



A Review on Novel Coronavirus Outbreak: Current Scenario of Bangladesh

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Abstract

Coronavirus disease (COVID)-19 outbreak was the first time experienced in Wuhan City, China, at the end of December 2019 which spreads rapidly in China and then worldwide approximately all countries of America, Europe, Australia, and Asia including Bangladesh. There are more than 1,039,135 mortalities and 35,207,771 people have been affected globally until October 4, 2020, and the figure is still increasing. The global information on the COVID-19 case was collected from a reliable database (worldometers.info) and domestic information was taken from the government circulating websites and analyzed. Different steps have been taken to control the COVID-19 worldwide. Even with few resources, Bangladesh also has taken rigorous measures such as designed special hospitals, laboratories, quarantine facilities, social distance awareness campaigns, and lockdown to control the spreading of the virus. As Bangladesh is an overpopulated country and vast population lives under the poverty line, it was difficult to maintain a strict lockdown to curb the COVID-19. In this study, we have focused the government efforts to combat this deadly pneumonia and presented recent situations and challenges of Bangladesh. We compiled general treatments, COVID-19 specific treatments, and antiviral treatments should be prescribed in fighting COVID-19. We suggest certain nutritional elements and natural products which can boost up the immunity of individuals and protect from the infection of this virus. The review was undertaken to synopsis the recent conditions, challenges of Bangladesh arise after the COVID-19 pandemic and summarize certain possible intervention options for management of COVID-19.

Edited by: Mirko Spiroski

Citation: Khan MNM, Barman NC. A Review on Novel Coronavirus Outbreak: Current Scenario of Bangladesh. Open Access Maced J Med Sci. 2020 Oct 25; 8(T1):314-324. https://doi.org/10.3889/oamjms.2020.5171

Keywords: Bangladesh; Coronavirus; Coronavirus Disease-19; Middle East respiratory syndrome; Potential treatments; SERS

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Received: 07-Jun-2020

Revised: 14-Oct-2020

Accepted: 15-Oct-2020

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Funding: Publication of this article was financially supported by the Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia

Competing Interest: The authors have declared that no competing interest exists

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Introduction

Coronaviruses (CoVs) fits the subfamily Orthocoronavirinae, in the family of *Coronaviridae*, and the order of Nidovirales. There are four categories of CoV; alpha-CoV, beta-CoV, gamma-CoV, and delta-CoV [1]. Mainly, CoVs cause enzootic infections in mammals and birds. In the past periods, they have shown their competence in infecting humans [2]. At present, a novel flu-like CoV (severe acute respiratory syndrome [SARS] -CoV-2) is related to the Middle East respiratory syndrome (MERS) and SARS that outbursts in 2002 and 2012, respectively, was found at the end of 2019 in Wuhan, Hubei Province of China [3], [4]. This CoV had >95% homology with bat CoV and >70% similarity with SARS-CoV [3]. Compared with SARS and MERS, this virus is highly infective and transmissible despite a low mortality rate [5]. Human-to-human transmission of this virus is confirmed [6]. It is important that though the number of new cases was comparatively condensing in China, exponentially increased in other countries such as Italy, Spain, America, South Korea, and Iran. Bangladesh had reported only 368,690 cases until October 4, 2020. Among them, 5348 patients have already died. Until

October 4, 2020, around 35,207,771 cases of CoV and 1,039,135 deaths have been reported in all over the world. Providentially, children have been intermittently pretentious with no deaths. The upcoming course of this virus is still unknown. In this review, we have tried to figure out a clear observation of Bangladesh's cause of the CoV Disease (COVID)-19 pandemic. This includes monthly cases of COVID-19 infections around the county, mortalities, health service facilities, and lacking. We discuss the burdens which Bangladesh faces now such as economical and educational pressures. Finally, certain potential intervention options are discussed in Bangladesh perspective which might be beneficial for the world against COVID-19. The objectives of this review are to summarize the present condition, challenges, and focus on potential medication, including both modern treatments and traditional home therapies to control CoV.

Genetic Structure of SARS-COV-2

CoV encircled single-stranded positive-sense RNA viruses with a diameter of 60 nm–140 nm, which

containing spike-like projections on its surface that giving it a crown-like presence under the electron microscope. For this reason, its name is CoV [7]. They have a typical genome structure that belongs to the cluster of beta-CoVs. It is more than 82% identical to SARS-CoV [4], [8]. The SARS-CoV-2 virus uses angiotensin-converting enzyme 2 (ACE2) of the host cell, as a receptor-like SARS-CoV [9]. In general, this type of CoV recognizes the target cell's equivalent receptor through the S-protein on its surface and enters into the cell for instigating the infection [8]. Wrapp *et al.* also showed by a structural model analysis that SARS-CoV-2 binds with ACE2 with the affinity above 10 folds higher than SARS-CoV [10]. COVID-19 is high in occurrence, and the population is generally susceptible to SARS-Cov-2, which spread rapidly from a single Wuhan city to the entire country within 3 days [8]. Infection of this virus occurs not only through large droplets formed from coughing and sneezing by symptomatic patients but also from asymptomatic people [11]. These droplets spread 1–2 m easily and can remain attached on surfaces. In advantageous conditions, the virus can remain live on surfaces for days but can be destroyed in less than one minute using disinfectants such as hydrogen peroxide, sodium hypochlorite, and so on [12]. Other human infection is assimilated either by inhalation of these droplets or touching the surfaces contaminated by them. The virus is also present in the patient's stool and can pollute the water supply through aerosolization [3].

COVID-19 Pathophysiology

The genome of SARS-COV-2 is similar to a previously identified CoV strain that caused the SARS outbreak in 2003 [13]. Structurally, the SARS CoV has a well-defined composition comprising of 14 binding residues that directly interact with the human ACE2 receptor. Among these amino acids, 8 are conserved in SARS-CoV-2 [14]. Although the precision pathophysiological mechanisms of SARS-CoV-2 are unknown, genomic similarities to SARS-CoV may assist to elucidate the resulting inflammatory response that could lead to the onset of severe pneumonia [14]. Until the laboratory trials initiated, the precise mechanism of SARS-CoV-2 remains hypothetical. All types of CoVs contain specific genes in ORF1 downstream regions that are responsible for encoding proteins for viral replication, nucleocapsid, and formation of spikes [15]. The glycoprotein spikes situated on the outer surface of CoVs are responsible for the attachment and entry of the virus to host cells (Figure 1). The receptor-binding domain (RBD) remain attached loosely among virus, so that, the virus may infect many hosts [16]. SARS-CoV-2 possesses the typical CoV structure with spike protein and also expressed other

membrane proteins, polyproteins, and nucleoproteins [17]. The spike protein of SARS-CoV-2 comprises a 3-D structure in the RBD region for maintaining the Van der Waals forces [18]. The 394 glutamine residue in the RBD region of SARS-CoV-2 can recognize by the critical lysine 31 residue on the ACE2 receptor [19]. The description of the entire pathogenicity mechanism of SARS-CoV-2 from attachment to replication is in Figure 1. ACE2 is a membrane-bound aminopeptidase that has an important contribution to the immune system and cardiovascular. ACE2, a receptor, engages in heart function and the development of diabetes mellitus and hypertension. ACE2 can be a functional receptor not only for SARS-CoV but also for SARS-CoV-2 [20]. SARS-CoV-2 infection is activated by binding the virus's spike protein to ACE2, which is highly articulated in the lungs and heart [20]. SARS-CoV-2 mainly attacks alveolar epithelial cells, which outcomes in respiratory symptoms. Weather, ACE2 is an efficient receptor for SARS-CoV-2, the well-being and potential effects of anti-hypertension therapy with ACE inhibitors or angiotensin-receptor blockers in patients with COVID-19 should deliberate prudently. If patients with COVID-19 and hypertension are taking an ACE2 inhibitor or angiotensin-receptor blocker can be an antihypertensive drug. Patients with COVID-19 are showing high cardiovascular symptoms. ACE2 is extensively expressed not only in the lungs but also in the cardiovascular system. Therefore, ACE2-related signaling pathways might also have a role in heart injury.

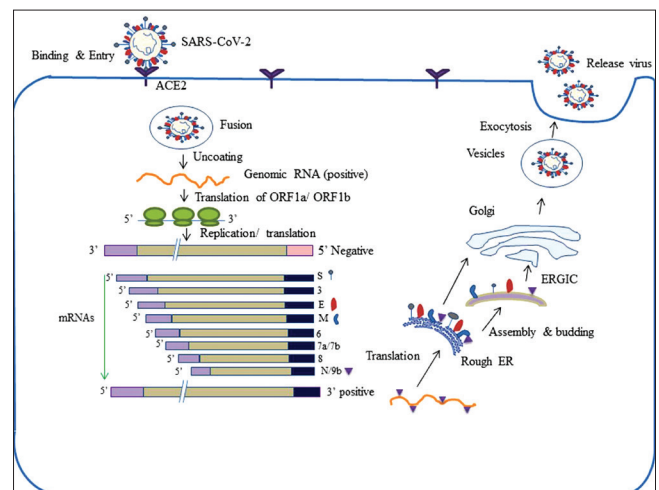


Figure 1: An outline of the life cycle of SARS-CoV-2 in the host cell; the life cycle of the virus starts when S protein attaches with cellular angiotensin-converting enzyme 2 (ACE2). After the ACE2 receptor binding, there happens a structural modification in the S protein which enables the viral envelope fusion with the cell membrane through a route called the endosomal pathway. Then, SARS-CoV-2 releases RNA into the host cell. Genomic RNA is translated into viral replicase polyproteins pp1a and 1ab, which are then cleaved into small products. The polymerase produces a series of subgenomic mRNAs by discontinuous transcription and finally translated into relevant viral proteins. Viral proteins and RNA are subsequently accumulated into virions in the Endoplasmic Reticulum and Golgi and then transported through vesicles and released out of the cell (ACE2: Angiotensin-converting enzyme 2; ER: Endoplasmic reticulum; ERGIC: ER-Golgi intermediate compartment)

Current Situation in Bangladesh

The first patient of COVID-19 identified in the country on 8th March. According to the Health Ministry of Bangladesh, there are almost 368,690 positive cases in the country and 5348 people have died until October 4, 2020. The highest cases appeared in the Dhaka Division (142,741) followed by Chattogram (47,473), Khulna (21,936), Rajshahi (20,158), Sylhet (12,685), Rangpur (12,083), Barishal (8399), and Mymensingh (6471) have been confirmed (Figure 2). A total of 281,656 infected people have been recovered in Bangladesh to date. The mortality rate in Bangladesh is 1.45% and the recovery rate is 76.39% [21]. After identifying the first patient of COVID-19 in Bangladesh on 8th March, it is being dangerous day by day. Not only total cases but also total death number is increasing every day. Every month, the total cases and death rates became more than double until June and then slightly declined (Figure 3) [22].

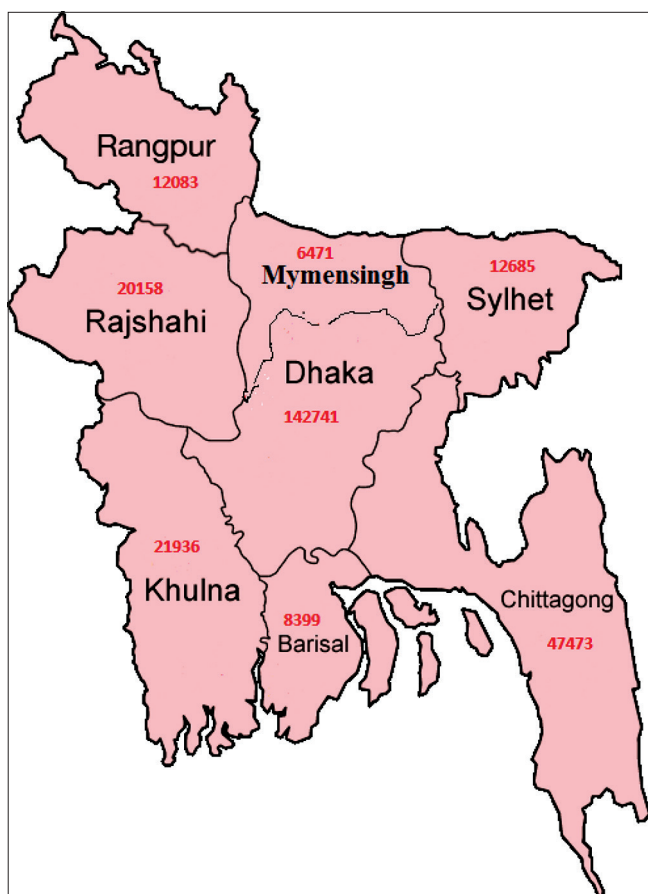


Figure 2: Division-wise COVID-19 cases in Bangladesh

Bangladesh is a dense population country with inadequate resources. The testing or diagnostic facility is limited in Bangladesh. The pandemic has proven to be a big challenge in Bangladesh, as the infectious nature of the virus can rapidly infect a large number of people in any given time or place. Many poor people in Bangladesh are living in different slams; they use a single toilet and bathroom for a large number of people. As CoV is so contagious, so if any person from a slum will be corona

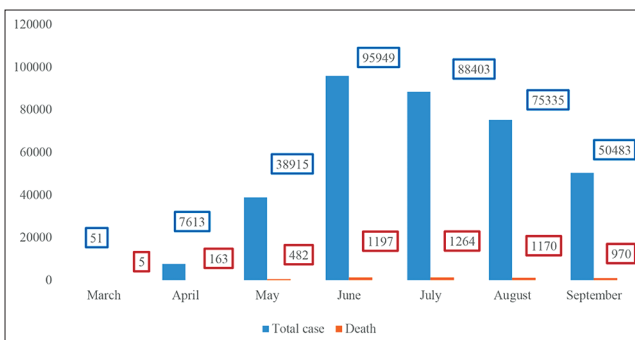


Figure 3: Monthly-wise COVID-19 outbreak in Bangladesh

positive, it will be so dangerous for that slum [23]. There has a large number (836,000) of Rohingya population residing in different camps [24]. Because of the fast infectious nature of the virus, the infection in one of the camps can be disastrous. Bangladesh is currently suffering from the availability of not only the testing kits but also testing labs that are essential for the detection of the virus. It is difficult to have social isolation in the densely packed camps, where several people are residing in a small space and have to rely on the collective effort for their collective survival. Any form of mass infection can be alarming for the rest of the countries.

In Bangladesh, millions of dollars' worth of readymade garments products of many international apparel brands had withdrawn their buying orders from a huge number of companies. It has created a knock-on effect on the Bangladeshi economy. For this reason, many small companies are already closed, and many people became unemployed and their livelihood condition is becoming worsen. The top companies are not recruiting now and reducing their employees. If this situation would run for more time, those people may involve in various crimes and it will be another challenge for the whole country.

Like most of the countries, Bangladesh also closed their educational institutes for more than 7 months to control the COVID-19. This is why nearly 40 million students are now out of institutions. This condition will continue until the epidemic returns to a normal stage [25]. The government is trying to use online or satellite television platforms to deliver education during the pandemic, but it is not enough to meet the complementary levels. Since the price of internet packages is higher, and almost 90% of students do not have any large-screen devices which can help them more in online education. Approximately 75% of people were affected by the decrement of family earnings during the lockdown and also worried about the job of their family members [25]. Many peoples are becoming jobless; most of their monthly payments are decreasing. During the COVID-19, many private companies are giving <50% payment [26]. As a result, the ability to buy nutritious food for their family is declining day by day, which affects their children in various malnutrition diseases. As family income has been decreased, some of the students are forcing to join multiple risky jobs

such as construction, garment-sector, driving bus, auto-rickshaw, and many more. Parents are forcing their girls to marry at an early age [25]. However, there are several non-government organizations that provide free food and necessary things to street children for education. Due to the COVID-19 outbreak, their educational activities have been postponed that may affect their mental development and future growth. Dropped-out students can be involved in any illegal and criminal activities [27].

Facilitation by the Government of Bangladesh against COVID-19

The Government of Bangladesh has taken all necessary measures against the virus, to provide and ensure the responsibilities of the country. Since the 1st day when the first case was confirmed by IEDCR, Dhaka, all the services and measures were used with the extreme capabilities to ensure the safety of life in the region. The government affords COVID-19 extenuation strategies with their measures such as early case detection, tracing and tracking of contacts, social distancing, risk communication, quarantine, and isolation to avoid the spreading of COVID-19 [28]. The Government of Bangladesh has announced several packages to address the impact of CoV. Our prime minister announced several packages for supporting not only the various private export-oriented companies but also for the agricultural sectors so that after this outbreak, the country can overcome the situation as soon as possible. She declared a BDT 5000 crore (emergency) incentive package for paying the salaries and allowances of export-oriented industries' workers and employees [28]. Relief is also ongoing for poor and middle-income people. The test center is also increased with time. Now testing is done in every division of the country. Even though our government is trying so hard to control the outbreak, general people are unwilling to follow the lockdown. Law enforcer agencies are working on maintaining the lockdown properly.

Hospitals for COVID-19 in Bangladesh

Being a populated country, Bangladesh is doing arrangements to fight against the COVID-19. Lots of measures have been taken by the government of Bangladesh to control the outbreak. Many hospitals are working in this scenario, to bring back life and fight against the deadly outbreak of COVID-19 in the country. In the capital territory of Dhaka, there were 12 functional hospitals. In every division, at least one hospital is reserved for COVID-19 patients.

Isolation Beds Facilities for COVID-19 in Bangladesh

Isolation centers are the separation of ill or infected persons from others for preventing the spread of infection. The hospitals use isolation centers for COVID-19 people to keep them safely care and provide a healthy environment to stay mentally and physically strong. According to the Directorate General of Health Services (DGHS), there are 7693 isolation beds in Bangladesh. Among them, 29% is in the Dhaka division, 11% Chattogram, 9% in Khulna, 4% in Sylhet, 15% Rajshahi, 7% in Barishal, and 13% Mymensingh [29]. ICU is not so available in a developing country like Bangladesh. Although there are 190 ICU beds in Bangladesh, and this is not sufficient for a huge country's people (Figure 4) [21].

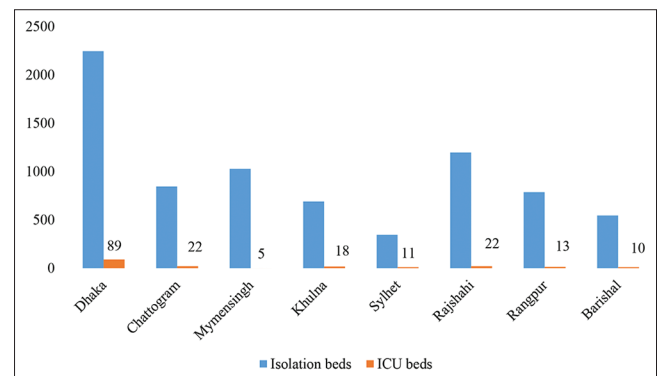


Figure 4: Division-wise isolation facilities in Bangladesh

Division-wise Quarantine Facilities for COVID-19 in Bangladesh

The quarantines, being considered to restrain people's activities who are not sick now but might have been contacted to an infectious agent, such as, COVID-19 with the purpose of monitoring symptoms. The spaces use for quarantine of COVID-19 suspected people was widely distributed in divisions. Until September 2020, 344,660 individuals were kept in home quarantine all over the country; out of them 48% (47,812) have been already safe and released [21]. At present, the number of people in home quarantine has been decreasing and the decrease rate of almost 60%.

Testing and Diagnostic Facilities in Bangladesh

Globally, PCR is used for the COVID-19 test, which is the gold standard method. Bangladesh's government also recommends the PCR test for COVID-19 diagnosis. At present, a total of 109 labs are conducting CoV tests, 63 are located in the capital Dhaka city, and

other 46 labs are situated in the different district outside Dhaka [28]. Samples are collected from the test seekers of these districts are being sent and tested at the facilities lab in nearby districts or in Dhaka [30]. People also can give samples by contacting the lab authorities. In Bangladesh, currently, no rapid testing method is government approved, for example, antigen-antibody testing method. The maximum testing number was around 20,000 samples each day in June month and this is inadequate for an overpopulated (160 million) country. Clinicians and experts suggest vigorous testing for mass-people. Since the outbreak, the country has tested nearly 1,989,664 CoV samples [31]. Government assures that new testing labs will be set up soon across the country with expert opinion.

Social Distancing Maintaining is Tough in Many Areas of Bangladesh

In starting, Bangladesh could not execute any strict restriction, and thousands of people were out on the roads, particularly in Dhaka, which is a megacity having 46 thousand people per square kilometer [32]. It seems that social distancing is really tough while taking public travel and living in the purlieus. In the context of enormously populated and lower-middle-income countries like Bangladesh, the implementation of social distancing which is recommended by the WHO seems to sound fancy but unreasonable. Over 1.1 million purlieu dwellers are living in the capital of Bangladesh, Dhaka [33]. Most children and parents have never gone to school and are living in an extremely close environment, scarcely aware of the threat from CoV. The household income of slum dwellers in Dhaka is around \$100 per month and they use more than 70% of their incomes on food and housing [34]. Even a small pack (400-mL) hand soap, which costs around BDT 80 Taka, is hard for them to buy. Besides, every 10–16 families have access to only a single bathroom and toilet, where there is lacking water supply and poor hygienic conditions [34], [35]. Along with slum dwellers, there are over one million Rohingya refugees are living in Bangladesh, most of them are living in close quarters in refugee camps where the sanitization facilities are not so good [36]. Fear of COVID-19 is already gearing up among those people in these camps. Instantaneous implementation of social distancing is practically impossible in a populated country like Bangladesh.

Clinical Characteristics of Sars-Cov-2 Infection

COVID-19 makes an acute viral infection in humans within 3 days incubation period [37]. The

presenting features of COVID-19 prominent in adults. The clinical features of infection are varied, ranging from an asymptomatic to acute respiratory distress syndrome (ARDS). Sometimes it also shows multi-organ dysfunction [3]. Fever (87.9%), cough (67.7%), and fatigue (38.1%), whereas diarrhea (3.7%) and rarely vomiting (5.0%) are the most common indication of this virus infection [38]. Sometimes patients also experience headaches, myalgia, sore throat, and breathlessness [3]. Most patients had some degree of dyspnea because the onset time of symptoms to the development of ARDS was only 29% [39]. Hence, severe heart damage and secondary infection might happen for patients [40]. There are already some pieces of indication that COVID-19 also can cause damage to other tissues and organs instead of the lung. In a study, researchers reported that 36.4% of COVID-19 patients had neurological manifestations [41]. Furthermore, there are already some indications of ocular surface infection in patients with COVID-19 and SARS-CoV-2 [42]. Some COVID-19 patients have arrhythmia, acute heart injury, impaired renal function, and abnormal liver function (50.7%). A case report of the pathological manifestations of a patient with pneumonia showed modest microvesicular steatosis in liver tissue [43]. Normally the radiographical features of COVID-19 were similar to community-acquired pneumonia caused by other organisms [44]. A recent study stated that most of the patients (90%) had bilateral chest computed tomography (CT) findings. The compassion of chest CT suggests that COVID-19 was 97% combining clinical symptoms and laboratory tests with chest CT imaging features could expedite the early diagnosis of COVID-19 pneumonia. Laboratory examination revealed that 82.1% of patients were lymphopenia and 36.2% of patients were thrombocytopenia. Most of the patients had normal leukocytes, but leukopenia observed in 33.7% of patients [8]. Most of the COVID-19 patients confirmed dominant levels of C-reactive protein, creatinine kinase, and lactate dehydrogenase. The minority of patients showed abnormal myocardial enzyme spectrum, higher transaminase, or elevated serum creatinine [8]. In addition, lower levels of CD4+T and CD8+T, higher levels of interleukin (IL)-6 and IL-10, were present in COVID-19 patients [45].

Potential Treatment of SARS-COV-2

Antiviral Western medicine treatment

At present, COVID-19 patient's treatments are mainly symptomatic. It has been reported that *Remdesivir*, an antiviral drug, can be used as a potential agent against a wide array of RNA viruses. Holshue *et al.* got decent results for the first time using *Remdesivir* against COVID-19 [46]. Meanwhile, analysts likewise

found that *Chloroquine* contains a safe regulating action on COVID-19 patients, which can viably hinder this infection [8]. Clinical preliminaries likewise demonstrated that *Chloroquine* ends up being working for COVID-19 patients [47]. A small indole derivative molecule (Arbidol) found to block viral fusion against influenza A, B, and hepatitis C viruses [48] and also *inveterate* having an antiviral effect on SARS-CoV in cell experiment [49], so it might be a choice for COVID-19 treatment. Apart from the above, neuraminidase inhibitors, *remdesivir*, *lopinavir/ritonavir*, nucleoside analogs, and peptide EK1 could also be the choices of antiviral drugs against COVID-19 [50]. *Baricitinib* might decrease the process of both virus invasion and inflammation. It can be a potential treatment against COVID-19 [7].

Chinese medicine treatment

Chinese medicines are also being used for the treatment of SARS-CoV-2 infection. Numerous traditional Chinese medicine prescriptions are also published by local governments and medicinal institutions. Novel CoV, pneumonia, diagnosis, and treatment plan encouraged clearing lung and detoxification decoction in the clinical treatment [8]. CAS found that Shuanghuanglian oral liquid can inhibit SARS-CoV-2. Previous studies have proved that chlorogenic acid, baicalin, and forsythin in Shuanghuanglian oral liquid have definite inhibitory effects on a variety of viruses and bacteria [51]. These components played a therapeutic role by reducing the inflammatory response of the body. Lianhuaqingwen capsule has been proven to have a wide-spectrum effect on a series of influenza viruses, including H7N9, and could regulate the immune response of the virus [52].

Immunoenhancement therapy

Synthetic recombinant interferon α has proven to be an active treatment in clinical trials for the SARS virus [53]. Interferon is an effective inhibitor of the replication of MERS-CoV [54]. These findings suggested that we can use interferon for treating COVID-19 patients. Moreover, Thymosin alpha-1 (Ta1) can be a promoter for an immune system of SARS patients, meritoriously controlling the spread of COVID-19 disease [55]. Immunoglobulin, intravenous, and Ta1 may also be considered as therapeutics for COVID-19 disease.

Convalescent plasma therapy

Convalescent plasma therapy is a promising treatment that could be an effective way to assuage the course of disease for severely infected patients when no specific drugs and vaccines are sufficient [56]. It is more effective than severe doses of hormonal shock in patients with severe SARS, reducing mortality, and shortening days to stay hospital [57]. From the immunology perspective, most of the patients who

recovered from COVID-19 would produce specific antibodies against the SARS-CoV-2 in their blood and serum. Those antibodies can be used to prevent reinfection. At the same time, those types of antibodies can limit the reproduction of the virus in the acute phase of infection and help to clear the virus, which is satisfactory to the rapid recovery of the disease.

Auxiliary blood purification treatment

According to the latest study, the main target to attack for novel CoV could be the kidney [58]. Most of the severe patients who are positive with novel CoV might agonize from a cytokine storm. Damage of the immune system can occur not only by the imbalance of pro-inflammatory but also by anti-inflammatory factors. Therefore, blood purification technology can be used for eliminating inflammatory factors, removing cytokine storm, adjusting electrolyte imbalance, and maintaining acid-base balance [59]. In summary, the drug treatment for COVID-19, mainly founded on four types of antiviral Western medicine, Chinese medicine, immunoenhancement therapy, and viral-specific plasma globulin.

Nutritional interventions

As no exact treatment is available for this virus, there needs an urgent alternative method to improve our immune system. Some vitamins can protect us from this virus by improving body immunity. Vitamin A could be a promising option not only for the treatment of CoV but also for the prevention of lung infection. Vitamin A and retinoid can block measles duplication, which is an up-regulating element of the innate immune response, making them rebellious to fruitful infection during subsequent rounds of viral replication [60]. Vitamin B plays an indispensable role in the body's immune function. Hence, it should be complemented to the virus-infected patients for improving their immune system [4]. Vitamin C also augments immune functions and guards against CoV [61]. A few analysts suggested that Vitamin C may hold the weakness of the infection of the lower respiratory tract under specific circumstances [62]. The COVID-19 essentially causes contamination in the lower respiratory tract, so we can say Vitamin C could be one of the effective treatments for COVID-19. Vitamin D likewise invigorates the advancement of insusceptible cells [4]. Vitamin D could fill in as another helpful open door for treating the novel virus. Studies found that long-chain PUFAs are significant intermediaries of adaptive immune responses and inflammation [63]. Therefore, Omega-3, including protectin D1, served as a novel antiviral drug that could be painstaking for one of the probable interventions of this virus. In addition, the combination of zinc at low concentrations and pyrithione can inhibit the replication of SARS-CoV [64].

Antiviral role of natural products and their compounds

Right now, exact treatments are accessible for COVID-19 yet, explicit immunizations or medications are not in the markets, and even though trials are ongoing [65]. There is developing proof of the antiviral capability of herbal compounds and medicinal plant extracts [66]. These compounds are bioactive elements and show antiviral properties, efficacy standards, and safety in various reports. Modern pharmacologists already revealed different pharmacological bioactive compounds. Curcumin is the bioactive ingredient of turmeric, which is the best example of phytochemicals with a multi-functional mode of action [67], [68], [69]. In trials, curcumin shows a positive effect, and it can change the structure of the surface protein in viruses, hindering the entry of virus and their replication. Besides, curcumin affects membrane proteins by modulating the characteristics of the host lipid bilayer [70]. In molecular docking, it was proved that curcumin can bind to the target receptors, including SARS-CoV-2 protease, spike glycoprotein-RBD, and PD-ACE2 [71]. Onion and garlic are common sources that are known to have antiviral properties [72]. Notably, onion and garlic are rich homes of organosulfur compounds. Organosulfur compounds such as quercetin and allicin are associated with shame of viral disease [73]. Phytochemicals present in these plants have been functional to obstruct the development of protein and hereditary material in the infection [74], [75], [76]. Onion contains quercetin and kaempferol as main flavanols. These compounds have been found to affect the growth of many viruses [77]. Experiments have proved that garlic extract can minimize influenza A and B viral infections and strong inhibitory effects against the multiplication of the Infectious Bronchitis Virus (IBV), which affect the poultry industry [78], [79]. Similarly, ginger is a common spice and a widely used medicinal plant.

Ginger contains an important antiviral source of compound [80]. Neem (*Azadirachta indica*) is a medicinal plant and its parts such as leaves, seeds, flowers, barks, and routes are widely using in various diseases. Methanolic extract of neem leaves exhibited antiviral activity against herpes simplex virus (HSV) type 1 infections by inhibiting HSV-1 glycoprotein mediated viral fusion [81]. Nimbolide is an active constituent of the Neem tree explored as a pharmacological modulator in treating various diseases. Tumor necrosis factor (TNF)- α is a pleiotropic cytokine involved in the activation of different signaling cascades and this cytokine might be playing a role in respiratory failure associated with COVID-19 mediated pneumonia. Nimbolide is found to be a TNF- α inhibitor and also suppresses the nuclear translocation of p65 NF- κ B and HDAC-3 and inhibited the cytokine storm observed in ARDS experimental model [82]. Thus, it might show beneficial effects in SARS-CoV-2 infections by direct antiviral activity or indirect supportive therapy by controlling the inflammatory cytokine storm. This natural

product may have clinical significance in inflammation associated with viral diseases. The other natural product Withaferin A is isolated from Ashwagandha (*Withania somnifera*) and widely used to treat various diseases like COVID 19. It has shown the antiviral activity against HSV-1 and 2, which may show plausible effects against COVID-19 [83].

CRISPR-Cas technique

Genome editing (CRISPR) could use for the treatment of this CoV, but this technique can only edit or target DNA [84]. Whether a new RNA-targeting CRISPR systems design is possible, it will be conceivable to treat this virus. In an outstanding new resource for the scientific community published in Nature Biotechnology, researchers in the lab at the New York Genome Center and New York University have developed a new kind of CRISPR screen technology to target RNA. They categorized the CRISPR enzyme named Cas13 that can targets RNA instead of DNA [85].

Potential Treatment in Bangladesh

Although the vaccine is the ultimate solution for COVID-19 management, it is not possible to get on time. Drug repurposing has become a promising approach for reducing the timelines of new drug development, cost, and making the treatment strategy easy [86]. At the initial stage of covid-19 infection and before starting community transmission in the country, Bangladesh government has given the approval to use certain potential antiviral drugs in fighting the CoV. These drugs are remdesivir [46], [87] and favipiravir [88] which have efficacy against viruses. Anti-parasitic medicine named ivermectin was also trialed on COVID-19 patients between 40 and 65 years olds. Bangladesh-based International Centre for Diarrhoeal Disease Research (ICDDR'B) has conducted the safety and efficacy of anti-parasitic medicine ivermectin in combination with antibiotic doxycycline or ivermectin alone. They found that initially the combination showed efficacy and cured all the COVID-19 patients who were administered with the drugs [89]. Hydroxychloroquine is a debatable drug for CoV and was trialed on COVID-19 patients. An observational study that was trialed in Bangladesh showed a combination of hydroxychloroquine and antibiotic azithromycin can reduce the mortality rate. The patients were given standard of care and administration of hydroxychloroquine and azithromycin. According to this finding, out of a total of 33 patients, 1 patient died at days 4 after admission, and the rest patients recovered [90].

Conventional or traditional home remedies are also playing a vital role alongside modern treatment to

combat this virus and boosting the immunity of patients. Natural products such as spices in Bangladesh such as ginger, garlic, onion, clove contain phytochemicals, and bioactive compounds have antiviral activity against many viruses. Garlic, turmeric, ginger, cinnamon, black pepper, and honey were reported to be used in Pakistan as home remedies against COVID-19 [91]. Leaf extract of holy basil, black cumin seeds, juice of lemon, and sliced rhizomes of ginger was supplemented with slightly hot water to COVID-19 patients and found a positive effect [92] in Bangladesh. Holy basil is very popular as a medicinal plant and the antiviral activity of this plant has been reviewed [93]. Lemon contains Vitamin-C and enhances body immunity. Although *Citrus limon* was reportedly showed antiviral activity against different viruses, this food item should be taken to boost up immune system [94]. Tea is a popular hot drink in Bangladesh and East Asia. About 65 biomolecules of tea plants have been evaluated by bioinformatics tools (molecular docking) for their binding affinities to the main protease (Mpro) of the SARS-CoV-2 virus, which is considered the main target for the development of antiviral drugs [95]. Drinking tea alone or together with spices may protect from COVID-19 by improving defense mechanism. In this case, natural products and their home remedies could be an alternative option indirectly to improve immunity and protection from CoV in Bangladesh and worldwide.

Conclusion and Future Prospects

The current scenario of Bangladesh is not satisfactory because daily cases are more than a thousand still now. Bangladesh is a much-populated country that requires more facilitation. Bangladesh is a lower-middle-income country where the financial position is not better as compared to China, the USA, UK, and Russia to combat with COVID-19 outbreak. The number of quarantine and hospital facilities is not fulfilling as required. If these medical facilities can be improved, it would not be difficult to control the transmission of CoVs and the treatment of patients. At present, the testing facilities are much lower than the required target. The testing facilities could augment by 5-10 folds. Bangladesh needs more screening facilities for the arrivals as well as for the departures.

We should take the right steps to control the situation worst such as staying at homes as much as possible, maintain lockdown and social distancing, use sanitizers, facemask, and PPE when necessary. Moreover, people should uptake Vitamin-C and dietary supplements to increase immunity boosting. We hope that Bangladesh will overtake the COVID-19.

Authors' Contributions

Both authors equally contributed to this work.

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