, but the mixed method approach provides a stronger view and validity. Yet another potential bias could be the reporting bias because of the online nature of the survey.

## Conclusion

To conclude this study found the existing misconception and poor practice regarding the use of PPEs against COVID-19 among the urban residents of Bangladesh. However, the sudden surge in PPE-use caused significant effect on the urban environment. No doubt, the existing infrastructure is insufficient to cope with this unforeseen efflux along with lack of awareness regarding disposal of the used PPEs among the mass. The overall scenario can have a positive feedback effect on the pandemic along with other long-term environmental hazards. This is high time the government should take a comprehensive multi-sectoral approach to stop this pandemic.

## Declarations

**Competing interests:** The authors declare no competing interest.

Author confirms consent from participants.

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## Tables

**Table 1. Distribution of the respondents by socio-demographic characteristics**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>Gender</b>		
Male	365	60.23
Female	241	39.7
<b>Age (years)</b>		
18 - 25	401	65.95
26 - 35	186	30.59
36 and above	21	3.46
<b>Educational status</b>		
Primary	66	10.93
Secondary	347	57.45
Honors	191	31.62
<b>Profession</b>		
Job	101	16.78
Business/self-dependent	165	27.41
House Wife	44	7.31
Student	220	36.54
Others	72	11.96

**Table 2. Distribution of the respondents by pattern of use and disposal of PPEs**

<b>Variables</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>Frequency of use of masks when outside home (n= 608)</b>		
Always	269	44.25
Sometimes	307	50.49
Rarely	32	5.26
Never	0	0
<b>Types of mask use (n= 607)</b>		
Medical mask	398	65.57
Cloth mask	209	34.43
<b>Frequency of use of gloves when outside home (n= 608)</b>		
Always	18	2.98
Sometimes	146	24.17
Rarely	309	51.16
Never	131	21.69
<b>Disposal place of used PPEs (masks/gloves) (n=597)</b>		
Home	547	91.62
Work place	283	47.40
Open in the streets	241	40.36
<b>*Multiple response</b>		