COVID-19, Climate Change and Challenges: Bangladesh Perspective to Fight against the Pandemic Condition

Abu Taher Muhammad Abdullah¹, Israt Jahan²

¹Additional Superintendent of Police, District Police, Thakurgaon, Bangladesh, Studied MA Criminology, School of Sociology and Social Policy, University of Nottingham, UK
²MA Digital Media, School of Computing and Digital Media, London Metropolitan University, UK

Abstract: This study investigated the impacts of COVID-19 and climate change, and the challenges of these events from Bangladesh's perspective with the qualitative method of research. Thematic analysis followed for synthesizing data collected from secondary sources. The total number of deaths found in Bangladesh 4,881 (1.4%), whereas 943,433 (4%) deaths found globally from COVID-19 disease. The highest number of deaths in a day was 64 in Bangladesh on 30th June 2020. The maximum rate of confirmed cases from COVID-19 infection was 26.7% in people between 31-40 years of age group. Whether male represented more confirmed cases (M=72%, F=28%) and deaths (M=78%, F=22%) than female. Death tolls highest at Dhaka City in Bangladesh, estimating 1547 persons. There are 7,155 beds and 370 ICU beds for COVID-19 patients. Due to climate change effect the air of Dhaka city become unbreathable, hence, COVID-19 patients require fresh air with healthy lungs to survive. Cyclone Amphan took the lives of 31 people, affecting approximately Tk 1,100 crore damages amid the COVID-19 outbreak. Floods affected a total of 2,246,472 people in 18 districts and heavy rainfall rampaged Rohingya camps in Cox's Bazar. Predominantly, challenges encountered from COVID-19 and climate change are more population; lack of 'testing, tracing and isolating', 'Health Care Services', coordination and awareness; difficulty in policing and management of Rohingyas, natural calamities, and transport bans. However, this research is not beyond the limitation of empirical observation which will be a future endeavor in the field.

Keywords: COVID-19, climate change, challenges, Bangladesh, social distancing

I. INTRODUCTION

COVID-19 pandemic outbreak is a pressing concern for every government in the world which turns it into a global crisis. This coronavirus disease caused huge confirmed cases and deaths, resulting in 213 countries affected (WHO, 2020a). It has triggered unprecedented behavioral changes as global norms which confined people and induced them to maintain social distancing (Manzanedo and Manning, 2020). While this crisis has affected all spheres of life and work and impacted the global economy tremendously. Also, this crisis offers insights on the global climate crisis, as there are many parallels between the COVID-19 crisis and the imminent global climate emergency. COVID-19 and global climate change are interlinked, and proper understanding of these linkages would be crucial for consumers, companies, and societies to a great extent (Mende and Misra, 2020). Global responses to fight COVID-19 have ameliorated climate change parameters-emissions, air, or water quality. But global climate change expedites the effects of COVID-19 in a way where public and environmental health are intertwined, and this connects from the vulnerable to the wealthy. As this infectious disease is zoonotic-spread from animal to human-COVID-19 demonstrates its severity (Jones et al., 2020). However, this pandemic creates an opportunity to learn and to mitigate future calamities by recognizing the correlation between COVID-19 and global climate change (Mende and Misra, 2020).

Bangladesh, a South Asian country with an emerging economy, has encountered a demographic and epidemiological transition with its rapid urbanization and an increase in life expectancy gradually (Mohiuddin, 2020). It estimated 160 million people, securing the seventh most populous country in the world, expecting to be doubled by 2050 (Islam and Kibria, 2020). Bangladesh has identified the first coronavirus disease case on 8th March 2020. It has followed the guidelines of the World Health Organization (WHO), including handwashing, sanitation, physical distancing, and home quarantine. While it was challenging to prevent the spread of this pandemic due to ‘congestion, inadequate water supply, poor sanitation facilities, poverty and lack of awareness’ (Islam and Kibria, 2020). Besides, Bangladesh is not beyond the global threats of climate change, which is the consequence of global warming, connecting with tropical cyclones (Pawlowski, 2020). Amid worldwide quarantine in this COVID-19 pandemic, super cyclone Amphan struck Bangladesh on 20th May 2020. This cyclone was the most devastating while millions of people need help since the Covid-19 pandemic has still existed in the country (ibid:11). Whereas the country has just 127,000 hospital beds of which 91,000 of them in government-run hospitals (Mohiuddin, 2020). Its economy is losing BDT 33 billion every day from its service and agriculture sectors during the nationwide lockdown. However, there are very little researches regarding COVID-19, climate change, and challenges from COVID-19 and climate change in Bangladesh. The current research will have an insight into the
impacts of COVID-19 and climate change and the challenges from these events on Bangladesh’s perspectives.

II. LITERATURE REVIEW

The current global health threat is the ongoing pandemic of the respiratory disease that was recently given the name coronavirus disease 2019 (Covid-19) (Fauci et al., 2020). Covid-19 was recognized in December 2019, showing to be caused by a novel coronavirus (SARS-CoV-2), relating to the virus that causes severe acute respiratory syndrome (SARS). Importantly, ‘the Covid-19 outbreak has posed critical challenges for the public health, research, and medical communities’ other than SARS (2002-2003) and the Middle East respiratory syndrome (MERS) from 2012 till to date. While COVID-19 was reported in Wuhan, Hubei Province, China (Zu et al., 2020). Subsequently, infections spread across China and other countries around the world. Then, the Chinese public health, clinical, and scientific communities recognized ‘the new virus and shared the viral gene sequence to the world’. Notably, WHO declared the outbreak a Public Health Emergency of International Concern on January 30, 2020. Later on, WHO named the disease caused by the novel coronavirus “coronavirus disease 2019” (COVID-19) on February 12, 2020 (Zu et al., 2020: E15). Complete viral genome analysis revealed that the virus caused the current pandemic ‘shared 88% sequence identity to two bat-derived SARS-like coronaviruses’, but differ from SARS coronavirus (Zu et al., 2020). Coronavirus evolved as ‘an enveloped and single-stranded ribonucleic acid named for its solar corona-like appearance due to 9–12-nm-long surface spikes’ (Wei et al., 2020). While four major structural proteins are encoded around the coronaviral genome on the envelope, where spike protein (S) binds to angiotensin-converting enzyme 2 receptor that intermingles ‘subsequent fusion between the envelope and host cell membranes to aid viral entry into the host cell’ (Kirchdoerfer et al., 2016; Xu et al., 2020). Also, SARS coronavirus 2 hosted in bats initially and transmitted to humans through pangolin (Lam et al., 2020) or other wild animals (Lu et al., 2020; Zhang et al., 2020), which have been sold at the Huanan Seafood Market, spreading with a mechanism of human-to-human transmission, subsequently (Zu et al., 2020). For example, ‘markets and bush-meat trade across Africa’, linked to poverty, and ensuring a nutrient diet for billions of people (Lorentzen et al., 2020:2). Lorentzen et al. (2020) argue that the destruction of the natural habitat of bats like caves, bridges, is crucial to the spread of current COVID-19 disease as this destruction pressed these bats species to live in small areas or forced to find ‘new semi-natural habitats’ close to humans’ habitat. Hence, coronavirus is transmitted from animal to human that causes the current outbreak of a pandemic. Furthermore, bats are the vector of the first spillover and outbreak of infectious diseases. However, there is a complex connection between virology, biodiversity, climate changes, poverty, food safety, and population growth (ibid.4).
Bangladesh is not beyond the attack of present worldwide pandemic outbreak of COVID-19 disease, while it has 341,056 confirmed cases with 4,802 deaths on 16th September 2020 (DGHS, 2020) after the detection of the first three cases in the country on 8th March 2020 (Chowdhury et al., 2020a). Although the Bangladesh government lifts the shutdown and re-open the economic activities, the government imposes lockdown, social distancing measures, and closure of the educational institutions. Besides, the government prohibited political, religious, social, and cultural gatherings, and canceled all state public programs, at the very beginning of the pandemic. Moreover, this pandemic condition has been bound to make a paradigm shift in ‘the healthcare delivery system’, where physicians have adopted ‘digital health solutions’, putting telemedicine at center stage, making an essential service from the optional one (Chowdhury et al., 2020b). To this end, the Bangladesh government-supported the lower-income people, providing online education facilities, arranging medical staff within a short period.

While Bangladesh is one of the most vulnerable countries in the world for climate change (Chowdhury et al., 2018). There is an ‘association of temperature, humidity, and rainfall with climate-sensitive infectious diseases in adults’ (ibid.1). For example, six diseases like malaria, diarrhea, fever, encephalitis, pneumonia, and bacterial meningitis are influenced by the climatic condition in northeastern Bangladesh. In this context, weather and climate extremes affect health, economy, and development sectors (Chowdhury et al., 2018:13). Also, heavy summer rainfall and high summer temperature with extra humidity are observed in the subtropical monsoon climate in Bangladesh regularly (Alam et al., 2020). But the average temperature in summer is 36°C–40°C, in contrast to, 8°C–15°C average winter temperature in this country (Huda et al., 2014). For these climatic situations, it was expected to confirmed cases and fatality of COVID-19 will be very low in Bangladesh during the summer season in particular (Wang et al., 2020). Although the influence of high temperature and high humidity on the transmission of COVID-19 is not clear from Bangladesh’s perspective, two mechanisms of coronavirus transmission have been identified. One is that in ‘cold temperatures’ influenza virus is more stable while ‘respiratory droplets remain airborne longer in dry air’ (Lowen and Steel, 2020). On the other hand, ‘cold and dry weather impairs mucociliary clearance, innate antiviral immunity, and tissue repair and makes them more susceptible to the virus’ (Eccles, 2020). Hence, these mechanisms are applicable for the transmission of COVID-19 (Alam et al., 2020:202).

Furthermore, the outbreaks of viral diseases are interlinked with climate changes, resource depletion, deforestation, changes in nature, farming, and industrialization (Pillai et al., 2020). Due to climate change, Bangladesh encountered various pandemic diseases like the Nipah virus (NiV)-a bat-borne pathogen. For instance, infected patients consumed raw palm sap about 30 days before the disease onset in Bangladesh, causing ‘the contamination of palm sap with secretions of NiV-infected bats’ (Luby et al., 2006). While the zoonotic outbreaks of this virus caused due to ecological, environmental, and anthropogenic factors (Belay et al., 2017). Besides, demographic, socioeconomic, and environmental heterogeneity of urban areas, climate variability has influenced the population dynamics of infectious diseases like cholera in Bangladesh (Reiner et al., 2012). There is a strong association between population density and the risk of a pandemic, with growing trends of population, and the risk of human-made disasters-climatic and disease-especially in the Global South like Bangladesh (Gholipour, 2013). The current COVID-19 pandemic is a disaster that produces immense wastage that is a burden on the environment, for example, ‘piles of cardboard packaging waste outside on the margins of a refugee camp in Bangladesh’ (Kalina and Tilley, 2020). Together with these, climate-induced disasters and infectious diseases like dengue during or after the COVID-19 condition will ‘create severe food insecurity and healthcare crisis’, and flood, cyclone, or drought may occur simultaneously, doubling the burden to the country (Bodrud-Doza et al., 2020). Therefore, poor people will suffer from food and nutritional deficiency and consequently, the country will envisage severe economic loss (ibid.10).

### III. METHODS

The current study was conducted based on the qualitative research methodology to find the extent of climate change, COVID-19, and challenges from these in Bangladesh (Kuckertz et al., 2020; Liu et al., 2020). While qualitative studies elucidate ‘ambiguous phenomena, generate rich evidence from the everyday experience, and focus on context’ (Birchall, 2014). But qualitative research is accused of lacking rigor and failing to measure up to the “cannons of positivist research”, due to its holistic and interpretive nature. However, it allows the researcher to explore meaning, interpretations, and individual experiences. Also, ‘qualitative methods transposed to a context is not yet known’ (Whitmarsh, 2009). Thus, this research tried to explore the impacts of climate change and coronavirus disease with the challenges of these in the Bangladesh context.

Underpinning on the secondary data taken from multiple published and unpublished sources, this study adopted two inter-linked components, such as documentary analysis and personal observations (Bakhshi and Chaudhary, 2020). In the documentary analysis, reports, articles, periodicals, health policy, and websites of the Ministry of Health and Family Welfare, DGHS, IEDCR, Bangladesh Police, Ministry of Public Administration, Ministry of Industries, Ministry of Home Affairs, Ministry of Foreign Affairs, Ministry of Disaster and Relief, Ministry of Forest, Environment and Climate Change, WHO, and others organizations analyzed to have insights on the extent and nature of climate change, COVID-19 and challenges from these phenomena in Bangladesh.
Bangladesh (Pierce et al., 2018). While in personal observations, the data that are already available on age, sex, underlying morbidity, place of residence, area clustering, sociodemographic factors, laboratory measures, and burden of undiagnosed disease on COVID-19 were observed for this research (Khunti et al., 2020). Subsequently, the higher observed incidence ‘associated with socioeconomic, cultural, or lifestyle factors, genetic predisposition, or pathophysiological differences in susceptibility or response to infection’ has been taken for this research. As such, the observation has been done on ‘risk of admission for acute respiratory tract infections’ (Simpson et al., 2015), ‘increased prevalence of Vitamin D deficiency’ (Martineau et al., 2017), ‘vaccination policies in their country of birth and immune effects’ (Miller et al., 2017), ‘increased inflammatory burden, and higher prevalence of cardiovascular risk factors such as insulin resistance and obesity than white populations’ (Tillin et al., 2012). Hence, ‘some of these are also risk factors for increased disease severity in covid-19’ (Li et al., 2020).

Besides, real-life scenario has been observed on social distancing, using of face mask, sanitizers, PPE (personal protective equipment), and protective behaviors of the people, while they are on the cue with policing, and relief distribution activities (Mantzari et al., 2020). Climate change phenomena have also been observed like impacts of rains in low-lying areas, ravages of cyclone Amphan, and flood-prone areas (Whitmarsh, 2009).

Thematic analysis method has been done, after carefully reviewing sources, to assess the relationship between climate change and COVID-19, and the challenges of these two phenomena in Bangladesh (Castleberry and Nolen, 2018; Son et al., 2020). For analyzing articles thematically, six steps were followed like ‘familiarizing with documents’ from the secondary sources, ‘data generating initial codes, searching for themes, reviewing themes, defining and naming themes and producing the report’ (Dowling et al., 2016; Lawless and Chen, 2018). Finally, report production has been done after reviewing of themes, defining, naming, and sub-themes creation to initiate the write up of this study (Thorne, 2000:69; Bryan et al., 2020). Few findings were produced in graphs and tabular format to show the richness of the findings (Verhoeven et al., 2020). Besides some sorts of findings were discussed elaborately to have in-depth insight of the logics that provided impacts of climate change and COVID-19 and challenges of these in Bangladesh.

IV. RESULTS AND DISCUSSION

COVID-19 scenario in Bangladesh

The comparison of the current COVID-19 scenario between Bangladesh and the World has been shown in Table 1 below as of the 18th September 2020. Globally, 315,919 cases were newly reported in the last 24 hours, while 1541 cases were reported in Bangladesh (WHO, 2020b; DGHS, 2020). Bangladesh has observed 345,805 confirmed cases in contrast to 30,055,710 cases in the world. The total number of deaths found from coronavirus in the world and Bangladesh 943,433 and 4,881 respectively. On the other hand, 22,257,376 persons recovered from the COVID-19 disease in the globe, and 252,335 persons recovered in Bangladesh. Still, as a new case of death 6,037 persons were found in the last 24 hours in comparison to 22 persons in Bangladesh. Thus, 4% of infected persons died in the world (Worldometer, 2020) while only 1.4% of the infected persons died in Bangladesh (WHO, 2020b).

In Bangladesh 1st death from coronavirus disease was reported on 21st March 2020 while globally it reported on 11th January 2020 (Figure 1). The highest number of death (64) reported in Bangladesh on the 30th June 2020 (DGHS, 2020) and in the world on the 17th April 2020 reported 12,430 (WHO, 2020b). It observed some fluctuations in death count from the very beginning of the COVID-19 till to date for both the situations. Lastly, it found 22 deaths in Bangladesh in opposition to the world condition with 6,038 deaths on 18th September 2020.

<table>
<thead>
<tr>
<th>Situation</th>
<th>Global</th>
<th>Bangladesh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases-newly reported in last 24 hours</td>
<td>315,919</td>
<td>1541</td>
</tr>
<tr>
<td>Confirmed Cases</td>
<td>30,055,710</td>
<td>345,805</td>
</tr>
<tr>
<td>Deaths</td>
<td>943,433</td>
<td>4,881</td>
</tr>
<tr>
<td>Recovered</td>
<td>22,257,376</td>
<td>252,335</td>
</tr>
<tr>
<td>Deaths-newly reported in last 24 hours</td>
<td>6,037</td>
<td>22</td>
</tr>
<tr>
<td>Death Ratio</td>
<td>4%</td>
<td>1.4%</td>
</tr>
</tbody>
</table>

*Source: Authors computation, Data collected from DGHS, 2020; WHO, 2020b; Worldometer’, 2020*
Figure 2 depicts a comparison of confirmed cases from COVID-19 between Bangladesh and the globe. Though COVID-19 confirmed case first identified on 8th March 2020 but recognized that confirmed coronavirus cases were maximum in the last six months. But globally it confirmed the COVID-19 case on the 4th January 2020. While the highest number of confirmed COVID-19 cases (316,961) found globally on the 18th September 2020 (WHO, 2020b), but the maximum case rate was 32% in Bangladesh on August 03, 2020 (DGHS, 2020). Most of the confirmed cases were found in the last three months (July-September, 2020) throughout the world. And maximum lab test was done during June-July, 2020 in Bangladesh which is around 17,500 per day.

Based on the geographical distribution of confirmed COVID-19 177993 cases of Dhaka City of the Dhaka Division among whom deaths were 1547 in persons, positioning highest in Bangladesh up to the 14th September 2020 (WHO, 2020c; Figure 4). While the least deaths were 4 persons in two districts namely Bandarban and Khagrachhari of Chattagram Division. Most of the deaths were prominent in Chattagram Division (308), Cumilla district (253), Narayanganj District (181), Bogura District (179), Sylhet District (153), Noakhali (112), and Chandpur District (106). Regarding confirmed cases, the least number were 441 in Sherpur District of Mymensingh Division. Besides, COVID-19 confirmed cases were prevalent in Chattagram District (17925), Bogura District (7212), Cumilla District (7169), Faridpur (6689), Narayanganj (6573), and Sylhet District (6217). Hence, the overall attack rate is 1,993 per 1 million in 100% (64/64) of districts.

The maximum rate of confirmed cases from COVID-19 infection was 26.7% in people between 31 and 40 years old while the minimum confirmed cases were 0.9% among older people above 80 years of age as of 14th September 2020 (WHO, 2020c; Figure 3). Other prevalent age groups of COVID-19 confirmed cases were 21 to 30 years (20.0%), 41 to 50 years (18.9%), and 51 and 60 years old (15.2%). The highest death rate was reported in the age group of 61 to 70 years old (31.2%) whereas the lowest was reported at 0.3% in the age group of 0-10 years old. The older age group of 71 and above with 27.4% and the age group between 51 and 60 years with 23.4% were the other dominant groups of death from the current coronavirus pandemic. Basically, ‘male represented 72% and 78% of the total reported confirmed COVID-19 cases and deaths respectively’, in contrast to, 28% confirmed cases and 22% deaths were among the female (WHO, 2020c).

Figure 3: Age-sex distribution of the COVID-19 confirmed cases and deaths in Bangladesh, as of 14th September 2020 (Source: Situation report - 29, WHO, 2020c)

Figure 4: Geographical distribution of confirmed COVID-19 cases, deaths and attack rate, 8th March to 14th September 2020 in Bangladesh (Source: Situation report - 29, WHO, 2020c)

Regarding the scenario of COVID-19 response in Bangladesh, it observed that there are 7,155 general beds with 2,102 admitted patients in the hospitals, as shown in Figure 5 (DGHS, 2020). While there are 370 ICU beds with 216 admitted patients occupying these beds. Also, most of the isolation beds are in Chattagram Division (1,366) and the least number of isolation beds are in Barishal Division (5). Other mostly occupying isolation bed observed Divisions are Dhaka (1,243), Sylhet (986), and Khulna (938). In terms of district-
It is evident from Figure 5 below that 47 persons were in isolation on the 25th March 2020 in the early stage of COVID-19 infections in Bangladesh (DGHS, 2020). While as of 18th September 2020, 277 persons kept in isolation as a part of the treatment process (http://103.247.238.92/webportal/pages/covid19.php). In the middle stage of infection (as of 29th March 2020), it recognized that the total number of isolations was 1028 persons which were the highest over the COVID-19 infection. Also, it was recognized from the daily bulletin of DGHS that number of patients in quarantine and released was 7,112 and 2,713 respectively on the 19th March 2020. Total number of quarantined and released patients is decreasing at a decreasing rate which are 1366 patients quarantine and 1413 patients in released on the 18th September 2020. But the quarantined and released people number were peaked at 31,079 (on 20th April 2020) and 28,548 (on 4th May 2020) respectively. Apart from these, the government prepared 588 hospitals in response to coronavirus disease with various settings like the control room (535), the medical team (565), isolation unit (493), and separate OPD (Out Patient Department) for RTI (Respiratory Tract Infection) patient (443).

In the epidemiological week 37, the number of international flights increased by 12.5%, in contrast to the previous week (week 37=99 and week 36=88), hence, the number of passengers increased by 15.5% (week 37=21,508 and week 36=18,629), as shown in Figure 7. While in the 37th week of COVID-19, 843 individuals sent to Institutional Quarantine after passenger screening at the Hazrat Shahjalal International Airport (HSIA) (WHO, 2020c). The number of passengers is increasing with some fluctuations after the lifting of lockdown. Figure 8 depicts instruction for all arriving passengers in Bangladesh in the airports (IEDCR, 2020). There are several steps in the entry checkpoint flow chart for arriving passengers in the airports in Bangladesh. First of all, ‘Health Declaration Forms & Passenger Locator Forms’ are usually distributed for filling up. The passengers must fill these forms duly and return to the designated person or immigration desk. On arrival, all passengers are scanned by a thermal scanner to identify if there is any of the passengers has any fever, he or she will be isolated to any designated hospital. Then, the ‘process for confirm diagnosis and management’ for the fever identified patient will be performed to recognize and for proper treatment. If any passenger does not have a fever, he or she will have to maintain certain instructions for the next 14 days- “Home Quarantine”, “DO NOT go outside, especially public gatherings”, “wear mask for essential outing”, and “keep hands clean”. During this period, if any passenger develops fever/cough/sore throat/breathlessness, he or she will have to ‘contact through IEDCR hotlines’ and ‘go to nearby government hospital wearing a mask’. For passengers who traveled abroad a “Health Information Card” has been designed by IEDCR for getting information on coronavirus disease infection as described in Figure 5 (IEDCR, 2020).
The World Health Organization declared the COVID-19 as a pandemic on March 11, 2020, after it was first diagnosed in Wuhan, China in December 2019 (Ross et al., 2020). While the current COVID-19 outbreak is causing a paradigm shift for our globalized world in the economic, social, cultural sector and even a religious impact. Bangladesh-a country with inadequate health care facilities-has experienced a community-level transmission at the early phase, it primarily introduced by Bangladeshi citizens, returning from Europe and the Middle East (Masrur et al., 2020). While effective associations prevail between the violation of non-pharmaceutical intervention (NPI) and the emergence of new higher-risk clusters over the post-incubation periods around Bangladesh. Whether the National Rapid Response Team of IEDCR found 26 incidents of disease outbreak in 2017. In other joint surveys of the Power and Participation Research

Figure 6: Number of isolation unit (a), number of total quarantine (b), and preparedness in different hospitals (c) in response to COVID-19 in Bangladesh (Source: DGHS, 2020)

Figure 7: International flights, a number arrived of passengers, and quarantine facility, 27 April–14 September 2020 in Bangladesh (Source: WHO, 2020c).

Figure 8: Instructions for all Arriving Passengers in Bangladesh (Source: IEDCR, 2020)

Figure 9: Health Information Card for information on coronavirus disease infection (Source: IEDCR, 2020)
Centre and BRAC Institute of Governance and Development reveals that per capita daily income drops by 80% in urban slum and rural poor for the countrywide shutdown imposed by the government to contain the spread of Covid-19. Unfortunately, 40%-50% of these populations meet daily expenses, taking loans from various sources (Mohiuddin, 2020). In other words, an economic slowdown would push a large population back into poverty. But there are four vulnerabilities concerning COVID-19 impacts- ‘the garment industry, urban slums, social exclusion, and pre-existing health conditions’ (Sakamoto et al., 2020). If some Sustainable Development Goals (SDGs) have been partly attained, people will not fear and worry about the pandemic, unemployment, and hunger.

Furthermore, ‘the WHO has given on the importance of diagnostic testing in tracking and managing COVID-19, hence, high-income economies have adopted wide-spread population testing schemes’ (Monjur and Hassan, 2020). However, Bangladesh has adopted a contrarian strategy, masking the true national spread of the virus. While the IEDCR was the only institute in Bangladesh for COVID-19 testing, but a second facility was given testing rights on March 26, 2020. For a large number of populations, a total of 1,169 ICU beds were devastated Bangladesh’s health system with multiple outbreaks. The situation worsened as the government declaring a 10-day holiday without travel restrictions from March 26 to April 5, which encouraged city dwellers to leave Dhaka to rural communities. Moreover, co-morbidity has found more than half (52.4%) patients, having hypertension (34%), diabetes (21.4%), and heart disease (9.7%) (Morshed et al., 2020). Along these, fever (78.6%), weakness (68%), and cough (44.7%) were the most common clinical traits. Other common symptoms included loss of appetite, difficulty breathing, an altered sensation of taste or smell, headache, and body ache. Remarkably, fever (78.6%), fatigue (68%), and cough (44.7%) were the most prevalent symptoms of non-critical COVID-19 patients in Bangladesh. Alternately, however, China included both critical and non-critical patients. Actions including social distancing, home quarantine, school closures, and case isolation would save ‘approximately 40.76 trillion USD globally, with social distancing accounting for 55% of the benefits’ (Yoo and Managi, 2020). To this end, amid the COVID-19 crisis, ‘the Rohingya refugees in Bangladesh are in the most vulnerable situation’ (Banik et al., 2020). As they encountered a lack of food, drinkable water, and shelter, together with limited access to health services, turning a major human disaster.

**Impacts of climate change and COVID-19 in Bangladesh**

The investigation regarding the impacts of climate change and COVID-19 in Bangladesh revealed that Dhaka—the capital city of Bangladesh—observing air pollution which becomes unbreathable in winter in particular. While people inhale thick dust and smoke in “every puff” that destroys their lungs (Kanya, 2020). This climate-changing condition is caused by emissions of carbon from brick kilns, factories and construction works, making the air toxic. In this regard, it is paradoxical that extreme breathing complexities are found in COVID-19 patients, hence, doctors are emphasizing an intact pair of lungs to survive against SARS-CoV-2. Thus, the weather in Dhaka, Bangladesh is worsening the COVID-19 woes as lungs, brains, kidneys and hearts of the citizens are in peril for the pollution. However, air quality in Dhaka remarkably improved during this COVID-19 period, feeling not sweltering in the summer afternoon like other years (Kanya, 2020). Also, sound pollution has been reduced overwhelmingly as a large number of public buses, trucks, trains, and motorbikes are suspended in the lockdown in Dhaka city (Roy, 2020). These environmental cleansing is not only evident in Bangladesh but also all over the world. It is supported by other findings that lockdown which has imposed on 26th March 2020 to restrict anthropogenic activities at the time of COVID-19 diminished reduced air pollution in Bangladesh, resulting from reduced vehicular and industrial emissions. Add to this, Dhaka, Gazipur, Chattogram, and Narayanganj amongst the major cities were found to be more influenced to emit fewer pollutants in the air through the restrictions. It also found ‘NO2 concentrations are highly correlated with the regional COVID-19 cases’ (Islam et al., 2020a; Salam, 2020; Masum and Pal, 2020.). Moreover, a strong association between climate variables and the total number of COVID-19 morbidity and mortality providing a breeding ground for the coronavirus in Dhaka city (Salam, 2020:14). Arora et al. (2020:1) argue that suddenly shut off ‘social, economic, industrial and urbanization activity’ influence nature to improve air quality, clean rivers, reduce noise pollution, undisturbed and calm wildlife. However, these changes of the environment are, for the time being, if we do not have a contingency plan to improve climate as well as COVID-19 condition, it will bounce back to the pre-COVID-19 state.

Natural calamities come hand-in-hand, while cyclone Amphan and successive floods with heavy rains struck over Bangladesh amid the ongoing COVID-19 pandemic (Table 2). Cyclone Amphan is bound to move more than 2.4 million people from their dwelling places (Hasina, 2020). It took the life of 31 people that are a tremendous blow during the coronavirus disease outbreaks (Dhaka Tribune, 2020b). It affected 26 districts badly, tolling Tk1,100 crore damages (Dhaka Tribune, 2020b). Besides, this cyclone destroyed 55,667 houses completely, and around 162,000 partially (IFRC, 2020a). It damaged around 149,000 hectares of agricultural lands and fish farms, estimating roughly about BDT 3.25 billion property destruction (IFRC, 2020a). As such, this cyclone uprooted millions of trees and washed away 150kms of protection embankments at 84 points in 13 districts (IFRC, 2020a). Particularly, 200 bridges and culverts, and 100km of roads were damaged by this powerful storm in the century (IFRC, 2020a). It ravaged to Sundarbans mangrove forest (Aljazeera, 2020). The frequent cyclones originated in the Bay of Bengal which is causing a huge loss for Bangladesh, which is the ultimate impact of climate change.
Recent floods in Bangladesh due to monsoon rains during COVID-19 disease have aggravated the woes of the people as shown in Table 2. Fresh floods affected a total of 2,246,472 people in 18 districts (IFRC, 2020b). While roads were cut off and hundreds of thousands of people were stranded, losing houses by 548,816 families (UNRC, 2020). Accordingly, floods endangered life resulting in over 220 deaths, displacing over 167,000 families, affecting over 170,000 hectares of agricultural land with riverbanks erosion (UNOCHA, 2020). Furthermore, heavy rainfall in the monsoon caused damage in Rohingya camps in Cox’s Bazar that worsen the misery to 109,312 people, while 8,911 were displaced, 41 injured and 14 persons died (ECHO, 2020). Floods affected 1,500 square kilometers (600 square miles) of farmland across the country (Patel, 2020). This climatic phenomenon escalated the COVID-19 pandemic in a various way like damaging of shelters; disrupting health care services, increasing the risk of mortality, morbidity, lack of nutrition; bringing the risk of water-borne disease, infection; and distressing on vulnerable and marginalized groups and their safety and security, Sexual and Reproductive Health (SRH), Gender-Based Violence (GBV) and Child Protection (CARE, 2020). It evident that one-third of the country was underwater due to torrential rains causing floods (Hasina, 2020; The Guardian, 2020). Hence, more than 1.5 million Bangladeshis were displaced coupled with tens of thousands of hectares of paddy fields have been washed away (Hasina, 2020).

During both pre-and post-monsoon seasons, one or more cyclonic storms strike, along the Bay of Bengal coast which is shared between India and Bangladesh, every year (De and Bandyopadhyay, 2020; Roman-Stork and Subrahmanyam, 2020). Although people of this region are mentally prepared for this devastation, they are undone due to the financial inability to fight against these sorts of natural events. In the current pandemic condition this year, super cyclone Amphan caused immense destruction to ‘live and livelihoods in the Sundarbans and along with the coastal areas of Odisha’. While over 3 million people evacuated from the Sundarbans, hence, this storm-damaged ‘1.5 million dwelling units, thousands of acres of fertile agricultural lands, crops, village and urban roads, and took lives of 80 people’ (The Business Standard, 2020; Shultz et al., 2020). Cyclone Amphan was not able to create a major upheaval as it struck only a few coastal areas in both the countries. However, it will affect over 14 million people over the coming years (BBC News, 2020; United Nations, 2020). Importantly, both countries were strictly enforcing COVID-19 lockdowns at the time of cyclone Amphan, 2.2 million citizens in Bangladesh and 4.3 million in the West Bengal and Odisha states of India were evacuated, and distributed these people to more than 15,000 shelters in the region, allowing shelter residents for physical distancing (Shultz et al., 2020). However, the mass evacuation process has spiked in new COVID-19 cases in the storm-affected regions, undermining of neutralizing both the COVID-19 pandemic and natural hazard risks (Mitra and Yengkhom, 2020). Hence, ‘the frequency of geophysical, meteorological, and biological hazards is increasing, intertwining the causes and impact of which only a few of them are predictable (Goss et al., 2020).

However, successively the worst floods of the decade affected a third of Bangladesh and at least 1.5 million people after cyclone Amphan ravage (Price, 2020). As climate change is increasing, floods and resulting landslides related to seasonal monsoon rains in the Indian subcontinent have become frequently prominent (Ebrahim et al., 2020). Irrespectively, natural disasters cause ‘displacement, food crises, and diseases for people and livestock’. Farmland value has been determined by seasonal precipitation and temperature variability, while floods are responsible for reducing land value, especially in low land area. Also, ‘the socioeconomic variables, farm size, soil types, access of extension services, and availability of irrigation facilities are positively associated with farmland value’ (Hossain et al., 2020). Particularly, ‘farmland value is elastic to climate change’, reducing the rate to be minor and limited. Whereas, amid the COVID-19 pandemic, the most low-income and fragile countries will be compounded the loss from disasters. While the COVID-19 lockdowns in this region resulted in mass gatherings of stranded workers, causing starvation and transmission of COVID-19 (Ebrahim et al., 2020). Conversely, outmigration, and the persistence of poverty are expected under all scenarios of disasters (Lázár, et al., 2020). While good management approaches, the coastal zone, in particular, can remain habitable and agriculturally productive until 2100 at least, mitigating flood risk to achieve a long-term goal of reducing poverty and ensuring sustainable livelihoods (Lázár, et al., 2020; Adnan et al., 2020; Sultana et al., 2020).

### Table 2: Impacts of cyclone Amphan and flood amid COVID-19 in Bangladesh

<table>
<thead>
<tr>
<th>Climatic Phenomenon</th>
<th>Cyclone Amphan</th>
<th>Flood</th>
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</thead>
<tbody>
<tr>
<td>- More than 2.4 million people had already been moved. (Hasina, 2020).</td>
<td>- A total of 2,246,472 people in 18 districts are affected by fresh floods (IFRC, 2020b).</td>
<td>- Roads are cut off and hundreds of thousands of people are stranded, 548,816 families lost their houses (UNRC, 2020).</td>
</tr>
<tr>
<td>- 31 people were killed by cyclone Amphan (Dhaka Tribune, 2020a).</td>
<td>- Floods resulted in over 220 deaths; over 167,000 families remain displaced; over 170,000 hectares of agricultural land has been affected; riverbanks continue to erode (UNOCHA, 2020).</td>
<td>- The total number of people affected in Rohingya camps in Cox’s Bazar has risen to 109,312, while 8,911 are displaced, 41 injured and 14 have died (ECHO, 2020).</td>
</tr>
<tr>
<td>- 10 million without power (Dhaka Tribune, 2020b).</td>
<td>- 1,500 square kilometers (600 square miles) of farmland were damaged across the country (Patel, 2020).</td>
<td>- Escalated COVID-19 pandemic due to damage of shelters; disrupted health care services, increasing the risk of mortality, morbidity, lack of nutrition; bringing the risk of water-borne disease, infection; and distressing on vulnerable and marginalized groups and their safety and security, Sexual and Reproductive Health (SRH), Gender-Based Violence (GBV) and Child Protection (CARE, 2020).</td>
</tr>
<tr>
<td>- Badly affected 26 districts, causing damage to the tune of Tk1,100 crore (Dhaka Tribune, 2020b).</td>
<td>- Thousands of acres of fertile agricultural lands, crops, village and urban roads, and took lives of 80 people’ (The Business Standard, 2020; Shultz et al., 2020).</td>
<td></td>
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<tr>
<td>- 55,667 houses were completely damaged, and around 162,000 partially damaged (IFRC, 2020a).</td>
<td>- Millions of trees were uprooted (IFRC, 2020a).</td>
<td></td>
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<tr>
<td>- Approximately 149,000 hectares of agriculture lands and fish farms worth about BDT 3.25 billion were damaged (IFRC, 2020a).</td>
<td>- 600 bridges and culverts,</td>
<td></td>
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<tr>
<td>- Escalated COVID-19 pandemic due to damage of shelters; disrupted health care services, increasing the risk of mortality, morbidity, lack of nutrition; bringing the risk of water-borne disease, infection; and distressing on vulnerable and marginalized groups and their safety and security, Sexual and Reproductive Health (SRH), Gender-Based Violence (GBV) and Child Protection (CARE, 2020).</td>
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</tbody>
</table>
Challenges of climate change and COVID-19 in Bangladesh

The people of Bangladesh are facing impacts of climate change and coronavirus pandemic, acting as a double edge sword in their lives and economy with various challenges (Figure 10). While the population is the main challenge for fighting against the effects of climate change and COVID-19. Then, lack of proper coordination among the different departments, institutions, and ministries related to climate change and COVID-19 fighting like DGHS, IEDCR, Bangladesh Police, Ministry of Health and Family Welfare, Ministry of Public Administration, Ministry of Industries, Ministry of Home Affairs, Ministry of Foreign Affairs, Ministry of Disaster and Relief, Ministry of Forest, Environment and Climate Change, and others organizations was another important challenge for containing the spread of COVID-19 outbreak with the subsequent climate change impacts in the preliminary stage. As there was no previous knowledge about the coronavirus disease, this happened at the early stage of the infection, but after taking some pragmatic decisions by the government improved the situations. After that, ‘testing, tracing and isolating’ were the major stumbling block of controlling the dissemination of COVID-19, while there were limited labs, expertise, and materials for mass testing and tracing to prevent the social transmission of the virus along with the unwillingness of the people for maintaining isolation. Next, shortage of Health Care Services was the key challenge for curbing the COVID-19 disease infection and for the treatment of patients, particularly the number of doctors, sanitizers, ventilators, masks, dedicated COVID-19 hospitals, and medical equipment were the impediment of coronavirus treatment in Bangladesh. Besides, corruption in the case of testing the COVID-19 patient’s samples was the major drawback of combating this disease. For instance, ‘Jobeda Khatun Shastha Seba (JKG) Health Care, commonly known as JKG Health Care, and Regent Hospital that were providing fake Covid-19 test reports at a high price’ (Habib, 2020), tarnishing the reputation of the health sector in Bangladesh, impending the COVID-19 crisis worsens.

Furthermore, policing was difficult by the various law enforcement agents for maintaining physical distance, keeping people inside the home, banning transportation, and preventing mass gatherings. Consequently, although Bangladesh Police performed a tremendous job in burring abandoned COVID-19 infected dead body with ‘Janaza-rituals for the dead body of a Muslim’ and rituals for other religious people, distributing relief, maintaining social distancing and home quarantine and helping destitute people, but they lost about 77 colleagues among 17,419 affected (collected from Corona Control Room, Police Head Quarters, Bangladesh Police). Accordingly, natural calamities like super cyclone Amphan, floods, and heavy rains amid COVID-19 pandemic, the grief of the people aggravated, indicating the impacts of climate change. These climatic conditions during the coronavirus disease challenge the controlling of the COVID-19 crisis, move people to shelters that worsen the social distancing, ravages agricultural products to lessen the income of the farmers to take nutritious food to grow immune and hinder availing medical facilities. Next, Rohingyaas—who displaced from Myanmar in Bangladesh—are big challenge for fighting COVID-19 as there are a large number of people living in a small area, where it is very difficult to maintain physical distancing, sanitation, pure drinking water, and medical support. Along these, cyclone Amphan and heavy torrential rains rampaged the Rohingya camps, which deepen the sore of the COVID-19 situation. Besides, travel bans were a great challenge for the farmers to transport their products to the cities from the rural villages, affecting the country’s economy in this pandemic time. Finally, lack of awareness about the gravity of the disease, the importance of social distancing, wearing masks, using sanitizers, staying at home, and testing for COVID-19 infection, was the vital challenge for reining the current pandemic in Bangladesh.

However, findings of other research supported that Bangladesh has a population estimated at 160 million with a growing economy, securing the 7th populated country position (Islam and Kibria, 2020). Most of the people are living in the urban areas of which 55% living in the slums. Although WHO recommended handwashing, sanitation, physical distancing, and home quarantine at the very beginning of COVID-19 outbreaks, but preventing the spread of this disease is unfeasible in slums due to challenges of congestion, inadequate water supply, poor sanitation facilities. In other words, the Government of Bangladesh has adopted strict measures for stopping the entry of passengers from Europe, stopping on-arrival visas and self-quarantine for all passengers return from abroad in response to the current pandemic (Alam et al., 2020). While ‘many loopholes exist at the entry points of Bangladesh’. Also, few measures were observed at the Shah Jalal International Airport like ‘the setting of some thermal scanners to check the real-time body temperature of the passengers and filling up a health declaration form’ (ibid. 204-205). However, no disinfection activities and no confirmation tests have been performed. Together with these,
other challenges found lack of laboratory facilities, scarcity of medical supplies—surgical masks and goggles, lack of personal protective equipment (PPE) for healthcare personnel, lack of quarantine facilities at the hospitals, not maintaining good hygiene and sanitation practices by the people, and no specific drugs or vaccines have been proven effective against COVID-19 till to date (ibid.205). Khan et al. (2020) argue that ‘government administration officials increased many efforts like prevention and containing the spread, raising the quarantine stations and increasing the laboratory capacity, strengthening surveillance, and contact tracing using artificial intelligence via technology apps’ (S 88).

Furthermore, the flood emergency and recovery responses are constraining due to COVID-19 spread (Htoon et al., 2020). For example, different places in India and Bangladesh flood risks reduction measures like embankment maintenance and repair works have been affected by COVID -19 lockdown, exacerbating the onset of monsoon rainfall. As such, maintaining physical distancing and health safety measures in cyclone shelters during Cyclone Amphan has been very challenging in Bangladesh. While social distancing will stop the spread of the virus, but will hamper to flood impacts mitigation measures. Besides, hundreds of Rohingyas recently rescued from stranded boats are in COVID-19 quarantine on Bhasan Char, where the Bangladesh government tried to relocate Rohingyas people, coming under renewed pressure because of an outbreak of COVID-19 among refugees there and the influence of cyclone Amphan and rains (Oxford Analytica, 2020). Add to these, Bangladesh and India are observing cyclones, floods, and other natural disasters, especially in the Sundarbans. Whether the two countries were hit by Cyclone Amphan in May 2020, which made landfall in Bangladesh and Western India, dealing with the double strike of a natural disaster and a pandemic. Another challenge identified by other research as the closure of market and transport bans is a different set of challenges for farmers in Bangladesh, facing a loss of income due to the lockdown (Hossain and Jahan, 2020). Whereas novel coronavirus (COVID-19) pandemic poses a significant public health threat worldwide, predominantly in densely populated countries like Bangladesh, having inadequate health care facilities. poor education, less public awareness, and massive unemployment (Masrur et al., 2020). Enough testing was not conducted at the very beginning of the outbreak in Bangladesh, while tests only conducted at the Institute of Epidemiology, Disease Control and Research (IEDCR) in the capital Dhaka, reporting huge patients all around the country (Chowdhury et al., 2020a). Therefore, a deep relationship found among human stress, economic hardship, and food crisis associated with the stress of mass people, hence hampering formal education and plan, creating stress for career seekers to exert challenges of climate and COVID-19 together (Islam et al., 2020b).

The awareness rate of Bangladeshi people was only 25%, although 96.9% knowing the COVID-19 epidemic, 33.5% maintain lockdown and 40.0% of people maintain social distance (Rana et al., 2020). With the advent of the coronavirus outbreak quickly worldwide, many countries are adopting ‘non-therapeutic preventive measures’ like travel bans, remote office activities, country lockdown, and especially social distancing (Anwar et al., 2020). However, these measures face challenges in Bangladesh. As social distancing is difficult in many areas of the country for the minimal resources the country, mobile sanitization facilities, temporary quarantine sites, and healthcare facilities could mitigate the impact of the pandemic. Therefore, Government, citizens, and health experts, along with international assistance, should take a prompt, supportive, and empathic collaboration to minimize the impact of the pandemic and climate change (ibid.1-8).

Figure 10: Challenges encountered by climate change and coronavirus disease in Bangladesh

V. CONCLUSIONS

COVID-19 and climate change are impacting throughout the globe, Bangladesh is not beyond the devastation of these two much-talked events in the contemporary world, tolling the lives of many people. In Bangladesh, coronavirus disease has already taken away about five thousand lives along with 345,805 confirmed cases, in contrast to, globally about 1 million death and 30,055,710 confirmed cases. While males are mostly victimized rather than female by this virus infection. As such, COVID-19 impacted Bangladeshi people through stagnation of the economic activities with their routine works. Consequently, the recent climatic phenomena like cyclone Amphan, heavy rains, and floods have also aggravated the woes of people amid the COVID-19 outbreak. These natural calamities took the lives of many people as well, displacing from their homes. Furthermore, Bangladesh is facing various challenges for fighting COVID-19 and climate change.
change, from these challenges, marinating social distancing, testing the disease, supplying protective equipment, Rohingyas in the refugee camps, and lack of awareness among people are the most prominent. But the concerted effort from government, citizens, NGOs, with the assistance of international organizations this pandemic could be mitigated. However, this research is not free from limitations, which demands empirical observation, which will be the future endeavor of the research.

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