Chapter 6
COVID-19 Under Origin and Transmission: A Data-Driven Analysis for India and Bangladesh

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Abstract The coronavirus disease 2019 (COVID-19) is an exceptionally contagious and pathogenic viral disease brought about by the SARS-CoV-2 infection that was first detailed at Wuhan, China, and later it spreads everywhere throughout the world. It was a severe acute respiratory syndrome (SARS)-like virus, and the primary host of this virus is bats, revealed through genome analysis. The intermediate medium between human and bats is still unknown, and it is quite contagious, resulting in rapid spreading of this disease. All things considered, there are no clinically endorsed medications or antibodies for this sickness, yet a few precautions and staying away from close contacts are suggested. The number of COVD-19 confirmed cases is rapidly increasing with higher mortality rates, more than other epidemics that occurred in the last century although it still fluctuates. We will analyze the COVID-19 outbreak situation considering confirmed cases, recoveries, mortality rate percentages, etc. India and Bangladesh are two geographically important countries, and we will also analyze the COVID-19 situation for these two countries either with similarities or differences.

Keywords SARS-CoV-2 · Coronavirus · COVID-19 · Transmission · Comparison · India · Bangladesh

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6.1 Introduction to COVID-19

An infectious disease called coronavirus disease 2019 (COVID-19) was first recognized in December of 2019 in Wuhan City of Hubei territory, China [1]. The disease is brought about by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The principal confirmed instance of COVID-19 was on November 17, 2019, in Hubei, China, and till July of 2020, about 15 million people all over the world have been reported with some shocking statistics of about 616,000 deaths. This communicable disease has basic side effects incorporating fever, weakness, cough, loss of smell and taste, and windedness [2]. Be that as it may, in most of the cases, mild indications are seen with the beginning time presentation of 5 days, ranging from 2 to 14 days. The SARS-CoV-2 spread through close contact and most often through small droplets produced by sneezing, coughing, etc. [3]. It is most contagious at the first 3 days of onset of symptoms, and gradually it loses its contagiousness. Real-time reverse transcription polymerase chain reaction (rRT-PCR) is the most standard diagnosis process for this contagious virus although it gives false negatives sometimes [4]. Chest CT can also be used to diagnose this infectiousness of this virus, but rRT-PCR gives a much better result than chest CT. To prevent the infection, wearing a mask, hand washing, maintaining physical distance from others, maintaining quarantine, etc., are some recommended tasks. Since July 2020, no vaccines have been recommended, so prevention is the one way left, although about four vaccines are in phase III trial in different territories of the world [5].

The World Health Organization (WHO) declared COVID-19 as a world pandemic on March 11, 2020 [1]. It spread in over about 168 countries or territories of the world, shifting its epicenter from China and Italy to Europe and the USA. In South Asia, its fatality rate is low than the other regions of the world. In India, the first case of confirmed COVID-19 was on January 30, 2020, and till July 2020, about 1.2 million cases have been confirmed [5]. The fatality rate is about 2.8% where the global fatality rate is 4.3%, and about half of the confirmed cases are from the popular cities of this country [6].

On another side, Bangladesh got the news of its first case confirmed on March 8, and till July, this virus has spread over the country with many about confirmed 215,000 COVID-19 cases and 2750 deaths [7]. To prevent the spread of this SARS-CoV-2 virus, both the neighboring countries India and Bangladesh followed the most appeared options like other countries of the world, to lock down the most possible epicenters of these countries. Also, a few additions of lockdown time and places results in around 3–5 months lockdown, in certain location as yet continuous and lockdown over the nation. Since there are no pharmaceutical interventions, prevention is the way to keeping a lower transmission, and that is the reason behind choosing lockdown.

The goal of this chapter is to analyze the present statistics of COVID-19 transmissions in these two neighboring countries, India and Bangladesh.

6.2 Literature Review

At the end of December 2019, the World Health Organization (WHO) was informed by China's health authority about some cases of pneumonia of unknown etiology. All the cases were from Wuhan City in Hubei Province and around a local seafood market called Huanan [8]. On January 7, 2020, the novel coronavirus was identified, and the WHO renamed the virus as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and the disease as coronavirus disease 2019 (COVID-19) [9, 10]. On Jan 30, the WHO declared the COVID-19 outbreak situation as a Public Health Emergency of International Concern (PHIEC) since it spread to about 19 countries with a mortality rate of 2.1% [11, 12].

The new infection is from the group of *Coronaviridae* and order *Nidovirales* [13]. It is a pathogenic infection that is encompassed with spike and named a positive-sense abandoned RNA (+ssRNA) infection [14]. Utilizing the genome groupings of SARS-CoV-2, contemplates propose that bats may be the first host of this infection [15]. Be that as it may, bats are improbably liable for the transmission of the infection to people since the Huanan Seafood Wholesale Market does not sell bats, and in the past cases, there was a middle of the road have each time [16, 17].

For example, the Nipah infection in Bangladesh was communicated through bats shedding into crude date palm sap [18]. In another genomic study and bunches of contaminated relatives, clinical specialists affirmed the nearness of individual-to-individual transmission [19, 20]. It happens for the most part through close contacts and little beads created by a tainted individual through hacking or wheezing [2]. The normal side effects that happen for this disease are fever, hack, weakness, windedness, and loss of smell and taste [21, 22]. The asymptomatic transmission likewise identified later with mellow manifestations and now and again, no indications [23].

An investigation establishes the mean hatching time frame was 5.2 days [17] with the most elevated number of 19 or 24 days, albeit the greater part of 14 days [24, 25]. The essential generation number R_0 (shows the job of spreading) for this sickness has been determined as 3.28 [26]. The ailment frequently happens in grown-up male patients with the middle period between 34 and 59 years [12]. It is additionally risky for individuals with incessant comorbidities, for example, cardiovascular and cerebrovascular illnesses and diabetes [27]. Nearly less cases are found in youngsters under 15 years of age [12].

Surveillance is significant for such an infectious SARS-CoV-2 infection to watch its future host variation, viral development, infectivity, contagiousness, and pathogenicity. Auxiliary examination proposes that SARS-CoV-2 may utilize receptor angiotensin-converting enzyme 2 (ACE2) to enter the cells [12, 28]. Promptly, after tying to the open receptor, SARS-CoV-2 enters the cells and appearances the sheltered response [12], and patients face the referenced most basic indications. Some more uncommon indications are migraine, dazedness, stomach torment, looseness of the bowels, queasiness, and spewing [29].

To control the spreading of COVID-19, an enormous measure of testing is required, and for the finding, a constant real-time reverse transcription polymerase

chain reaction (rRT-PCR) process is utilized. Be that as it may, case definitions change after some time and in nations [12]. For the patients meeting indicative models are tried for COVID-19 and test, examples are gathered from the upper respiratory plot (nasopharyngeal and oropharyngeal swab) and if conceivable, lower respiratory lot (sputum, tracheal suction or bronchoalveolar lavage) [30]. Since there is no particular antiviral treatment for COVID-19, seclusion and steady consideration incorporating oxygen treatment, liquid administration, and antimicrobials for auxiliary bacterial diseases are suggested [31].

Currently, no immunization is accessible, yet around four antibodies are in stage III trials and are expected to come in the market before 2021 [32]. Albeit, an antibacterial medication named remdesivir (produced for Ebola virus) has been utilized to treat COVID-19 cases in the USA [33]. To control the spread of COVID-19, unique methodologies ought to be actualized in medicinal services settings. Applying emergency and right disease control measures, segregating the cases, and contact tracing are the ways to restrict spreading [34]. Confining contaminated individuals is the essential measure to interfere with transmission. Locking down is one of the prompt activities taken by various nations which eased back the worldwide spread of COVID-19 [35].

The first case of COVID-19 in India was detected in January 30, 2020, which originated from China. In July there are about 1.2 million confirmed cases, the largest number in Asia and the third highest in the world after the USA and Brazil. India's case fatality rate is 2.41% in July, lower than the other countries of the world, and is steadily declining. The recovery rate for India is about 63.18%, and this progress occurred as a result of several locking down steps. Although from June, they started unlocking the country [6].

On account of Bangladesh, the initial three cases were affirmed on March 8, 2020, by the Institute of Epidemiology, Disease Control, and Research (IEDCR). From that point the pandemic spread step by step over the nation, and in July, there are a sum of 2.12 million confirmed cases with 115,000 recuperations and 2700 deaths. Bangladesh is the third most influenced nation in South Asia and seventeenth in over the world. Clinical specialists questioned about insufficient testing here in Bangladesh and extra death of patients with COVID-19 manifestations. Bangladesh announced to shut down from 23rd March 2020 and it proceeds over July. Bangladesh faces noteworthy difficulties to confront the COVID-19 as it is a thickly populated nation and is furthermore a place of a million stateless Rohingya outcasts. It additionally has a critical transient populace living in Italy, an extreme COVID-19-infected nation [7].

6.3 Analysis of COVID-19 and Discussions

At the beginning of this outbreak, the number of confirmed cases doubled every 7.5 days approximately [17]. The virus spread over the Chinese provinces through New Year migration, and as Wuhan is a transport hub, there was major rail

interchange [36]. On January 31, Italy had its first confirmed case from China, and on March 13, Italy and Europe were the active center of this pandemic [37]. The first case of COVID-19 in the USA was confirmed on January 15, and on March 26, the confirmed cases reach on the peak than any other countries [38]. The epicenter of this COVID-19 pandemic moved in several places across the world since it started.

The information clearly states the pandemic outbreak situation of COVID-19 disease: spreading, transmutability, characteristics, etc. More than 20 million people had been confirmed COVID-19 positive with a huge case of about 0.7 million deaths till July 25. Figure 6.1 describes the outbreak trend all across the world, specifically the rising amount of confirmed cases. The curve is smoothly increasing concerning the time which points out that the total confirmed cases of COVID-19 across the world are increasing from the start of this outbreak. And it may now follow a linearly increasing trend.

This pandemic occurred in China, and then it moved its epicenter from China to Europe. A huge amount of patients were confirmed through Europe and later in the USA. Although it started in China, it is now out of the top ten countries of the confirmed list with the highest number of active COVID-19 cases in the world. The USA still keeps the peak position of confirmed cases with several actions taken by the US government. Brazil holds the second highest position of confirmed cases, following the USA. And India is very close to Russia, the third highest confirmed case holder across the world. Besides these four countries, the UK, Peru, Chile, South Africa, Mexico, and Iran are the other countries from the top ten with most COVID-19 confirmed cases as on July 27, 2020. Figure 6.2 displays the top ten countries with most COVID-19 confirmed cases.

Active cases are the reduced number of confirmed cases by death and recoveries. Active case comparison shows the situation of the pandemic in any country. In the case of active patients, the USA, Brazil, the UK, Russia, and India hold the same situation in confirmed lists, but Pakistan, Canada, France, and Bangladesh are the new faces here, as shown in Fig. 6.3.

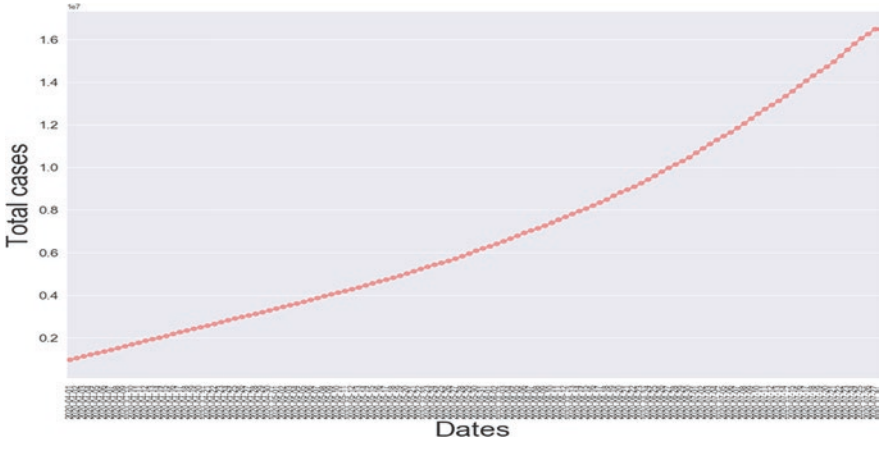

Fig. 6.1 Worldwide confirmed cases over time

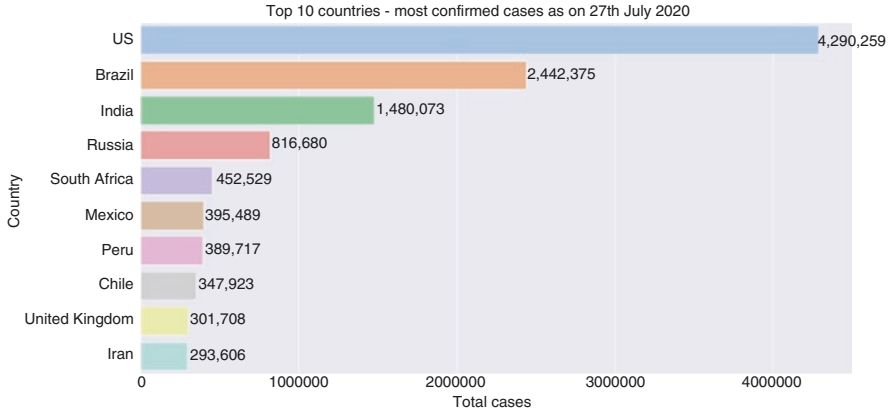

Fig. 6.2 Most confirmed cases across the world

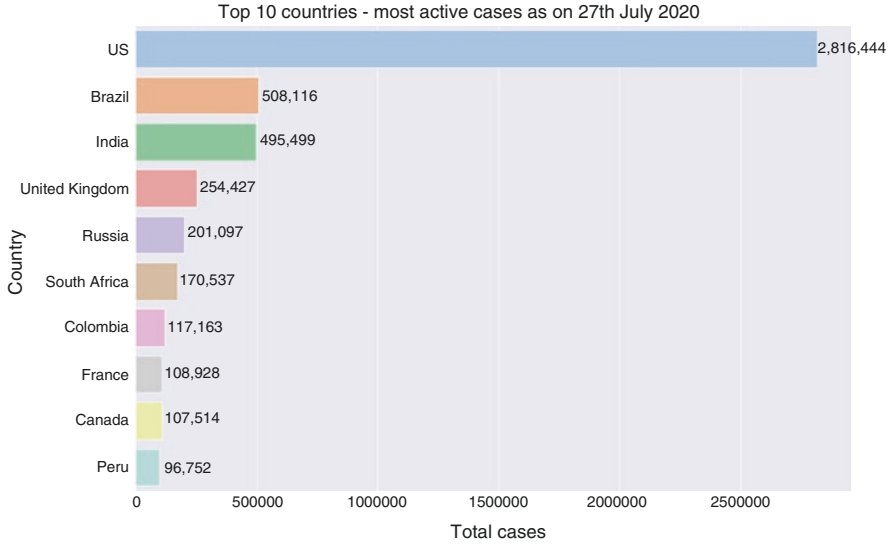

Fig. 6.3 Most active cases across the world

Most deaths occur in the USA as confirmed. India is relatively slower in case of deaths than other countries in the confirmed list which shows the effective initiative taken for the COVID-19 pandemic. Morocco and Belgium are new faces in the top ten with most deaths list as they were not in the top ten confirmed or active list.

Recovery reflects the healthcare systems of a country. Germany and Turkey are impressive in this case to enter the top ten with most recoveries list. Figure 6.4 shows the top ten list of countries with deaths, and Fig. 6.5 shows for recoveries of COVID-19 patients across the world.

Sometimes, the total number of deaths could not express the real scenario of a pandemic as population size and geographical area are different for different

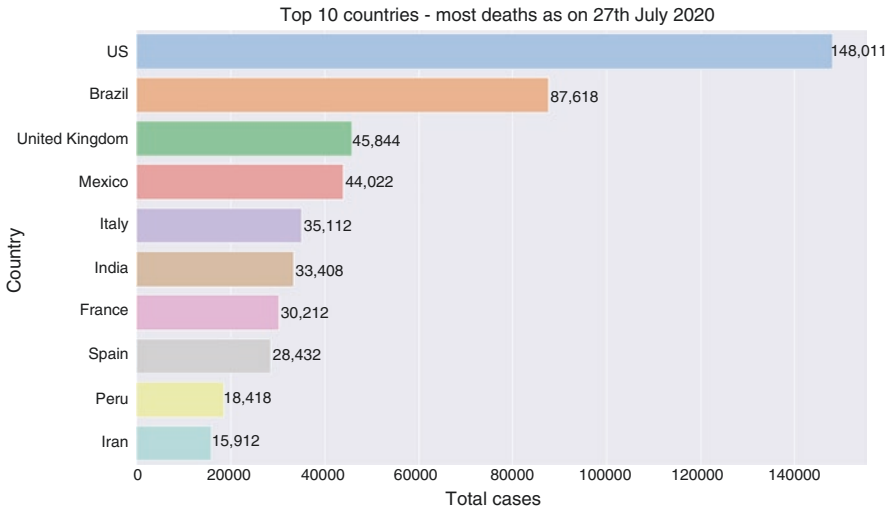

Fig. 6.4 Most death cases across the world

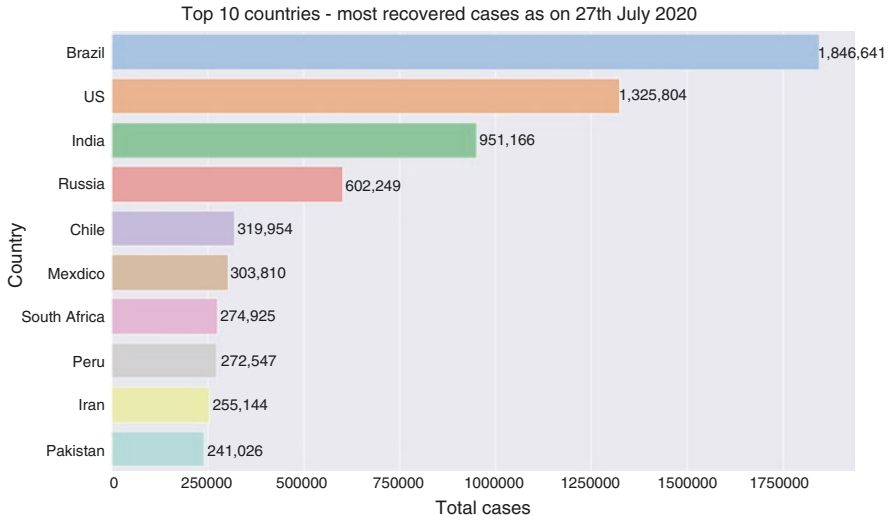

Fig. 6.5 Most recovered cases across the world

countries. And that is the reason to consider a scaled size of the population with per unit of time. The measurement of the number of deaths is called the "mortality rate" or "death rate" [39]. As shown in Fig. 6.6, Yemen has a mortality rate of 36% which is almost more than double than other close countries in terms of mortality rate. Belgium, France, Italy, the UK, Hungary, the Netherlands, Mexico, Antigua and Barbuda, and Spain have a mortality rate of 10–15%. There are no countries here from the top ten with most deaths.

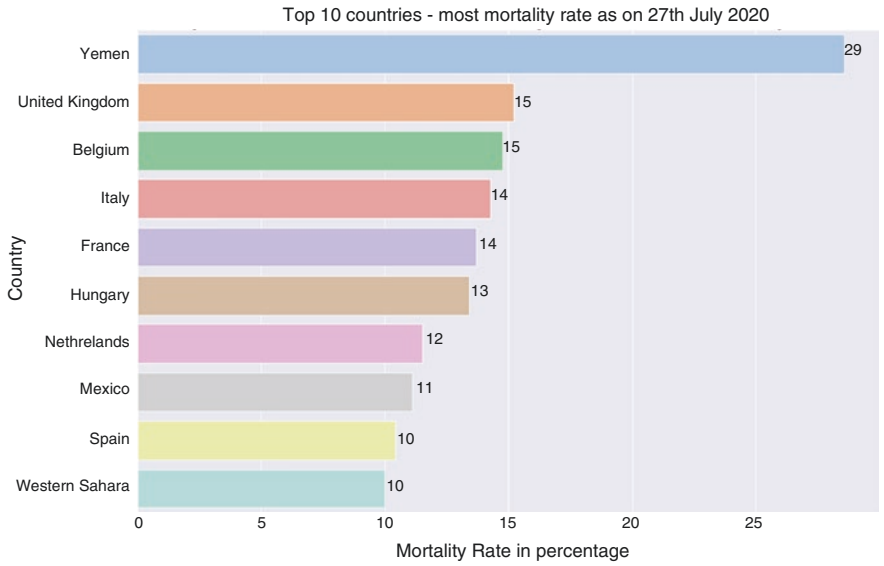

Fig. 6.6 Most mortality rates across the world

In case of the recovery rate, we see that Saint Kitts and Nevis, Dominica, the Holy See, Granada, Greenland, Fiji, and Laos are the countries with 100% recovery rates, as shown in Fig. 6.7. That is, there are no active cases in these countries as of June 25, 2020. These countries controlled the overall situation of COVID-19 pandemic and result in almost zero transmissibility. Among the top active patients holding countries, Chile, India, and Brazil also possess a better recovery rate than other countries.

In this section, we will discuss the pandemic situation of COVID-19 in India and Bangladesh, two South Asian neighboring countries. India is the second most populous country with 1.352 billion people and the seventh largest country by area in the world [40]. The first COVID-19 case was identified on January 30, 2020, which originated from Wuhan, China. Bangladesh is a densely populated country with the eighth most population in the world, exceeding 162 million people. Maintaining social distance to prevent virus transmission is tough in such a populous country. The literacy rate of Bangladesh is about 74%, and population density is 1265 people per square kilometer [41], which is much high. India's literacy rate is almost similar to Bangladesh, but it has a lower population density of 464 people per square kilometer as of 2020 [41]. Besides these, the transmissibility rate mostly depends on social awareness, reactions, and steps taken by governments, etc. In this paper, we are keen to discuss the overall COVID-19 case situations between these two neighboring countries rather than discuss the geographical situations and other measurements. We will take January 30 as the first day of the confirmed case for India and March 8 as the first day of the confirmed case for Bangladesh.

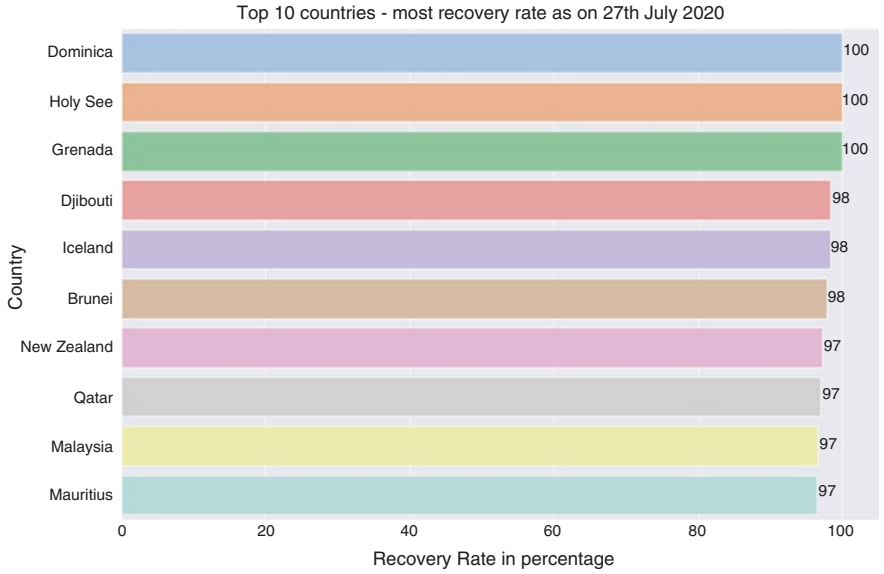

Fig. 6.7 Most recovery rates across the world

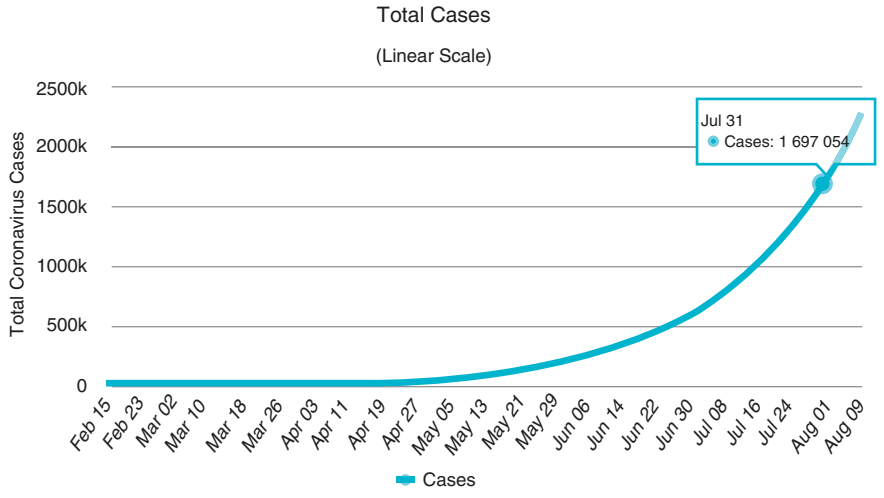

Fig. 6.8 Confirmed cases in India

Figures 6.8 and 6.9 show the curve for confirmed cases with COVID-19 in India and Bangladesh, respectively. The confirmed case rate was very low for both countries at first till the mid of April for India and mid of May for Bangladesh, but it increased very fast afterward. And it continues for both graphs. Figure 6.10 shows a comparative confirmed case graph for both countries.

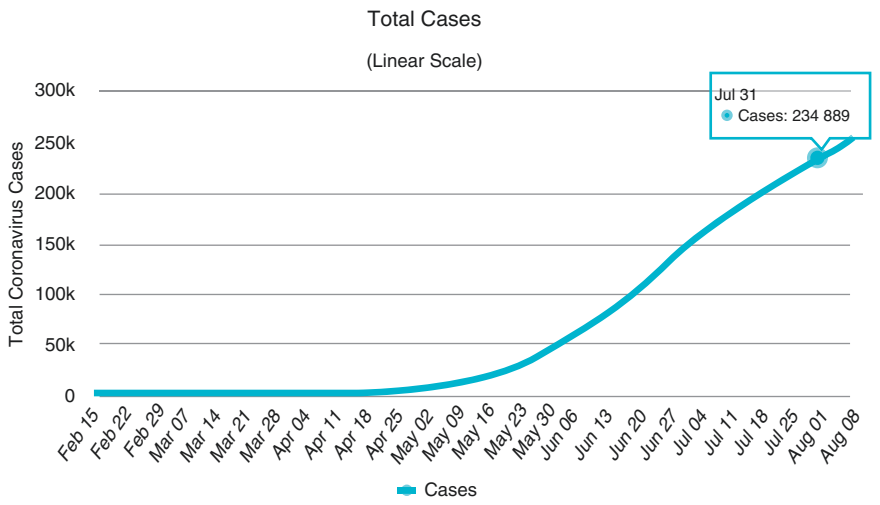

Fig. 6.9 Confirmed cases in Bangladesh

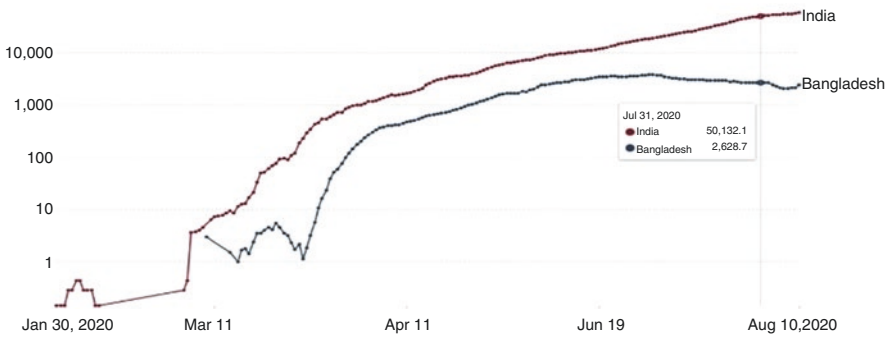

Fig. 6.10 Comparison for total confirmed cases for India and Bangladesh

Here, Figs. 6.11 and 6.12 display the daily new cases for COVID-19 patients in India and Bangladesh, respectively. We see that for India, the number of new cases is equal or increasing, but in the case of Bangladesh, there is some decreasing scenario. Figures 6.13 and 6.14 show the currently active cases, that is, confirmed reduced by recovery and deaths for India and Bangladesh, respectively. Although new cases are downfalling for Bangladesh, active cases are increasing, and it is almost similar to India. We also see a sudden breakpoint in case of Bangladesh's active cases. It was for some combined recoveries entry in the national systems in early June.

Figures 6.15 and 6.16 represent the death cases with time for India and Bangladesh, respectively. Both the graph indicates that the number of death cases for both countries is increasing. Figure 6.17 shows the comparative death cases for India and Bangladesh where we see that the number of deaths is following the same

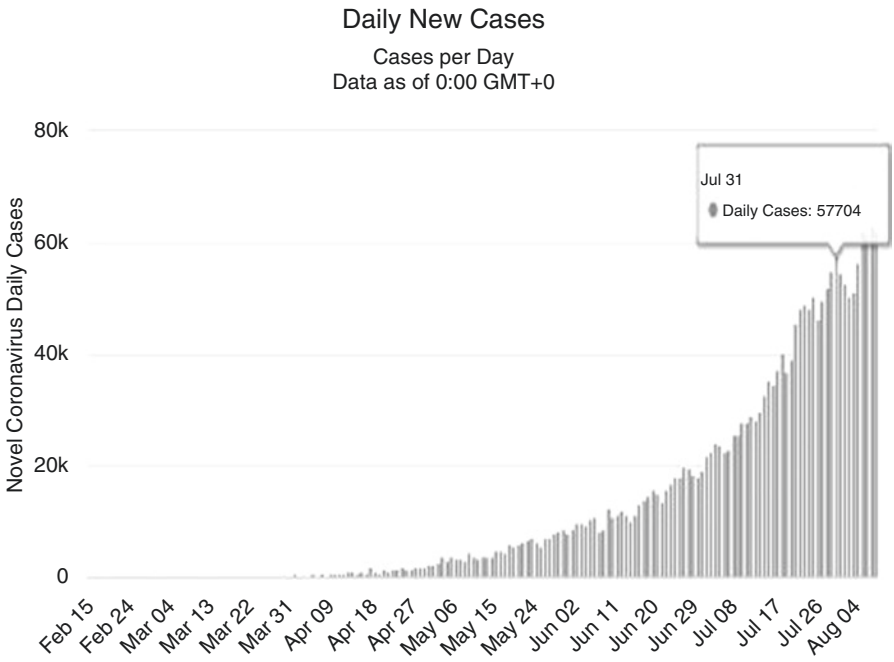

Fig. 6.11 Daily new cases for India

pattern for both countries. Figure 6.18 represents the case fatality rate of deaths with red and indigo curves for India and Bangladesh, respectively.

Although the case fatality rate was very high for Bangladesh in the beginning as now in July, Bangladesh is in a much better situation than India in case of a fatality rate. But India's case fatality curve is much stable, whereas Bangladesh's one not. The case fatality rate for India is also decreasing. However, we know from the previous epidemic that the case fatality rate gives the actual scenario after all populations being recovered or died, and before that, it shows lesser values (Table 6.1).

6.4 Conclusions

This research paper presents the current trend of COVID-19 outbreak from the beginning to June 25, 2020, and more specifically for two South Asian countries: India and Bangladesh. A modified literature review has been introduced considering the origin, transmission, prevention, precautions, vaccines, etc. for the noble SARS-CoV-2 virus. We also analyzed the overall pandemic situation of the world through worldwide data analysis, recovery percentage, active patient percentage, mortality rate percentage, etc. COVID-19 is a contagious disease with unpredictable

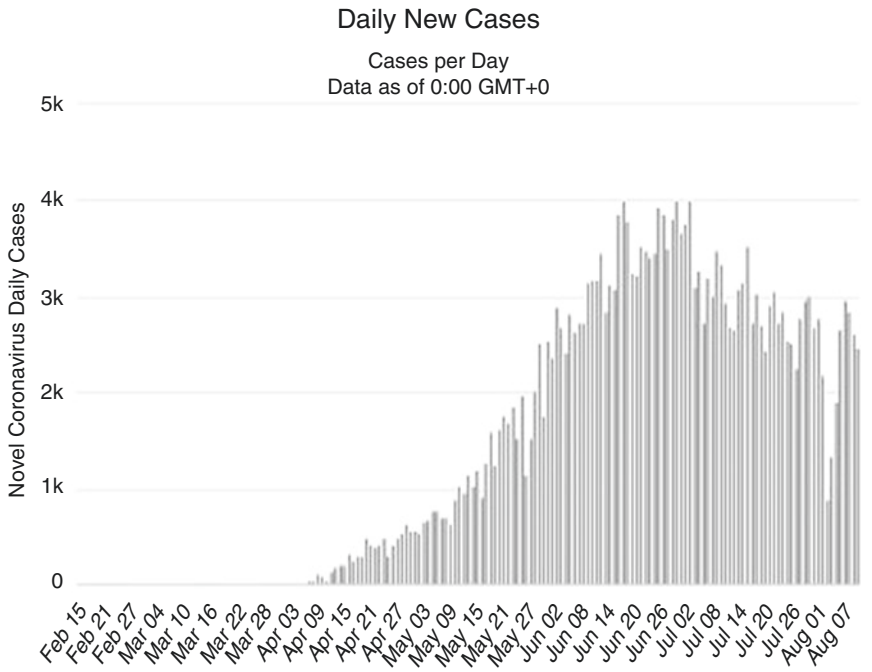

Fig. 6.12 Daily new cases for Bangladesh

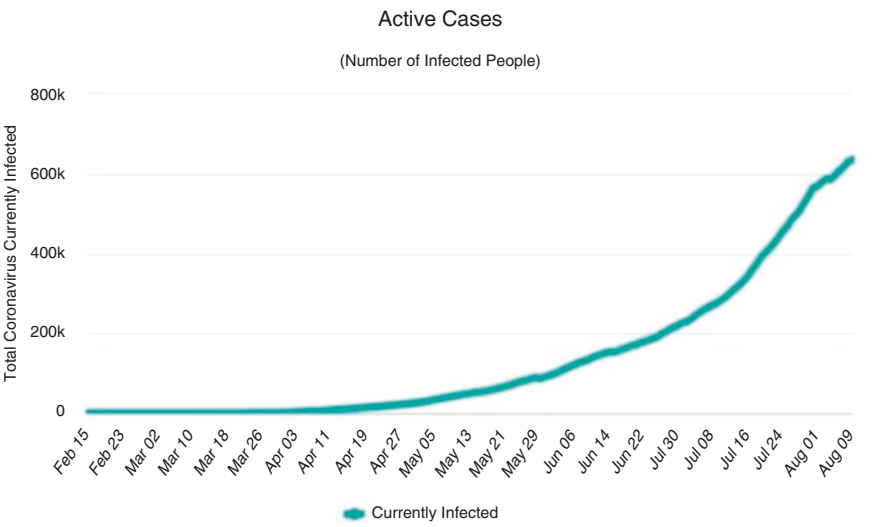

Fig. 6.13 Active cases in India

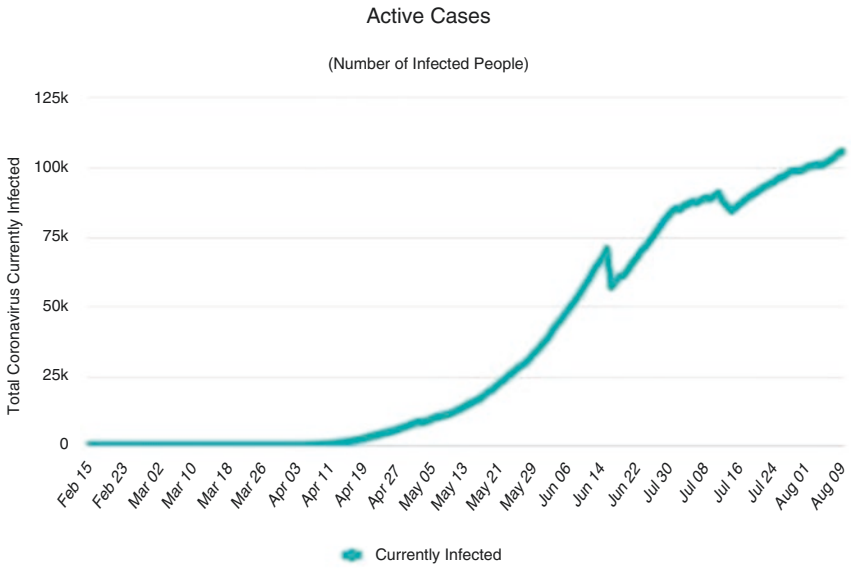

Fig. 6.14 Active cases in Bangladesh

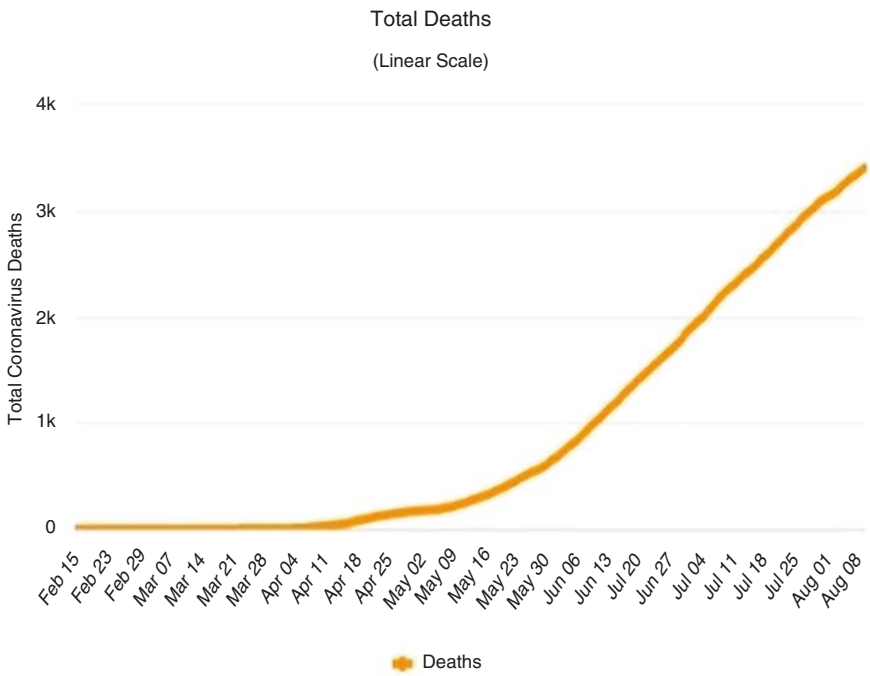

Fig. 6.15 Death cases in Bangladesh

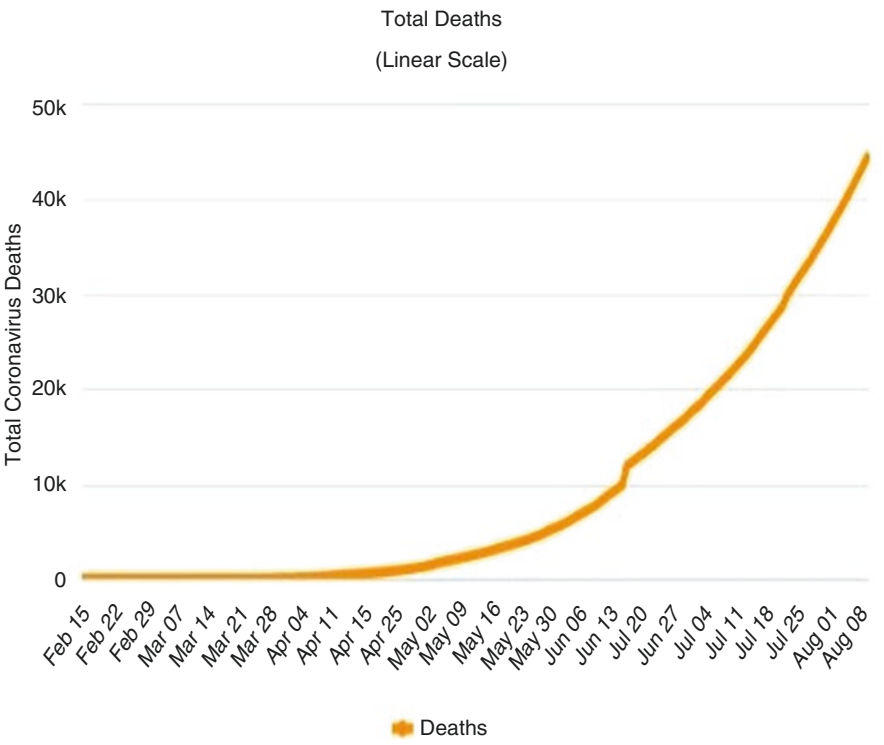

Fig. 6.16 Death cases in India

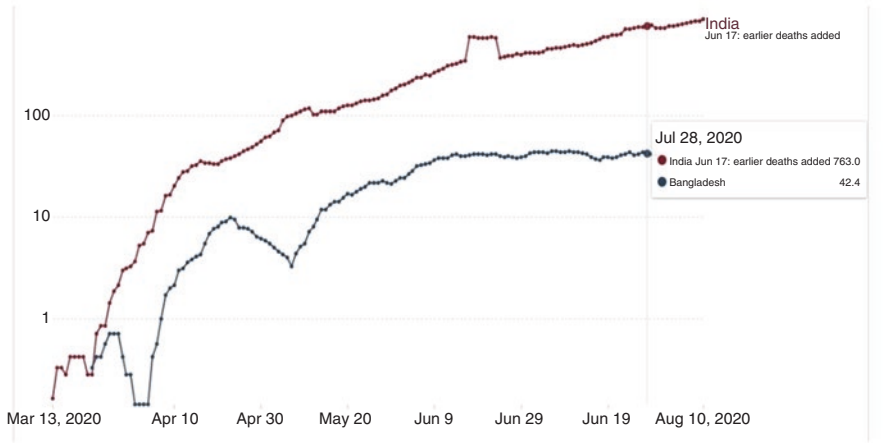

Fig. 6.17 Comparison for death cases

properties, which indicates that still model prediction is tough until it has been successfully contained, and that is the reason for the importance of data-driven analysis. In a pandemic like this, providing information to the public is paramount. For India and Bangladesh, both countries' data for this pandemic situation has been analyzed for confirming cases, active cases, and death cases. These two countries are facing almost similar situations, and the pandemic situations are blooming here day by day. Proper steps and actions can make the transmissibility slower.

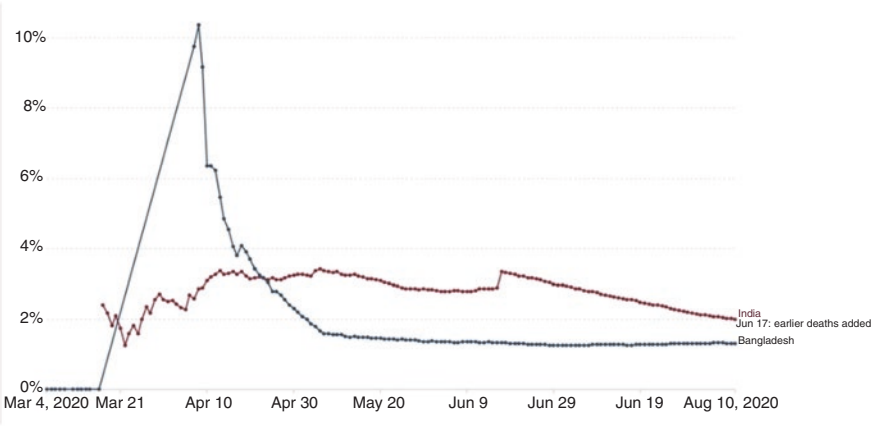

Fig. 6.18 Comparison of fatality rates

Table 6.1 Comparative analysis of COVID-19 transmission between India and Bangladesh

Features	India	Bangladesh	References
First case	January 30, 2020	March 8, 2020	[6, 7]
Area of emergence	Mumbai, Delhi, Ahmedabad, Chennai, Pune, Kolkata, etc.	At the early stage, mainly in Dhaka city and Narayanganj. Later it spreads mainly in all divisional cities	[1, 6, 7]
Origin	China	Italy	[42, 43]
Entry receptor in humans	ACE2	ACE2	[12, 28]
Sign and symptoms	Fever, cough, fatigue, shortness of breath, loss of smell and taste	Fever, cough, fatigue, shortness of breath, loss of smell and taste	[1, 6, 7, 21, 22]
Asymptomatic transmissions	Yes	Yes	[1, 5–7, 23]
Total infected	[a]1,435,453 patients	[a]226,225 patients	[1, 5–7, 25, 41]
Total recovered	[a]917,568 patients	[a]125,683 patients	
Total death	[a]32,771 patients	[a]2965 patients	
Mortality rate	[a]2.49%	[a]1.30%	[44, 45]

[a]As on July 27, 2020

The outbreak spreads are largely influenced by each country's policy and social responsibility [46] to avoid close contacts as prevention is the better cure until the arrival of the COVID-19 vaccine.

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