



Review

A Short Review on the Covid-19 Situation in Bangladesh: Current Perspectives

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Abstract: During the current coronavirus disease (COVID-19) pandemic, extensive progress in clinical and immunological research on the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) as well as epidemiological surveillance is ongoing around the world. Indeed, halting the enduring spread of this virus has become the most important issue around the world from a public health perspective. Bangladeshi people are at high risk of SARS-CoV-2 infection since a number of circulating variants of the virus have been evident in this country. In order to mitigate SARS-CoV-2 from Bangladesh, primarily the curative preparation besides remedial action like self-isolation, social distancing, lockdown strategies are essential to avoid community transmission. Some of the major healthcare infrastructure challenges in Bangladesh project from the highly centralized healthcare system; weak regulatory and governance structures; difficulties in the institutional healthcare management by the Ministry of Health and Family Welfare (MoHFW); lack of private sector based healthcare management system regulation; and the disparity of the healthcare facilities/medical equipment. Development of the health sector's infrastructure to a global level ensures rapid and accurate diagnosis. Besides, the sound treatment facilities of the severe COVID-19 patients, as well as the vaccination of the total population of the country with appropriate vaccines are needed. Further work for the improvement of the COVID-19 situation in Bangladesh needs flawless analysis of the emerging variants of the SARS-CoV-2 as well as understanding their pathophysiology in order to select the appropriate clinical treatment. Based on these parameters, the present review discussed the essential issues based on the recent literature published on the COVID-19 situation in both local and global aspects.

Keywords: severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), Bangladesh, COVID-19

1. Introduction

Perturbation of the global public health in an apparently frequent manner by the respiratory viruses has a story of more than 100 years starting from Russian influenza (1889-1892) with the descending Spanish flu pandemic (1918-1920), followed by Asian Influenza and Hong Kong Influenza in 1957 and 1968, respectively; then in 2002-2003, the epidemic of the Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV), the endemic of the Middle East Respiratory Syndrome Coronavirus (MERS-CoV) in 2012; and the currently ongoing SARS-CoV-2 pandemic (starting from December 2019 till date) caused by SARS-CoV-2 causing 4,777,503 deaths out of 233,503,524 affected cases so

far around the world [1-5]. The lethality of the coronaviruses has been studied extensively [6-10]. A number of reports on the SARS-CoV-2 infectivity and pathogenesis, aspects of the host protective immunity, viral genomics, ecology and transmission dynamics, and the SARS-CoV-2 mitigation strategies mainly involves (1) preventive cares like isolation/quarantine/lockdown strategies; (2) use of the repurposed drugs (remdesivir, chloroquine/hydroxychloroquine, favipiravir, lopinavir, ritonavir, arbidol, ribavirin, etc.) based on *in silico* modeling, cell culture, animal model studies and patient trials; (3) vaccine development including the ongoing commercial vaccines in use as well as the ongoing clinical trials; (4) and most importantly, studies on the emerging variants of SARS-CoV-2, which have been published [11-15].

Along with SARS-CoV, MERS-CoV and SARS-CoV-2, causing severe lung diseases; the other human coronaviruses including HKU1, NL63, OC43 and 229E are also associated with mild symptoms of the disease [3, 4, 6]. The lethality of SARS-CoV-2 over the SARS-CoV and the MERS-CoV has so far been extrapolated from (1) their Spike (S) proteins consisting of the Receptor Binding site (RBD) that interacts with the human Angiotensin-Converting Enzyme 2 (hACE-2) mediating the viral entry into the host; (2) their escaping strategy from host protective immunity especially from the host Interferons (IFNs) that are responsible for generating the antiviral state; (3) onset of the immunopathology triggered by the cytokine storm (i.e., the increased levels of cytokines and chemokines as well as monocytes, macrophages and dendritic cells); and (4) the emerging variants including the first SARS-CoV-2 variant (with a single D614G mutation, causing the shift of aspartate to glycine at 614 position in the spike protein) [5, 13]. After the commencement of SARS-CoV-2 in Europe in early February, and the Variants of Concern (VOCs); i.e., the United Kingdom (UK) variant comprising B.1.1.7 lineage, the B.1.351 lineage (501Y.V2) variant in South Africa, the B.1.1.248/B.1.1.28/P1 (501Y.V3) variant in Brazil, the Indian variant of VUI-202012/01 of B.1.1.7 lineage, and the variant in California, namely B.1.427/B.1.429 lineage, the current antiviral drugs and vaccines may raise the question of their effectiveness [5, 13-16]. The variants may enhance the transmissibility, evoke the degree of pathogenicity, and may therefore reduce the effectiveness of the commercial vaccines like the mRNA-1273, BNT162b2, ChAdOx1/AZD1222, Sputnik V/Gam-Covid-Vac, etc. [5, 11, 14-16].

In such a shattering global public health caused by SARS-CoV-2, the COVID-19 situation in Bangladesh demands thorough studies as the country has a high population density with the huge lack of awareness on maintenance of proper hygiene, of concept on the necessity of self-isolation and quarantine, and with the reluctance to the lockdown, etc. The initial three SARS-CoV-2 positive cases were identified in Dhaka on 8th March, 2020 by the Institute of Epidemiology, Disease Control and Research (IEDCR) and since then, 1,556,758 confirmed cases of COVID-19 with 27,531 deaths have been reported to the World Health Organization (WHO) so far [16-19]. Till 27th September 2021, a total of 48,139,752 vaccine doses have been administered [17]. An extensive sequencing and phylogenetic work conducted by Hasan et al., 2021 showed that SARS-CoV-2 viruses might have transmitted into Bangladesh through the infected travelers from the European countries whereby the D614G mutation in Spike (S) glycoprotein had been noticed to be significantly high (98%) in the Bangladeshi SARS-CoV-2 isolates [18, 19]. The group detected the high number of mutations in the ORF1ab, S, ORF3a, M, and N protein encoding genes within the G614 variants; and also concluded the high prevalence of mutations, such as R203K, D614G, G204R, P4715L and I300F at protein levels. Thus, the SARS-CoV-2 variants might circulate across the whole country [18].

Unfortunately, the medical settings like the Intensive Care Unit (ICU) and oxygen supply for the severe SARS-CoV-2 patients are also relatively inadequate for the huge population even in the capital, Dhaka of Bangladesh [16]. Surprisingly, the majority of people across the country is still unaware of the COVID-19 fatality that may render its public health situation dreadful due to the emerging variants of SARS-CoV-2 as well as the insufficiency of vaccination. Along with this rationale, the present review focused on the ongoing second wave of SARS-CoV-2 in Bangladesh with the possibility of propagation of the SARS-CoV-2 variants within the mass population.

2. SARS-CoV-2 trend in Bangladesh till the third week of February 2021

The health management system in Bangladesh is relatively weak compared to those in developed countries. The resource-poor settings, for example, approximately 5 physicians, 3 nurses, around 9 hospital beds for 10,000 people, are indeed insufficient for general treatment purposes; and the situation is extremely meager when it has been estimated

that the facility has only 7 ICU beds and only one ventilator for every one million people, which made the clinical management of the SARS-CoV-2 patients very tough [19]. Moreover, the Personal Protection Equipment (PPE) is still not enough to cover the total demand; nevertheless, there are enough masks.

Another major problem is the insufficiency of molecular diagnosis as well as the pathophysiological and epidemiological interventions of the disease. Aside from the facilities for testing a nasopharyngeal swab for SARS-CoV-2 nucleic acid using a Real-Time Polymerase Chain Reaction (RT-PCR) assay, SARS-CoV-2 antigen tests, antibody testing, etc. are scanty in the medical settings of Bangladesh, resulting in a very low number of tests of the SARS-CoV-2 suspected individuals per day. Therefore, the actual number of SARS-CoV-2 positive cases clearly remains lower than the number that comes up with social media. However, one interesting point to ponder is that as of October 2020, around 20% of people were detected positive for SARS-CoV-2 infections from the total number of individuals tested, which was quite high in comparison to the statistics from other countries [18-20].

A careful weekly intervention of the positive cases reveals that, at the end of March 2020, the confirmed SARS-CoV-2 positive cases were 40, then increased to more than 25,000 by June 2020 followed by a decrease within the first week of October (around 9,500), and again increased up to approximately 15,000 in the last week of November followed by a gradual decrease till the third week of February (around 2,700 cases) [17]. A comparatively sharp increase in SARS-CoV-2 positive cases was noticed within the first week of March and the first week of April of 2021 reaching more than 48,000, which again started to decrease after the 2nd week of April; and as of May 17, the confirmed cases were found to be 6,902 [17]. Therefore, the confirmed cases peaked three times; i.e., (1) on June 29, 2020 the SARS-CoV-2 positive cases were 25,701; (2) on November 23, 2020 the positive cases were 15,338; and (3) on April 5, 2021 the highest positive cases of 48,660 were noticed [17, 20]. This is to be noted that within October 2020 the SARS-CoV-2 cases spread over all districts of the country among Dhaka, Narayanganj, Gazipur and Chattogram districts, which have showed the high prevalence of SARS-CoV-2 [19]. So far 27,531 people have died of SARS-CoV-2 in Bangladesh out of 1,556,758 affected cases [17].

3. Major aspects for the mitigation of SARS-CoV-2 in Bangladesh

3.1 Development of health care logistics

In the year 2020 up to October, the insufficient amounts of PPE and the inadequate real-time RT-PCR test facilities were the main challenges encountered; and very unfortunately, 92 physicians died of SARS-CoV-2 in Bangladesh during that period [19]. If SARS-CoV-2 infected individuals remain asymptomatic and remain undetected due to the lower number of tests under the circumstances of resource-poor settings, the true data on the fatality of the pandemic in Bangladesh will not be available. Therefore, the number of tests for the suspected and asymptomatic individuals should be increased, the rapid test protocol (antigen or antibody-based test) needs to be developed and is yet to be used in Bangladesh for being diagnostic of SARS-CoV-2 [19]. The extreme crisis of ICU beds (approximately 1000 in the whole country) and ventilators also needs to be solved immediately in order to ensure the recovery of the severely infected patients [19-22]. It is to be pondered that the work on such deficiencies is undergoing in the country, which is expected to improve the SARS-CoV-2 management. Also, this is worth mentioning that the number of health workers including physicians and nurses must be increased [19].

3.2 Curative preparation besides remedial action

Considering the low socio-economic state that many of the people are suffering in Bangladesh, high population density, lack of general knowledge and consciousness on the diseases, lack of awareness on disease transmission possibilities within a community, and most importantly, due to the variations of availability of vaccines depending on locations or a complete condition of vaccine unavailability, preventive measures like social distancing, strict lockdown strategies, self-isolation, quarantine, shutting down all educational institutes and the offices, restricting all sorts of the public gathering are very essential to mitigate such pandemic [22]. Indeed, from the mid of March 2020, Bangladesh government implemented the lockdown with a defined time span, which still has been continuing that; and started publicizing the COVID-19 case information through social media. The educational institutes are totally closed to

date. One important point is to ponder that the daily labourers who cannot stay at home due to the need for their daily earnings need to go out every day; and they are very likely to be attacked by SARS-CoV-2 infection. The Bangladesh government has been helping them as much as possible during the span of the strict lockdown. Nevertheless, the reluctance to the lockdown and the unnecessary gathering of people have been noticed, which is not unlikely to be observed among many other countries as well.

The concept of curative preparation besides remedial action (regarding the implementation of lockdown/self-isolation/social distancing, etc.) and the pharmaceutical interventions of the pandemic has been well explained by some defined mathematical modeling rules describing the SARS-CoV-2 transmission dynamics in a community based on the certain parameters like the susceptible and asymptomatic population, including both the infected and recovered population, and on the isolated infected individuals and the quarantined susceptible population [22]. The implementation of such research would be feasible to analyze and to predict the possibility of further transmission of SARS-CoV-2, which would be helpful for the population or within a situation whereby the vaccination or other pharmaceutical approaches are not possible [23-25]. The major challenge of such curative preparation besides remedial action has been noticed within immigrants in Bangladesh who are unwilling to follow the appropriate social distancing and quarantine, which in turn increased the community transmission of SARS-CoV-2. Although the Government of Bangladesh has taken substantial awareness-raising campaigns on the preventive care during the pandemic, and implemented several measures including the nation-wide lockdown, the announcement of public holidays, etc., still a large number of people are getting affected by SARS-CoV-2 infection as most of them are not following the instructions properly. Hence, strict regulation on such social distancing and lockdown should be brought up as a national security measure.

3.3 Requirements for constant study of the SARS-CoV-2 variants in Bangladesh

The top priority during vaccination should focus on the hindrance of viral transmission [8, 10, 11]. However, Bangladesh, being a country with high population density, it is not always possible for the Government to ensure the mass safety unless the people are aware by themselves; i.e., in perspective of maintaining the social distance, implication of quarantine and self-isolation as and when necessary. Due to the viral transmission, the affected cases could go up and make the situation more drastic. As transmission occur, the possibilities of the spread of new SARS-CoV-2 variants may increase [5, 12, 15, 16]. Bangladesh has already faced a blow when the neighboring country, India was hit by the Delta variant of SARS-CoV-2; and when people crossed borders regularly due to business, medical and other purposes. Given the circumstances, they introduced the variant in Bangladesh, which resulted in thousands of deaths as confirmed by the public health officials of Bangladesh.

In July 2020, according to a study, 353,341 mutations were noticed out of 48,635 SARS-CoV-2 genome sequences around the world, which were analyzed and annotated against the reference genome sequence of Wuhan SARS-CoV-2 strain [26]. Interestingly, the study showed that the genome sequences of SARS-CoV-2 strains from India, Congo, Bangladesh, and Kazakhstan have slightly high but significant numbers of mutations per sample in comparison to the global average [26]. From that time, the D614G mutation carrying strain was prevalent in India; and also, in Europe, Oceania, South America, Africa, and the Middle East [26]. A recent phylogenetic study conducting the comparison between 371 whole-genome sequences from the isolates of Bangladeshi SARS-CoV-2 patients, and 467 global sequences of SARS-CoV-2 isolates from the patients of Asia, Africa, Europe, Australia and North American countries, identified a total of 4,604 mutations among the 371 Bangladeshi SARS-CoV-2 genomic sequences, extrapolated the circulating variants with Unique Mutations (UMs) in Bangladesh geospatially, and concluded that 98% of SARS-CoV-2 strains in Bangladesh have D614G mutation, which is also prevalent in the world especially in Europe [27].

3.3.1 Comparison with COVID-19 conditions in other countries

As stated earlier, the emerging variants of SARS-CoV-2 may render the current vaccines ineffective by avoiding the inductive immunity generated by those vaccines. The B.1.1.7 variant (VOC 202012/01 or 20B/501Y.V1), first identified in the UK in December 2020, having the mutations within the spike proteins was observed to spread very rapidly and pose 3-fold higher viral loads among the infected individuals with the strain carrying N501Y (located in the RBD domain of the spike protein); and as it is reported by early February, 2021 this variant was detected in 64 countries [12]. The South African Variant B.1.351 (20H/501Y.V2), identified in December 2020, may prevent the antibody

function in hosts [11, 12]. It is to be noted that B.1.351 and B.1.1.7 variants share the N501Y mutation and have a high re-infection potential [10, 13]. This is also investigated that a clinical trial evaluating AZD1222 (AstraZeneca/Oxford) vaccine, which has been administered to the Bangladeshi people, did not show protection against SARS-CoV-2 due to B.1.351 variant [10-13]. The B.1.1.248/B.1.1.28/P1 (501Y.V3) variant of Brazil, detected in early January 2021, became the dominant circulating strain, which caused a 6-fold higher infection than the affected cases in December 2020 [10, 23]. The Indian variant, B.1.617 (VUI-202012/01 of B.1.1.7 lineage), a major reason for the second wave of SARS-CoV-2 in the country, has rapidly spread throughout India and to several countries, and has been reported to partially evade the neutralization by the antibodies elicited through the immunization with the BNT162b2 (Pfizer-BioNTech) vaccine [13, 24]. In such circumstances, constant surveillance of the new strains by genome sequencing is a mandatory task for the relevant scientists of Bangladesh. Moreover, as the variants continue to evolve, it's important to screen how the mutations within the spike protein influence the viral resistance against the neutralizing antibodies besides the assessment of the viral transmission dynamics and the effectiveness of vaccines against the possible variants.

The epidemiological study of the variants, noting the immune escape mechanisms by the variants would improve the knowledge on the propagating viral strain, which in turn may be helpful not only to import the correct vaccines but also to warn the mass people about the dreadfulness of SARS-CoV-2 spread. Such studies will be helpful for the assessment of vaccine efficacy as well. In this context, the constant use of the public database of the Global Initiative on Sharing All Influenza Data (GISAID) along with associated bioinformatics is mandatory because of their efficiency and accuracy to identify clades of SARS-CoV-2 so that the origin and all the variants can be subsequently detected [25-27]. The fatality rates or the transmissibility can be efficiently predicted if the pathogenesis of the variants and the virulence of each strain are well understood by such comparative genomic analysis, which can be further annotated and compared with the epidemiologic data from other countries [26, 28]. Identification of the demographic risk factors investigating the SARS-CoV-2 transmission, on the basis of spatial and statistical modeling, would be another research-based step to intervene in the potential risk factors for the SARS-CoV-2 transmission in Bangladesh [29]. A recent study involving the spatial lag and spatial error model and non-spatial/classic model regression analysis showed that the population density (such as in Dhaka and Narayanganj) was a vital parameter for the propagation of the virus in Bangladesh [29].

However, it is worth noting that the Bangladesh government has taken a very effective effort to vaccinate its population. The SARS-CoV-2 vaccination started on the 27th January 2021 in Bangladesh. As of the 2nd September, the total doses (both single and double) of vaccines from different platforms (the traditional platforms, adenovirus vectored vaccines and the mRNA vaccines have been given to 18,746,000 people, of which 7,891,624 million people have been fully vaccinated with the corresponding two doses, which accounts for 5.1% of the total population [30]. In addition, as mentioned earlier, a total of 48,139,752 vaccine doses have been administered till 27th September 2021 [17].

4. Conclusion

The present review discussed the prevalence of COVID-19 in Bangladesh as well as the possible remedies in order to fight against the dreadfulness of the transmissibility of the SARS-CoV-2 and its variants. The health care logistics have been described based on the recent reports; and the gaps have been identified. According to the current rate of viral transmissibility across the globe along with the emergence of the variants of the SARS-CoV-2 in Bangladesh, the current pandemic situation may get worse if appropriate measures are not taken and the extensive research on the different aspects of SARS-CoV-2 is not conducted. Besides, improvement of the health sector in terms of settings/logistics; i.e., increasing the ICU beds, ventilators, PPE, vaccination scope, etc. and meanwhile establishing a sound and skilled administration with technical expertise, are indispensable. Most importantly, public awareness on the necessity of social distancing and obeying to the norms of lockdown as well as ensuring the appropriate vaccination of at least 70% of the population is of utmost importance.

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Conflict of interest

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