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COMMENTARY | COVID-19 PANDEMIC

COVID-19 Pandemic in Pakistan

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ABSTRACT

Since February 26, 2020, the coronavirus disease 2019 (COVID-19) pandemic emerged in Karachi City and rapidly spread throughout Pakistan. In the first seven weeks, the disease affected more than 6,200 people and more than 111 deaths were reported. If we compare the disasters of COVID-19 in Pakistan with other countries like China, Iran and European Union nations, so many questions arise. We have many challenges in controlling this pandemic, including the geopolitics of country, poverty, low literacy rate, environmental conditions, hygienic conditions, and food intake habits. In all these aspects there are poor conditions but the outbreak of COVID-19 in Pakistan was slower than other developing countries. Pakistan's humid condition hot weather, early response to COVID-19, population immune system, BCG vaccination, and the number of young people appear to attenuate the impact of COVID-19. In this paper, we discuss the outbreak of COVID-19 pandemic in China, Iran and Pakistan and share day-by-day developments of this pandemic. We present the structure of COVID-19 and its similarity with SARS-COV and SARS-COV2. We also discuss treatment procedures and their disadvantages, including use of Remdesivir (an adenosine analog) used against RNA viruses, Chloroquine (an extensively used anti-malarial drug), convalescent plasma, neutralizing antibody targeting the ACE-2 receptor, and an ACE-2-like molecule that might bind to the S protein of the coronavirus. The impact of COVID-19 on the economics of Pakistan and government reliefs are also discussed.

Keywords: • Coronavirus • COVID-19 • Pakistan • Pandemic • Outbreak

Introduction

Coronavirus belongs to a coronaviridae family. At the end of 2019, Wuhan, an emerging business hub of China, experienced an outbreak of coronavirus which killed more than 1,800 people and infected more than 70,000 people during first five days of the epidemic. This coronavirus was named the novel coronavirus disease 2019 (2019-nCOV) by Chinese researchers. The International Committee on Taxonomy of Viruses (ICTV) named the virus SARS-CoV-2 and the disease COVID-19.[1] Coronavirus is small in size (65-125 nm in diameter) and contains a single-stranded ribonucleic acid (RNA) as nucleic material, size ranging from 26 to 32 kbs in length[2] (Figure1).

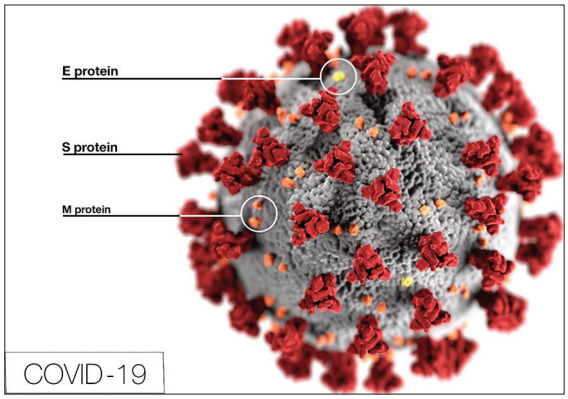

Figure 1: Structure of SARS-CoV-2 (Source: CDC)

COVID-19 works like a typical respiratory coronavirus in the basic mechanisms, infections and replications. But some mutations allow it to bind tighter to the host receptor and increase its transmissibility, which is thought to make it more infective. Researchers have found that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is detectable in aerosols for up to three hours, up to four hours on copper, up to 24 hours on cardboard, and up to two to three days on plastic and stainless steel.[3] These results provide key information about the stability of SARS-CoV-2, which causes COVID-19 disease, and suggest that people may obtain the virus through the air and after touching contaminated objects.[4]

More than hundred years since the outbreak of the 1918 influenza pandemic, we now have another pandemic on our hands. The outbreak of COVID-19 infection is spreading to everywhere in the world, forcing us to live with this virus for perhaps a long time. Scientists and professionals have continued to be educated on COVID-19 and its complicated pathogenesis and presentation.[5] For example, not all people exposed to COVID-19 are symptomatic and not all infected patients develop a severe respiratory infection. Consequently, COVID-19 infection can be roughly classified into three phases: phase I, an asymptomatic incubation period with or without noticeable virus; phase II, non-severe symptomatic period with the occurrence of virus; and phase III, severe respiratory symptomatic phase with high viral load.[6] It has been reported that the first severe acute respiratory syndrome (SARS) outbreak was caused by SARS-CoV2002 in Guangdong, China.[7] One reason why the transmission rate of SARS-CoV-2 is higher than the first SARS-CoV could be the S-protein in the receptor-binding domain (RBD) region of the current virus may have increased transmission.[2]

COVID-19 Outbreak in China

In December, 2019, the World Health Organization (WHO) was informed by the Chinese government about numerous cases of pneumonia with unfamiliar etiology. The outbreak began in the Hunan seafood market in the Wuhan city and quickly infected more than 50 people. The Hunan seafood market was the selling point of live animals such as frogs, bats, birds, rabbits and marmots.[8] On January 10, 2010, the National Health Commission of China suggested it was a viral pneumonia,[8] but this virus was later identified as novel coronavirus. Initially, it was assumed that the seafood market had infected animals and people were infected if they visited the market. Further investigation showed that some individuals were infected with the virus with no record of visiting the market. Thus, later observations revealed the human-to-human capabilities of the virus. Spreading of virus occurs due to the close contacts with an infected person, or exposure to virus-containing aerosols during sneezing, coughing, and respiration. These aerosols can penetrate to the lungs via inhalation through the nose or through the mouth.[9] Table 1 shows the early stages of the COVID-19 outbreak.

Key Hosts of COVID-19 and Comparison with Previous Coronaviruses

Initial research concentrated on raccoon dogs and palm civets as a key reservoir of infections in the case of the first SARS-CoV.[2] However, only the samples isolated from the civets foods at the food market provided positive results. This suggests that the palm civets were infected at the market by other palm civets or by other infected animals.[10] Later, Rhinolophus bats were found to have anti-SARS-CoV antibodies suggesting that bats are a source of viral infections following prior exposure to the virus.[11] Saudi Arabia faced the Middle East Respiratory Syndrome (MERS) coronavirus outbreak in 2012. A recent study shows that MERS-Coronavirus was also

detected in bats and that bats were key hosts and transmitting media of the virus. Table 2 shows the key hosts of SARS-CoV-2 and its comparison with SARS-CoV.[12]

COVID-19 Outbreak in Iran

Iran reported its first confirmed cases of SARS-CoV-2 infections on February 19, 2020 in Qom. On the same day, Iran's Ministry of Health and Medical Education (MOHME) stated that both patients had died. On March 31, 2020, according to the MOHME, there had been 2,898 COVID-19 deaths in the country with 44,605 confirmed patients.[13] As at March 31, 2020, Iran has the sixth highest number of COVID-19 deaths and coronavirus-infected cases following Italy, China, Spain, United States, and France.

Table 1: Timeline of early stages of COVID-19.

Dates	Events
December 30, 2019	Cluster of cases of pneumonia of unknown origin reported to China National Health Commission.
January 1, 2020	Hunan seafood market closed.
January 7, 2020	Novel coronavirus isolated.
January 11, 2020	First fatal case reported.
January 12, 2020	Named as 2019-Ncov; whole genome sequence shared with WHO.
January 13, 2020	First case in Thailand reported.
January 16, 2020	First case in Japan reported.
January 19, 2020	First case in Korea reported; 2 cases in Beijing and 1 in Guangdong province reported.
January 20, 2020	Infection in healthcare workers caring for 2019-nCOV patients reported.
January 24, 2020	853 cases reported in China (549 from Hubei province, 286 from other 31 provinces, municipalities, or specials administrative regions) reported.

It was thought that the virus may have been transported to the country by a merchant from Qom who had visited China. Iran became an epicenter of the virus in the Middle East with more than 10 countries tracing their cases back to Iran by February 28. Government actions in Iran included suspension of public events and Friday prayers, closure of schools, colleges, universities, and shopping centers as well as holy shrines, and banning of festival celebrations. Economic actions were also announced to help families and businesses. The government was reluctant to quarantine entire cities and areas, and heavy traffic between cities continued ahead of Nowruz holidays, despite the government's intention to limit travel. The government later implemented a travel ban between cities following an increase in the number of new cases.

COVID-19 Outbreak in Pakistan

Table 3 gives the COVID-19 outbreak report on a daily basis in Pakistan.

Table 2: Biological Features of SARS-CoV and SARS-CoV-2 (Last updated: April 3, 2020).[1-3]

Feature	SARS-CoV	SARS-CoV-2 (COVID-19)
Emergence date	November 2002	December 2019
City of emergence	Guangdong, China	Wuhan, China.
Date of full-control	July 2003	Not controlled yet.
Key hosts	Bat, palm civets and Raccoon dogs	Bats
Number of countries affected	26	Worldwide
Entry receptors in human	ACE-2 receptor	ACE-2 receptor
Symptoms	Fever, malaise, myalgia, headache, diarrhea, shivering, cough and shortness of breath SARS	Cough, fever and shortness of breath
Disease caused	SARS, ARDS	SARS, COVID
Total infected people	8,098	1,089,479
Total recovered patients	7,322	22,8005
Total deaths	776 (9.6% mortality rate)	58,476 (3.4 % mortality rate)

Table 3: COVID-19 Daily update in Pakistan till March 31, 2020. (Last updated: April 03, 2020).[11,13,14-18]

February 26	Prime Minister's special assistant on health confirms in a tweet that two persons had been diagnosed with COVID-19, both of them known to have visited Iran. The first patient was from Karachi, Karachi, in Sindh, province while the second patient was from the federal territory of the country. At the end of February, Pakistan confirmed three other cases.
March 2	Fifth case was from the federal area of the country of a 45-year-old lady from Gilgit-Baltistan, who had traveled from Iran.
March 6	Adviser to Chief Minister of Sindh reports that the initial patient with COVID-19 in Karachi had recovered and discharged from hospital after testing negative.
March 8	Seventh case tested positive of COVID-19 in Karachi.
March 9	Officials report 9 new cases in Karachi, shows that there was a total of 16 cases of COVID-19 in Pakistan and 13 cases in Sindh Province. Five of the new patients had visited Syria and a few others patients had returned from London.
March 10	Three new cases were confirmed on March 10, with first case in Quetta, Baluchistan and one from Hyderabad.
March 11	Several districts of Punjab province, including Lahore, Gujranwala, Sargodha, Hafizabad and Lodhran announce 76 suspected cases. The Healthcare Department officials reported that 10 patients were immediately cleared of suspected infection, while 55 patients were cleared after testing negative. A second case in Gilgit-Baltistan was confirmed in Skardu bringing the number to 20.
March 12	Gilgit-Baltistan in Shigar district confirms a 3rd case; patient had a travel history to Iran and was reported to be under treatment at the Skardu hospital. Adviser to Chief Minister of Sindh reported that the second infected patient had completely recovered.
March 13	The Sindh Health Department reports a 52-year-old patient as positive, which marked the primary case of local disease transmission because the patient had traveled from Islamabad. 24 of the 27 assumed cases in Khyber Pakhtunkhwa were also cleared that day. The entire number of cases had risen to 28, with 6 new cases in Taftan and another in Sindh.
March 14	The number of cases was 31 as 2 new patients were found positive in Karachi while 1 was reported in Islamabad.
March 15	5 more cases were announced in Karachi, including a second local transmission of the coronavirus in Sindh, while the other 3 had a travel history of Saudi Arabia and 1 had been to Baluchistan. A new case was also reported in Islamabad. Lahore Health Secretary confirmed the first case of coronavirus in Punjab within the city of Lahore. The infected patient had returned from England on March 10 and was transferred to Mayo Hospital Lahore, Pakistan in an isolation ward. The Pakistan National Institute of Health reported 11 new cases in Sindh and 6 new during a mobile laboratory at the Tafton border area, and therefore the first case in Punjab, increasing the total to 53.
March 16	134 new positives cases were registered, 116 of them in Sindh. Khyber Pakhtunkhwa reported its first 15 cases while 3 were found in Baluchistan. This marked the sharpest increase to date. Not only were over 100 cases reported in a province within a day, the number across the country reached 187 infections.
March 17	The total cases had risen to 237 with 25 new cases in Punjab, 12 in Sindh and 4 in Islamabad.
March 18	Azad Kashmir reports the first case of COVID-19. The provinces of Sindh and Gilgit-Baltistan saw a rise of cases by 36 and 10 respectively. New cases were also reported in other provinces. A patient from Hyderabad was also discharged after recovering in Sindh province, making the entire number of recovered cases to 5. Total of 302 positive cases was confirmed in Pakistan on 18 March. The two primary deaths from the virus within the country were also confirmed on this day. Both were reported from the province of Khyber Pakhtunkhwa, the primary being a 50-year-old man who had recently returned from Saudi Arabia to Mardan District after performing Umrah in Mecca, while the second victim was a 36-year-old from Hangu District. Both had been hospitalized in Peshawar.
March 19	The cases double from 33 to 80 in Punjab; and from 23 to 81 cases in Baluchistan. The increase in cases led the provincial government of Baluchistan to declare a health emergency and impose a ban on transport. The provincial government announced relief packages will be delivered to employees of transport companies. With a total of 159 new cases, the number confirmed cases rose to 461.
March 20	Sindh reports the first death from COVID-19. The patient was a 77-year-old who had acquired the virus through local transmission .The patient was a cancer survivor and had other underlying medical problems such as hypertension and diabetes. While in other provinces, the growth in number of new cases was lower compared to the past few days at 34 and the tally stood at 495.

(*Contd....*)

Table 3: (*Continued*)

March 22	Khyber Pakhtunkhwa announces the 3rd death from the virus. The primary death in Gilgit-Baltistan and Baluchistan were also announced, increasing the number of deaths to six. The number of cases had also increased to 784 with 138 new cases. The fatality at DHQ (District Headquarters) Hospital in Gilgit was a medical doctor who contracted the virus after screening pilgrims coming back from Iran. Gilgit-Baltistan went under lockdown for an indefinite period. 13 new pilgrims from Taftan via Dera Ghazi Khan were quarantined at Mirpur. Descon, Pakistani multinational company of engineering donated 10,000 hand sanitizers to hospitals in Punjab. In Baluchistan 26 drivers who transported the positive COVID-19 cases to hospitals were quarantined.
March 23	Many doctors across the nation criticize the shortage of proper equipment for fighting the virus. Preparations were made on the day by the Ministry of Health of Foreign Affairs to bring back 72 Pakistanis stranded at the Doha International Airport in Doha. The passengers were subjected to strict screening upon arrival. Another flight was arranged to bring 150 Pakistanis stranded at Dubai and Abu Dhabi International Airports. The Sindh Education Minister tests positive for the virus and self-quarantines for 14 days. Sindh and Baluchistan governments announced lockdown until April 7. Azad Kashmir announced lockdown until April 13.
March 24	Punjab imposes lockdown until April 6. After being tested negative for the virus, the provincial government of Sindh allowed 640 pilgrims quarantined in Sukkur to return home.
March 25	Many restrictions were imposed within the capital territory of Islamabad, such as closing of the outpatient departments of hospitals, complete ban on intra-city, inter-district and inter-province transport, and social gatherings. Three new recoveries were announced. With an 8th death, the number of positive cases in Pakistan increased to 1,057.
March 26	140 new cases were confirmed positive across Pakistan. One new death was confirmed in Punjab, increasing total deaths to 9. The total cases increased to 1,197. The number of recoveries was 2.
March 27	Pakistan reports a record number of new cases detected in a single day of 211. Punjab also surpassed Sindh as the province with highest number of cases at 490. Two deaths were reported in Punjab. The Pakistan National Institute of Health (NIH) distributed N95 masks across Sindh, while in Khyber Pakhtunkhwa, screening teams were stationed at the district entry and exit points for screening of tourists for the virus. In Gilgit-Baltistan, the government decided that travelers from the Taftan border would be tested for the virus. The number of positive cases in Pakistan reaches 1,408, while 3 patients were cleared, making the recovered cases 26th with two deaths, bringing the number of deaths to 11.
March 28	Pakistan allows Thai Airways to resume international flight operation to Islamabad to bring back 175 Pakistanis stranded in Bangkok, Thailand.
March 29	Pakistan reports an additional 118 cases, increasing the number of cases to 1,526. One death each was reported in Sindh and Khyber Pakhtunkhwa, respectively, bringing the number of deaths to 13. Khyber Pakhtunkhwa established and disseminated quarantine discontinuation guidelines. Same day, five Pakistani nationals visiting India on medical visas returned home via the Wagah border after being stranded in India due to India's 21-day nationwide lockdown. Two of them tested positive for the virus on March 31.
March 30	The Federal Minister for Science and Technology announces that locally-manufactured ventilators and testing kits would hit the market within the coming days.
March 31	Authorities announce 82 total recoveries and the 26th death. 174 new cases were identified bringing the total number of positive cases to 2,039.

Comparing Pakistan with the world

From the data in Table 4, Khyber-Pakhtunkhwa (KPK) had the highest fatality rate followed by Sindh and Gilgit Baltistan. Punjab followed by Sindh had the highest number of infection cases. The Baluchistan had highest recovery rate. The environmental conditions of countries such as Malaysia, Indonesia, and Thailand appear not to be conducive to the prolonged survival of the virus, ostensibly due to their high tempartures.[20] Scientists are examining the effects of temperature and relative humidity on COVID-19. Most scientists believe that COVID-19 is not effected by temperature and humidity, but the connection between the virus and weather remains unknown. Likewise, the relationship between the immune system and how it affects infection, fatality and recovery from COVID-19 is currently unknown. Using data from Worldometer (https://www.worldometers.info/coronavirus/), we compared the

Table 4: Confirmed COVID-19 Cases in Pakistan According to Daily Reports.[17,19] (Last updated: April 18, 2020)

Province/Territory	Cases	Death	Recoveries	Active Case	Fatality Rate (%)	Recovery Rate (%)
Punjab	3,410	37	672	2,701	1.09	19.71
Sindh	2,355	48	581	1,726	2.04	24.67
Khyber Pakhtunkhwa	1,077	50	216	811	4.64	20.06
Baluchistan	335	5	142	188	1.49	42.39
Gilgit-Baltistan	250	3	192	55	1.20	76.80
Azad Kashmir	48	0	9	39	0.00	18.75
Islamabad	163	1	20	142	1.61	12.27
TOTAL	7,638	144	1,832	5,662		

number of cases reported, the number of deaths and the fatality rate in Pakistan with selected countries across the world (Table 5).

COVID-19 started in Iran nearly the same date as in Pakistan, however, as shown in Table 5, Iran has higher number of infected cases and deaths than Pakistan. In March, the United States of America reported 26,000 registered deaths compared to 40,000 in Italy and Spain combined. Some researchers say that the number of reported cases of COVID-19 is rapidly increasing in the EU/EEA and the UK.[21] The observed trends in the cumulative incidence of COVID-19 suggest that the pandemic is progressing at a comparable speed in all countries, although the trend in Pakistan, thus far, may not have been as in other countries. This is despite countries being at different stages, variations in national public health responses, and possibly different case definitions, and different protocols for selecting patients to test for confirmation of COVID-19 disease, including catch-up testing.[22] From Table 5, it appears that Pakistan has a lower fatality rate than other countries, especially countries in the EU, USA, Iran, and Indonesia (Table 5).

Control of COVID-19 in Pakistan: Potential Views and Prevalent Opinions

Weather Conditions

Although there is currently no research to support them, there are some anecdotal assertions on the relationship between weather conditions and coronavirus spread. It is widely known that in the cold days, the outdoor air is colder. For influenza, it has been shown that absolute humidity strongly affects flu transmission, with drier conditions being more favorable to the transmission of the flu than colder conditions.[23] Based on studies in Vietnam and the USA, analysts argue that SARS-Cov-2 transmission patterns are similar to those exhibited by influenza.[23,24] Notably, the Vietnam study observed influenza-like illnesses, without distinguishing influenza from other types of pathogens.[25] It has been argued that similar patterns observed with influenza transmission may be applicable for corona virus, but there are no specific studies examining the role of humidity for coronaviruses or other respiratory viruses besides flu. The countries with dry cold air have favorable conditions for flu transmission but for coronaviruses, the relevance of this factor is largely unknown. A study has suggested that transmission is possible in different hot and humid climates. Pointing out that Singapore, for example, which lies nearly on the equator, has had significant transmission of coronavirus.[26] But there are differences between Singapore in February and a temperate zone in summer. For example, there are different lengths of day light hours, ultraviolet radiation, and other unknown factors that may be important for coronavirus transmission. Further study is required to determine if the regions with hot weather like Pakistan and Saudia Arabia have less viral spread of transmission.

Indoor/Outdoor Living

In the winter, in many climates, people spend more time indoors with less ventilation and less personal space than outdoors in the summer. Schools are

Table 5: Confirmed COVID-19 cases, deaths and fatality rate according to daily report in the countries with more than 100 COVID-19 Deaths.[14] (Last updated April 15, 2020)

Country	Total Cases	Total Deaths	Total Recovered	Fatality Rate (%)
Algeria	2,070	326	691	15.75
Argentina	2,443	109	596	4.46
Austria	14,325	393	8,098	2.74
Belgium	33,573	4,440	7,107	13.22
Brazil	25,758	1,557	14,026	6.04
Canada	27,063	903	8,235	3.34
China	82,295	3,342	77,816	4.06
Colombia	2,979	127	354	4.26
Czechia	6,151	163	676	2.65
Denmark	6,681	309	2,515	4.63
Dominican Republic	3,286	183	162	5.57
Ecuador	7,603	369	696	4.85
Egypt	2,350	178	589	7.57
France	143,303	15,729	28,805	10.98
Germany	132,500	3,521	72,600	2.66
Greece	2,170	101	269	4.65
Hungary	1,579	134	192	8.49
India	11,555	396	1,362	3.43
Indonesia	5,136	469	446	9.13
Iran	76,389	4,777	49,933	6.25
Ireland	11,479	406	77	3.54
Israel	12,200	126	2,309	1.03
Italy	162,488	21,067	37,130	12.97
Japan	8,100	146	853	1.80
Mexico	5,399	406	2,125	7.52
Morocco	1,988	127	218	6.39
Norway	6,740	145	32	2.15
Pakistan	5,988	107	1,446	1.79
Peru	10,303	230	2,869	2.23
Philippines	5,453	349	353	6.40
Poland	7,408	268	668	3.62
Portugal	18,091	599	383	3.31
Romania	7,216	362	1,217	5.02

(*Contd....*)

Table 5: (*Continued*)

Country	Total Cases	Total Deaths	Total Recovered	Fatality Rate (%)
Russia	24,490	198	1,986	0.81
South Korea	10,591	225	7,616	2.12
Spain	177,633	18,579	70,853	10.46
Sweden	11,927	1,203	381	10.09
Switzerland	26,336	1,221	14,700	4.64
Turkey	65,111	1,403	4,799	2.15
UK	98,476	12,868	N/A	13.07
Ukraine	3,764	108	143	2.87
USA	615,406	26,164	38,879	4.25
World	2,024,622	128,965	492,482	6.37

Source: Worldometer, https://www.worldometers.info/coronavirus/

a place of potentially increased opportunities for infectious disease transmission. School terms have been strongly identified as periods of higher transmission for respiratory viruses including those causing flu, chicken pox, and measles.[27] The 2009 pandemic flu in the United States was very much reduced during the summer, and then came back rapidly in September.[28]

Schools and Schools Closures

However, the significance of school terms is important but unknown for the SARS-CoV-2. At the beginning of the pandemic, few children were identified as cases. This was suspected to mean that they were not easily infected and did not significantly transmit the virus. It was also suspected that when they do get infected, children were less likely to exhibit severe symptoms compared to their older counterparts. Nonetheless, newer studies had indicated that children and younger-aged people were getting infected.[29] With the first case reported in Pakistan on February 26, 2020, the Government of Sindh announced school closure and later for the entire country. Understanding how the virus infects children is important in understanding whether school closures may help in the control of COVID-19 spread, and to anticipate how much summer vacation may potentially help in reducing viral spread.

Immune Levels

In Pakistan, the cold weather remains for a very short time, Almost the entire year the population enjoys sunny weather and the average person's immune system is generally stronger in summer than in winter. One hypothesis has focused on the role of melatonin which has some immune effects and is modulated by the photoperiod, which varies seasonally.[30] Another hypothesis is that of vitamin D levels, which depend, in part, on ultraviolet light exposure. According to one research paper, vitamin D supplementation reduces the incidence of acute respiratory infection.[31] As Lipsitch argues in his paper, many people think that as the proportion of susceptible contacts declines, the epidemic peaks, and eventually declines.[32]

Lipsitch presents a compelling argument on the seasonality of COVID-19, and whether the virus will be attenuated by warmer weather.[32]

A recent study, nonetheless, suggests that children may be infected and shed detectable virus at about the same rate as adults, but the open question remains whether children transmit the virus as readily as adults?[33] The immediate school closure by Pakistan government as first case reported helped the country to weaken outbreak.

As indicated by the most recent figures on the COVID-19 fatalities recorded by John Hopkins, out

of the 132,276 cases recorded around the world, the greater part have been from Italy, USA and Spain combined.[34] In the interim, just 515 individuals have died in India and Pakistan, while 20 deaths have been recorded in Nigeria and Kenya. Since its first COVID-19 case reported on Feb 26, Pakistan has recorded 107 deaths and about 6,300 cases as of April 15.

Some researchers have suggested that nations like the European Union and the United States where the Bacille Calmette Guerin (BCG) immunization, an effective immunization against tuberculosis, was not mandatory are greatly impacted by COVID-19.[35] Some researchers also assert that in Iran, where widespread BCG vaccination was embraced in 1984, fewer people have died from COVID-19. The nations that did not actualize the BCG immunization, which for the most part incorporate western nations, had more coronavirus infections per capita and a higher death rate.[36] In Pakistan, the BCG vaccination is obligatory for newborn children. Since 1949, all babies in Pakistan are given a single portion of the BCG immunization at birth.[37] Figure 2 shows COVID-19 deaths in the European Union and Pakistan.

Treatment Plans and Developments in Vaccine

At the time of submitting this paper, there were over 80 clinical trials to evaluate a diversity of potential SARS-CoV-2 treatments all over the world.[39] One simple but very effective treatment modality is the use of convalescent plasma therapy, or serum from patients who have recovered from the virus to treat new patients. Patients with resolved viral infection develop a specific antibody response which may be helpful in neutralizing viruses in newly-infected individuals. This treatment was successfully employed in the past.[40,41] On March 20, Pakistan's top hematologist and transplant surgeon in the state of Shamsi announced that the blood of recovered COVID-19 patients can be habituated to slow the spread of the deadly contagion which has infected and killed thousands people worldwide. It has been reported that the body of a COVID-19 patient creates antibodies against the virus.[42]

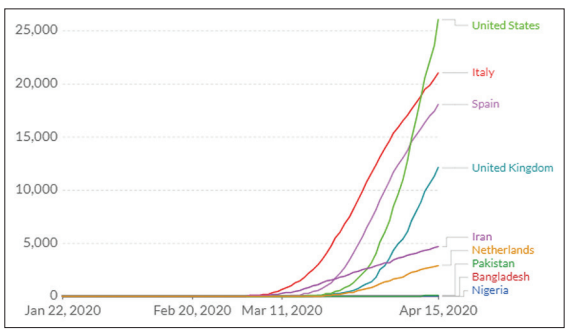

Figure 2: Shows the comparison of COVID-19 deaths with European countries with Pakistan.[38]

On April 10, the national Institute of Blood Disease (NIBD), Pakistan, prepared to deliver its first plasma therapy.[48] The Drug Regulatory Agency of Pakistan (DRAP) on April 9 granted approval for a passive immunization using plasma therapy.[48] On April 13, medical experts at the Dow University of Health Sciences (DUHS), in Pakistan, claimed that they had formulated a drug to treat COVID-19 patients. Medical specialists from the DUHS claimed that intravenous immunoglobulin was a great development in the fight against novel coronavirus. The DUHS study team reported the globulin was manufactured with purified antibodies obtained from the recovered COVID-19 patients, and referred to it as a ray of hope.[44]

Globally, the long-term objective of COVID-19 research is to develop an effective vaccine to produce neutralizing antibodies. Researchers at the Baylor University in Waco, Texas, and the National Institutes of Health in the United States are working on a vaccine based on what they know about the coronavirus in general, using evidence from the SARS outbreak. In addition, the recent mapping of the COVID-19 spike protein may overlay the way for quicker progress of a specific vaccine.[45] Of particular attention is the use of a relatively new vaccine technology, RNA vaccines that have the ability to cause potent immune responses against infectious diseases and definite cancers.[46] Traditional vaccines stimulate the production of antibodies via experiments with purified proteins from the pathogens, or by using whole cells (live, attenuated vaccines). While very effective, the formation of new vaccines can take years. Instead, RNA-based vaccines use mRNA that, upon entering the cells, are translated into antigenic

molecules that in turn stimulate the immune system. This process has been used effectively against some cancers,[47] and clinical trials are ongoing for several other cancers. In addition, the production of RNA-based vaccines is more rapid and less-expensive than traditional vaccines, which can be a major advantage in pandemic situations. Clinical trials for an mRNA-based SARS-CoV-2 vaccine are currently underway.[48] Study participants will receive the mRNA vaccine in two doses, 28 days apart and the safety and immunogenicity will be considered. On April 18, the Federal Minister of Science and Technology, Pakistan, reported that Pakistan would be starting the first phase of clinical trial of COVID-19 vaccine and would be fully contributing to the 66 different global studies being conducted on three different approaches, including repurposed drugs, antibodies and vaccines.[49]

Economic impact

According to a report by the Asian Development Bank (ADB) during the COVID-19 outbreak, Pakistan's economy could lose about $16.387 million to $4.95 billion, or about 0.01% to 1.57% of its gross domestic product, a GDP drop that will cost Pakistan's GDP by at least 1.57% and trigger 946,000 job losses.[50] The textile sector in Pakistan relies on foreign countries for the bulk of its capital goods input. Lots of foreign textile industries were closed during the pandemic which will surely affect Pakistan textile sector. Pakistan Stock Exchange (PSX) is experiencing a major downturn due to the pandemic. On March 19, the PSX fell to its lowest point in more than five years. Karachi Stock Exchange 100 index (KSE-100) has suffered several trade standstills these days to protect investors during instability and unrest.[51]

Conclusion

COVID-19 is an evolving pandemic. Data available indicate that the rate of transmission of COVID-19 in Pakistan appears to be small in comparison to other countries, however, it is unknown how this will change over the coming months and years. It has been postulated that the low rate of infection may be attributed to many reasons such as humid conditions, hot weather, tropical conditions, widespread BCG vaccinations and the government's precautionary measures. The lives and livelihood of Pakistan citizens as well as those of the world are at stake due to pandemic. There are still many uncertainties about how the pandemic will be controlled in Pakistan if the virus re-emerges. In concluding, one can say that current support mechanisms may not be adequate to stem the tide of the virus. Even with the minimal support available, it is even weaker for rural communities where the impact of the virus might even be worse than the urban areas of the country. As the pandemic evolves, further studies would be needed to further explore government efforts to stem the virus and its impact across the country.

Compliance with Ethical Standards

Conflict of Interest: *The authors declare that they have no conflicts of interest relevant to this article.* ***Financial Disclosure:*** *None.* ***Funding/Support:*** *None.* ***Ethics Approval:*** *This is a commentary and no ethical approval was required.* ***Acknowledgment:*** *The authors acknowledge the assistance of Mr. Salman Farrukh in the preparation of this article.* ***Disclaimer:*** *None.*

Key Messages

- COVID-19 will no more hit PAKISTAN like other countries.
- Most of factors are favoring Pakistan in attenuating the disaster of COVID-19 like environmental conditions, early response to this pandemic and BCG vaccination.
- COVID-19 will impact the economy of Pakistan like other world.

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