



Social Perspectives of COVID-19 Pandemic in Bangladesh: A Review

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[Received: 12 January 2022; Accepted: 3 March 2022; Published: 1 April 2022]

Abstract

The natural spread of various harmful organisms into the environment has resulted in a wide range of diseases worldwide, including in Bangladesh. In December 2019, the world was exposed to a new virus-mediated sickness known as coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), which has mostly afflicted mainland China but has thereafter quickly spread to all the continents. The ongoing pandemic has taken the lives of more than 4.5 million people out of more than 10 million confirmed COVID-19 cases as of August 22, 2021. With an increase in infection and fatality rates, Dhaka, has become the most vulnerable to COVID-19. To deal with the emergency, the government of Bangladesh has imposed different measures including lockdown in various stages. The colossal effort of the government of Bangladesh deserves a standing ovation in order to mitigate the situation timely. Based on the current circumstances, it is undeniable that the situation will not be alleviated despite the government's sincere efforts and enforcement of rules unless the country's citizens are aware and willing to follow the prescribed prevention and control measures. This literature review compiles and summarizes the morphology, mechanism, current status, likely therapies, and preventative strategies for this novel coronavirus strain in Bangladesh. [*Bangladesh Journal of Infectious Diseases*, April 2022;9(suppl_1):S28-S39]

Keywords: COVID-19 pandemic; Bangladesh; social media; social organizations; law enforcement agencies

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Conflict of interest: There are no conflicts of interest declared by the authors.

Funding agency: To conduct this study, the authors received no funding from any agency, institute, or individual.

Contribution to authors: These authors contributed equally.

How to cite this article: Alam S, Emon NU, Hosaain MJ, Rudra S, Khan MR, Islam MR, Ahmed NU, Islam MM. Social Perspectives of COVID-19 Pandemic in Bangladesh: A Review. *Bangladesh J Infect Dis* 2022;9(suppl_1):S28-S39

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Introduction

As of October 11, 2022, SARS-CoV-2 has affected more than 225 countries while killing more than 6.5 million people out of more than 619 million confirmed COVID-19 cases¹. This pandemic situation is affecting Bangladesh in numerous ways. In Bangladesh, where the risk of undiagnosed or unreported patients cannot be eliminated, the catastrophic occurrence already imposes a 1.7% mortality rate. According to the statistics, more than half of those sick are between the ages of 21 and 40. However, 65.0% or more of deaths occur in people above the age of 50 years². Males account for more than 70% of infections and deaths compared to females². If healthcare professionals, hospital beds, support personnel, volunteers and equipment are not used effectively and in a planned manner, the situation might become even worse³. Total lockdown and strict restrictions on mass movement via various means such as rail, boat, and air for specific periods can play a critical role in protecting the community from a high death rate^{4,5}.

Coronaviruses (CoVs) have been known to infect humans and a range of animals, including birds and mammals, since their discovery in the mid-1960s⁶. Two coronaviruses have evolved and caused outbreaks in people since 2002, before this novel strain of SARS-CoV-2, viz., SARS-CoV (Severe Acute Respiratory Syndrome), which was discovered in southern China in 2003, and MERS-CoV (Middle East Respiratory Syndrome), which was discovered in Saudi Arabia in 2012⁷. They can disseminate and infect humans, causing sickness in varying degrees, ranging from upper respiratory tract infections (URTIs) and lower respiratory tract infections (LRTIs), as well as a severe acute respiratory syndrome (SARS)⁸. The newly emerged coronavirus, originated from Wuhan (a city of China), also known as 2019 novel coronavirus, SARS-CoV-2, it is a single-stranded, positive-sense RNA coronavirus which is a novel strain of coronavirus (the term corona means crown)⁹. It is now responsible for causing a devastating pandemic with severe respiratory consequences all across the world⁹. Scientists believe that SARS-CoV-2 was generated from diseased wild animals and spread through a vast open animal and seafood market, animal spillover and cross-species jumping events with zoo anthroponotic potential in affecting few animal species have been observed. There are debates for concluding with regards to the origin of this pandemic virus and implications of zoonotic concerns are being investigated^{7,11}. In less than two months, it was able to spread from person to person and cover over 100 countries and thereafter spread

to more than 225 countries. It has been connected to the coronaviruses SARS and MERS. The incubation period for this novel coronavirus strain is 2-14 days¹². The researchers found that the virus was detectable four days after exposure in those who had the Delta variation, compared to an average of six days in people who had the original strain, implying that Delta replicates quicker^{13,14}. Delta-infected patients had viral loads that were up to 1,260 times greater than those infected with the original strain¹⁵. The novel HCoV genome, which was recovered from a cluster-patient with atypical pneumonia after visiting Wuhan, shared 89% nucleotide identity with batSARS-like-CoVZXC21 and 82% with human SARS-CoV. As a result, the new virus was given the name SARS-CoV-2¹⁶.

Bangladesh is a South Asian country. It is not distant from China, which is why this country has grown particularly susceptible to SARS-CoV-2. By October 11, 2022, over 2.03 million people in Bangladesh had tested positive for the virus, and another 29386 had died as a result of it¹⁷. There is a chance that carrier patients in Bangladesh are discreetly spreading the disease to others. However, the extent to which this viral infection is spreading in this country is unknown¹⁸. Despite having a limited number of healthcare experts, hospital beds, support staff, volunteers, and treatment equipment, the government is a valiant effort to combat the pandemic and keep its citizens safe. This study aims to present information on the current state of COVID-19 cases in Bangladesh, public concerns, possible therapies and preventative strategies, and detection methods, including a kit that is thought to detect COVID-19.

Morphology of SARS-CoV-2

Coronaviruses (CoVs) are enclosed viruses having a single-stranded, positive-sense RNA genome (Order: Nidovirales, Family: Coronaviridae, subfamily: Coronavirinae). CoVs have the biggest genomes among RNA viruses, with RNA genome sizes ranging from 26 to 32 kilobases (kb) (Figure I).

Coronaviruses are divided into four genera based on genetic and antigenic criteria: α -coronavirus, β -coronavirus, γ -coronavirus, and δ -coronavirus²¹. HCoV-NL63 and HCoV-229E are α -coronaviruses, while HCoV-OC43 and HCoV-HKU1 are β -coronaviruses. SARS-CoV-2 belongs to the beta CoVs family of viruses. It has a 60–140 nm diameter and is round or elliptic in shape, with a pleomorphic arrangement. It is susceptible to UV radiation and heat, just like other CoVs.

Furthermore, lipid solvents, such as ether (75%), ethanol, chlorine-containing disinfectants, peroxyacetic acid, and chloroform, can effectively inactivate these viruses, except for chlorhexidine. The novel coronavirus has 29891 nucleotides in its single-stranded RNA genome, which codes for 9860 amino acids²².

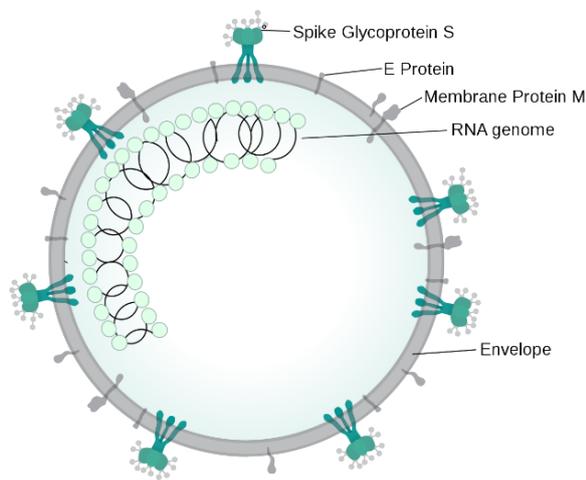


Figure I: Illustration of the COVID-19 (SARS-CoV-2) virion^{19,20}.

These genetic investigations imply that SARS-CoV-2 evolved from a strain identified in bats, despite its origins remaining unknown. However, the identity of the potential amplifying mammalian host, which somewhere between bats and humans, is unknown. Because the initial strain's mutation could have directly caused pathogenicity toward humans, there's no guarantee that this intermediary exists^{20,23}.

Essentially, the virus infiltrates human cells of the throat, nose, and lungs by integrating one of its membrane spikes into a receptor molecule of a healthy cytomembrane, much like a key in a lock. Later, after encroaching on a cell membrane sac, it reaches the cellular nucleus, where the virus's envelope and cell membrane sac fuse to allow the virus to capture the nucleus and construct all of its genetic elements²⁰. The viral genetic material is then replicated in large numbers using energy and resources scavenged from the host cell's nucleus. Following that, certain genetic materials leave the nucleus and attach to the ribosome, a protein-building unit that exits the nucleus, to use the information to convert genetic codes into viral proteins such as spike protein²⁴. The spikes, together with the rest of the virus, are then transported in vesicles to the cellular outer layer, where they integrate with the host's cell membrane.

Finally, the new virus egresses the cell, destroying the membrane²⁵.

COVID-19 Cases in Bangladesh

First Case and First Death: The first coronavirus cases were reported in the Dhaka city on March 7, 2020 declared by the Institute of Epidemiology, Disease Control, and Research (IEDCR)². The virus was claimed to have been spread by two of the sick people who had recently returned from Italy, and the third patient was a family member of one of the passengers². On March 18, 2020, the first confirmed patient died from the new coronavirus. The death occurred 11 days after the country's first coronavirus cases were reported. He had been infected by one of his relatives who had lately returned from Italy, and he was kept in isolation².

Detection Methods of SARS-CoV-2 in Bangladesh:

Whole-genome sequencing is a costly, time-consuming, and complicated procedure; thus, it is not a viable choice for critical and broad-based issues²⁶. GenBank compiled the first complete SARS-CoV-2 genome sequence by Wen et al.²⁵ on January 5, 2020 (accession number MN908947). Spike glycoprotein (1273 amino acids), membrane protein (222 amino acids), ORF1ab polyprotein (7096 amino acids), nucleocapsid protein (419 amino acids), and envelope protein have all been identified in the genome of SARS-CoV-2 (75 amino acids)²⁶. Research conducted in China^{6,23}, Australia, and the United States have also appended 19 other genome sequences of SARS-CoV-2 obtained by using Illumina or Nanopore platforms on GenBank. The International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR,B), in partnership with the Government of Bangladesh, began monitoring SARS-CoV-2 variants after discovering novel variants from the United Kingdom, South Africa, and Brazil. A total of 5,250 nasopharyngeal swab samples were screened for SARS-CoV-2 by real-time reverse transcriptase PCR employing RdRp (open reading frame 1ab [ORF1ab]) and N gene-specific primers and probes between 15 December 2020 and 21 January 2021. The full sequencing of SARS-CoV-2 strain G039392, which is 99.9% identical to the UK variant B.1.1.7, has been discovered²⁷. Several diagnostic tests have been developed and commercialized in response to the growing need for COVID-19 testing²⁸. Nucleic acid amplification tests (NAATs), such as reverse transcription-polymerase chain reaction (RT-PCR), shorten the time it takes to identify viral nucleic acid to minutes or hours and have high specificity and sensitivity²⁹. Despite the fact that implementation is complex due

to high costs, the Centers for Disease Control and Prevention consider it the gold standard for identifying COVID-19^{29,30}. SARS-CoV-2 RNA is reverse transcribed into cDNA first; then specific gene fragments are amplified using targeted specific primers³¹. This method can also be used to detect SARS-CoV-2, which is an RNA virus. Another vital innovation to RNA characterization is using the CRISPR-Cas (clustered regularly interspaced short palindromic repeats) framework. Cas13a, previously known as C2c2³² can be reprogrammed with CRISPR RNAs to provide a platform for precise RNA sensing. SHERLOCK protocol based on CRISPR/Cas13a system has been developed by Zhang and Collins' laboratories collaboration³³ which uses reverse transcriptase recombinase polymerase magnification in combination with T7 transcription to intensify all particular RNA segments of DENGUE or ZIKA viruses, theoretically opening up the possibility of a quick SARS-CoV-2 diagnostic approach.

Introduction of Rapid Dot Kit for the Detection of SARS-COV-2 in Bangladesh: On March 19, 2020, Gonoshasthaya Kendra received official authority to import raw materials needed to manufacture the coronavirus-detection kit that the organization developed. The Directorate General of Drug Administration (DGDA) granted permission to import raw ingredients. The Rapid Dot Blot kit's raw components were shipped to Bangladesh from the United Kingdom. In a meeting convened in this respect, the DGDA said that the organization had received a no-objection certificate to import nine reagents needed to build the testing kit. Even after importing the raw materials and manufacturing the testing kits, Gonoshasthaya Kendra must submit the kits to the DGDA. The DGDA will next submit it to the WHO for approval³⁴.

The Rapid Blot-Dot technique, which was recently invented, is used in the kit to identify positive coronavirus cases in under 15 minutes. The Ganoshasthaya Kendra estimates that the kit will cost roughly \$3 or BDT 250³⁵. The Ganoshasthaya Kendra led to develop the 'dot blot test,' which uses antibodies from the blood produced in response to these intruder viruses, despite the fact that real-time polymerase chain reaction (RT-PCR), which uses sequencing from a nasopharyngeal swab or sputum sample, has been considered the standard method of coronavirus diagnosis³⁶. The developed kit uses AuNP technology to detect and determine the existence of SARS-CoV-2 antibodies in affected people. The flow-through dot-blot assay (FT-DBA) has a sensitivity of 98% and a specificity of 98.8% when compared to an ELISA kit produced

in-house. The kit is more specific for SARS-CoV-2 antigens than for antigens from other coronaviruses³⁷.

Vaccine Development in Bangladesh: COVID-19, the ongoing worldwide pandemic necessitates the mass vaccination to be controlled. Since the outbreak of the COVID-19 pandemic, there has been a global race to produce vaccines to combat the virus. According to a review of vaccine development data from the World Health Organization, more than 40 nations and regions were working on COVID-19 vaccines by the end of February 2021, with at least half of these countries having one or more vaccines in clinical trials³⁸.

Two vaccines from the United States (Moderna and Johnson & Johnson), one from the United States (Pfizer) and Germany (BioNTech), one from the United Kingdom (AstraZeneca/Oxford), four from China, and one from Russia have all received conditional approval in one or more countries¹⁴. Though Bangladesh is obtaining fair and equal access to the COVID-19 vaccine as part of the COVAX program, it is challenging to vaccinate a large number of people in a short period of time with limited supply of vaccine. It also necessitated a large sum of money. A memorandum of understanding (MoU) was signed between the government, China's Sinopharm, and Bangladesh's Incepta Vaccines Ltd to meet the vaccine supply³⁹. Also, a group of Bangladeshi researchers developed an mRNA-based SARS-CoV-2 vaccine candidate that demonstrated promising results in animal trials⁴⁰.

Anti-COVID drugs in Bangladesh: The world is putting previously developed antiviral medicines to the test in the treatment of COVID-19. Although ivermectin, favipiravir, azithromycin, chloroquine, lopinavir, and hydroxychloroquine have been shown to be effective against SARS-CoV-2, their selectivity in the treatment of coronavirus remains uncertain^{7,41,42}.

Azithromycin is primarily an antibiotic with a broad spectrum of action, whereas chloroquine and hydroxychloroquine are anti-malarial medicines, and lopinavir is an antiviral agent⁴³. Chloroquine and hydroxychloroquine, two of the four drugs, have been shown in vitro to inhibit SARS-CoV-2, although they have a number of side effects, including cardiac arrest. The in vitro evidence of corona-treating medications and their links to cardiac problems (Table 1).

Table 1: In vitro evidence of corona treating drugs and their connections with cardiac arrest.

Possible therapy (SARS-CoV-2)	In vitro inhibition evidence	Cardiac arrest	Ref
Azithromycin	Negative	Yes	44
Chloroquine	Positive	Yes	45
Hydroxychloroquine	Positive	Yes	46

A World Health Organization (WHO) research forum on coronavirus disease 2019 (COVID-19) recommended large-scale evaluations, randomized trials^{7,41}, and other WHO expert groups offered four repurposed antiviral medicines that could have at least a moderate effect on mortality in February 2020: Interferon-beta-1a, hydroxychloroquine, lopinavir, and remdesivir^{7,41,42}. The WHO launched a primary, open-label, simple, worldwide, randomized trial enrolling hospitalized patients in March 2020 to evaluate the efficacy of these four medications on in-hospital mortality. The experiment was adaptable, allowing for the removal of unpromising medicines and the addition of more promising therapeutic candidates. Hydroxychloroquine, lopinavir, and interferon were eventually taken out of the trial, but others, like monoclonal antibodies, were included. For the first four medications, we present preliminary data. Overall mortality, the commencement of ventilation, and length of hospital stay showed that this remdesivir, hydroxychloroquine, lopinavir, and interferon regimens had little or no effect on hospitalized COVID-19 patients⁴⁷. From May 17 to September 9, 2020, a survey of 182 Bangladeshis was conducted. The antivirals remdesivir and favipiravir have been demonstrated to be effective in treating COVID-19 patients⁴⁸. Following tales about remdesivir, ivermectin, favipiravir, azithromycin, chloroquine, lopinavir, and hydroxychloroquine's anti-COVID efficacy, the Bangladeshi people agreed to use these treatments on their own⁴⁶.

Environmental Factors on COVID-19

Temperature, humidity, wind speed, and air pressure have all been shown to play an essential effect in the transmission of infectious diseases⁴⁸. In Korea, the incidence of influenza (a respiratory viral infection) has increased dramatically in response to low daily temperatures and low relative humidity, and this study found a notable positive link with the diurnal temperature range (DTR)⁵⁰. Temperature and DTR were found to have a consistent relationship in deaths caused by respiratory illnesses⁵¹. Another study found that

absolute humidity significantly impacted influenza virus survival and transmission rates⁵². Despite having no effect on the mortality rate, COVID-19 is linked to climatic elements that can be down regulated by an enhanced temperature⁵³. As a result, it is only a hypothesis that meteorological conditions may influence COVID-19 mortality. COVID-19 is thought to be susceptible to high temperatures as most viruses are nucleic acid inside a protein shell called the capsid, which is protected by an exterior membrane that is temperature-sensitive⁵⁴. As a result of the higher temperature, it will float in the air, where it will survive for a shorter period of time. Several pieces of research have shown a substantial link between COVID-19 instances and specific meteorological parameters^{55,56}. As Bangladesh has a temperate climate, and the virus is predicted to be temperature sensitive, it may provide a ray of hope to the people of Bangladesh. On the contrary, it can be highly harmful and even welcome severe catastrophe if individuals behave freely based on this environmental aspect.

Effect of COVID-19 on Daily Life of Bangladesh

Bangladesh has closed all of its educational institutions since March 17th, 2020. Incoming flights from European destinations are likewise forbidden initially⁵⁷. To curb the spread of the virus, Bangladesh has also banned all international commercial passenger flights with other nations multiple times. The Department of Immigration and Passports has initially denied new enrollments for electronic and machine-readable passports, with some workarounds in place for emergencies. Despite the government-imposed "complete lockdown" multiple times, still millions of people are out on the roads all day⁵⁸. As suggested by the WHO, maintaining social distance to avoid the transmission of the coronavirus seems like a utopian dream in a city like Dhaka. Many other hospitals and private clinics refused to treat patients with cold and pneumonia symptoms because they lack adequate protective equipment such as PPE (Personal Protective Equipment). This has resulted in widespread unhappiness, rage, and anxiety among the general public⁵⁹.

Appreciable Government Approaches

Following a coronavirus outbreak that resulted in five deaths and at least 39 illnesses, Bangladesh implemented a statewide lockdown beginning March 24, 2020⁶⁰. To combat the spread of COVID-19, the government imposed restrictions on mass movement via water, rail, and domestic air routes beginning March 24th, as well as a

suspension of public transportation on roadways starting March 26th. The government declared a halt to all public transit on March 26th, warning not to travel on any goods-carrying buses or trucks. However, vehicles bearing perishable commodities, fuel, and medications were permitted to transit throughout the country to meet essential needs². The Bangladesh Inland Water Transport Authority (BIWTA) has confirmed that all launch services will be postponed. The Bangladesh Railway Authority also suspended local, postal, and commuter train services across the country (BRA)². Armed forces were dispatched to Bangladesh's sixty-four districts to confirm social separation and aid with other critical tasks. The army, air force, and navy force might provide essential support to magistrates from every area, depending on the needs, such as managing COVID-19 positive patients and confirming isolation for possible infected people. The military was expected to look into whether or not returnees from overseas are hesitant to follow quarantine protocol back home. During the holiday season, public transportation will be limited, and the government has advised citizens to avoid this mode of transportation to the greatest extent feasible. People who need to travel by civil transport for an emergency should take basic precautions to prevent contracting coronavirus illnesses during the pandemic. The drivers and workers of the vehicle must wear masks and take other precautions. Bangladesh Bank has been designed to provide financial services on a limited basis to meet clients' basic needs⁵⁹.

Social organizations during COVID-19 in Bangladesh

Like other developing countries, Bangladesh has faced humanitarian challenges from the early phase of the COVID-19 outbreak due to its shortages of resources like specialized hospital facilities throughout the country, shelter, or food supply for all classes of people. Besides the declaration of “general leave” or “lockdown,” the GoB has adopted several adamant control measures to protect the country's people from the COVID-19 disease and food or treatment scarcity from the embryonic stage of the epidemic in the country^{61,62}.

Moreover, to battle the COVID-19 pandemic, distinct social or non-governmental organizations (NGOs) in Bangladesh played a pivotal role in assisting the vulnerable people as frontline service givers to ensure a basic knowledge of COVID-19, economic, food, and health safety during the lockdown period. A survey conducted on NGOs during the COVID-19 beginning era in Bangladesh reported that NGOs spent more than BDT 1.55

billion within only 80 days to tackle the crisis where public awareness programs, food, health, and cash support were 37.1%, 32.2%, 19.2%, and 11.5%, respectively^{63,64}. Moreover, the active NGOs urged the GoB to associate them in the COVID-19 battle. They also exhibited an immense interest in working hand in hand with the GoB for durable coordination, which would profoundly dominate national health, disease management, and the economy, particularly on the marginalized and vulnerable communities over the country⁶⁴. As established to build exploitation, discrimination, and a violence-free society, JAAGO Foundation has stepped forward to help unprivileged people by raising crowd-funds with a Facebook page named “Bangladesh Relief Fund to fight COVID-19 by JAAGO Foundation”. This volunteer's organization aimed to distribute safety materials like a mask, hand sanitizers, soap, and other fundamental necessities to protect the most vulnerable population from SARS-CoV-2 infection⁶⁵. Another innovative conception, “One Taka Meal” or “Ek Takay Ahar”, was developed by “Bidyanondo”, a non-profit organization in Bangladesh. This organization delivered food to more than one million families with the help of several volunteer organizations, armed forces, and police across the country just within 23 days (April 12 to May 3, 2020) during the early lockdown period. Besides the “One Taka Meal” program throughout the country, the organization donated PPE and disinfectant sprays to medical staff in Dhaka city⁶⁶.

By namely “Mission Save Bangladesh”, another relief program was initiated by a Bangladeshi digital service provider, “Sheba.xyz”, in collaboration with The Daily Star and The Daily Samakal, to assist the needy people to tackle the repercussion caused by the COVID-19 pandemic in Bangladesh. The program included delivering the required groceries to underprivileged people, financial aid for small businesses, and community-based disinfecting activities. Many other organizations like “Alor Pothe Nobojatray (APON) Foundation”, “PFDA-Vocational Training Centre”, “P Ashe Achi Foundation”, “Shishuder Jonno Foundation”, etc. as well as several student unions among various public and private universities or youth organizations contributed to supporting food, preparation and free distribution of hand sanitizers, soaps, masks, gloves, and medical necessities with the arrangement of some public awareness programs^{65,67}. In addition to NGOs, some private organizations like Epyllion Group, a leading business holder in the garments sector of Bangladesh, donated PPEs, eye protector goggles, and masks with all other safety materials to many

hospitals in Dhaka to ascertain the safety of frontline health care providers during COVID-19 pandemic⁶⁸. More importantly, the two leading charity organizations named Bangladesh Red Crescent Society (BDRSC) and Anjuman Mufidul Islam have signed in a Memorandum of Understanding (MoU) to work together for providing humanitarian care to the affected people due to the COVID-19 pandemic in Bangladesh⁶⁹.

Moreover, religious leaders and Imams of mosques have been playing an undenied role since the early phase of the COVID-19 pandemic throughout the country, including the Rohingya Refugee camps, to disseminate the key life-saving information by utilizing the megaphones to the people who do not have any television or smartphone. In this regard, UNICEF and BRAC have conducted several training programs for the additional 300 religious leaders in camps to spread the prevention measures and debunked false information or myths associated with the COVID-19 outbreak^{70,71}.

Bangladeshi Print and Online Media in COVID-19

Mass media plays a pivotal role in spreading information rapidly, impacts the public's perception and behavioral responses, particularly during the pandemic era, and curtail the transmission of disease⁷². Mass media like television, newspaper, print and online news portals, etc., are acting as the main route of the rapid spread of daily updates like daily infections, mortality, recovery number, and other fundamental information of COVID-19 worldwide. Although the catastrophic effects of the pandemic, lockdowns with extended quarantines, economic hardships, social stigmas, sexual violence, and psychological disorders like stress, anxiety, and fear, etc., converted people's livelihood difficulty and distracted, the media, media activists, or journalists did not keep arrested themselves in the home without their daily briefing, regular reporting, and publication⁷³⁻⁷⁶. Besides, most of the national print and online media in Bangladesh created a live updates dashboard for COVID-19 tracking throughout the country as well as the international infections, deaths, and recovery. It is a notable success of media promotion and encouragement that maintaining social distancing, regularly washing hands, using a face mask and hand sanitizers, etc., were observed as an upward trend of healthy and hygienic behaviors and practices among the general population^{58,64}.

Proper knowledge and information of COVID-19 have a strong correlation with the public's good attitudes and positive behavioral responses toward

the disease^{77,78} (Hossain et al., 2020; Hossain et al., 2021). In addition, people's behavioral responses and attitudes are modified and influenced by news reporting; hence, media can affect emerging disease control⁵⁸. On the one hand, media briefing on disease spread can raise fear, anxiety, depression, and many other psychological disorders. Media reports can build public awareness and help people to immediately adopt several protective measures. This interaction between public awareness mediated by media and disease preventive measures is a bi-directional strategy⁵⁸. Interestingly, besides the print and online media, YouTube channels, and several pages and groups on social media platforms such as Facebook, Messenger, Twitter, Instagram, WhatsApp, etc., were always well-connected with the general people to keep updated, entertained, and promoted emotional stability, from the embryonic moment of the current COVID-19 pandemic in Bangladesh. Many scholastic people related to schooling have created social media pages or groups to continue their educational programs with their students. Plenty of videos regarding mental, psychological, and physical health development were always uploaded in various channels. Numerous books were made freely accessible on social media platforms that relaxed general people from the gloomy mood and psychological distresses during lockdowns.⁶⁴

Apart from the significant effect and omnipresence of mass media, scientists and public health experts had to compete with several sources of information that might contain potential fake and misleading information on the COVID-19 pandemic. The most viewed medical content on COVID-19 in YouTube and found that independent users were more likely to upload misleading videos than useful videos. In contrast, news agencies uploaded more useful videos than misleading videos⁷⁹. A survey was conducted on the Bangladeshi population who were connected with social and electronic media, where a significant number of participants experienced a higher anxiety rate during the COVID-19 pandemic than in 2019⁸⁰.

Moreover, telemedicine service has become a buzzword from the early phase of COVID-19 in Bangladesh. Healthcare professionals can quickly evaluate, diagnose, and treat patients in a remote area by utilizing telecommunications technology, saving money, time, and lives. This virtual treatment method using social media for audio-video or internet has played a backbone role for clinical practice in the current COVID-19 era, while mass media is acting to promote the concept throughout the country. Finally, mass media plays

an imperative role in today's world by providing a unique platform for all health communications, health education, and guidelines and strategies for control measures for combating an emerged infectious disease like the COVID-19 outbreak.^{64,81}

Law Enforcement Agencies in COVID-19 Pandemic

Apart from frontline health care providers, law enforcement agencies like Bangladesh Army, Police, including all other administrators have not arrested themselves in the home during the COVID-19 epidemic in Bangladesh⁶¹. Instead, these law enforcers were deployed to keep the unruly people at home, implement government orders, and penalty the zealots. More than 2,00,000 police and firefighters and 10,000 armed forces in Bangladesh were working heart and solely to control the COVID-19 outbreak⁶¹. They worked with extreme effort in streets, markets, and populated places by taking high infection risk to ensure social distancing with spreading public awareness using megaphones. The first of foremost aim of the Bangladesh Army was to aid local administration in fighting against COVID-19 from the beginning phase of the current outbreak. Besides, Bangladesh Armed Forces assisted civil administration in ensuring lockdown and ascertaining social distancing, institutional or home-quarantine measures for foreign returnees to avert viral transmission. Moreover, they evacuated the first batch of Bangladeshi citizens from Wuhan, China, on February 2, 2020, and organized these returnees to the Ashkona Hajj camp for institutional quarantine by coordination with the Ministry of Foreign Affairs and Ministry of Health and Family Welfare. Importantly, they created an innovative "Isolation Pod" and converted two MI 171 helicopters into air ambulances to carry COVID-19 patients rapidly. It is notable that the Bangladesh Armed forces have imparted their one-day salary to the relief fund of the prime minister as a gesture of solidarity for the destitute people⁸² (Prime Minister Office, 2020). They also created "Ak Minitar Bazar" (one-minute bazaar) at the plethora of places across the country to allow people easy access to daily commodities⁸³.

According to the empowerment of the local law of Bangladesh, section 11 (1) of Act No. 61 of 2018; infectious disease (prevention, control, and eradication), the whole of Bangladesh was declared as "high-risk area" by the health department of the GoB on April 16, 2020⁸⁴. A person who would violate any order of GoB related to the adopted measures to stop the transmission of the infectious disease COVID-19, he/she can be prosecuted under several provisions of the stated law. The law

enforcement agencies, including the police, are responsible for ascertaining that the country must abide by the acts and government guidelines⁸⁵. Besides, the troop disinfected the busy streets, helped mandatorily working people, took people to hospitals for treatment, located people who have escaped quarantine⁸⁶. According to the Bangladesh Police Headquarters, around 10,000 cops were infected, and thirty-eight died of SARS-CoV-2 infection till June 26, 2020, while executing their duty during the COVID-19 outbreak in Bangladesh⁶¹.

Unfavorable Challenges during COVID-19 Pandemic

An insufficient number of ICU beds to accommodate all patients can be a trigger. Patients encounter life-threatening respiratory and neurological issues, necessitating ICU support in serious situations for proper monitoring and medicine. In terms of therapy, international standards recommend that a 100-bed hospital must have at least five intensive care units (ICUs); however, Bangladeshi hospitals only have 1,169 ICU beds among which 432 beds in government and 737 beds in private hospital despite a large population⁸⁷. Furthermore, Bangladeshi hospitals only have 141,903 available beds, which means there are only nine beds for every ten thousand Bangladeshis⁸⁸. According to the Organization for Economic Co-operation and Development (OECD), the United States has 28 hospital beds per 10,000 people. In contrast, China, South Korea, and Italy have 43,123 and 32 general hospital beds per 10,000 people. In comparison to other nations, Bangladesh supplies only nine doctors, midwives, and nurses for every ten thousand citizens, despite the government's recent focus on recruiting a significant number of doctors and other relevant expertise⁸⁹. In addition, the IEDCR announced in the media that 150 ICUs had been managed in Dhaka and that a few more would be ready shortly to treat coronavirus patients². Experts from practically every area, including doctors, nurses, police officers, pharmacists, journalists, delivery men, and others, have worked with the government to address this crisis. Bangladesh's overall management and policy-making steps were so good and matured, even after facing the first pandemic emergency, as seen by the low death rate and infection numbers compared to most other South Asian countries^{90,91}. As a result, it is easy to argue that the government of Bangladesh and other authorities' decisions and actions during the pandemic can be used as models for combating the horrifying SARS-CoV-2 epidemic⁹²⁻⁹⁵. To combat

this unexpected circumstance, the people of Bangladesh should be more careful and cooperate with the government^{96,97}.

Conclusions

Governmental and non-governmental groups in Bangladesh are currently working hard to remove health-related problems in society. The article shows that the government, in partnership with other social and non-governmental organizations, must take a comprehensive initiative to address the pandemic situation. The government can announce more financial stimulus packages for social organizations, the media, and frontline fighters to stimulate them. Because false information on social media and YouTube can exacerbate the situation, the media can play a critical role by disseminating facts and organizing campaigns to raise vaccination awareness among the public. Law enforcement authorities and the government can collaborate to maintain social distancing, personal awareness, personal hygiene, self-quarantine, and compliance with national and WHO standards. In addition, the government must invest adequate research funds for COVID-19 research and finances for healthcare system improvement. Finally, authors are expressing their heartfelt gratitude to the quick and contemporary activities of the government in this pandemic situation and it can be easily said that the rational stand and the total action plan of the government of Bangladesh can be efficiently considered as a role model for the other countries to overcome from this newest pandemic.

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