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1. Introduction

A deadly β-coronavirus (CoV) resembling pneumonia and causing severe acute respiratory syndrome originated in Wuhan city, China, in December 2019 (The Novel Coronavirus Pneumonia Emergency Response Epidemiology Team, 2020). Initially, Chinese researchers referred to it as a novel coronavirus (2019-nCoV), although later, the World Health Organization (WHO) referred to it as coronavirus disease 2019 (COVID-19). After its emergence, as there was no knowledge about the virus, it rapidly spread through China and then to various parts of the world. The rate of the spread of COVID-19 is considered very high compared with that of SARS-CoV and MERS-CoV—it took two and a half years for MERS and 4 months for SARS to infect their first 1000 persons, whereas it took just 48 days for the first 1000 persons to become infected with COVID-19 (Bhatia et al., 2020). COVID-19 was considered a pandemic and the “worst public health crisis in a generation” globally; COVID-19 was declared a Public Health Emergency of International Concern (PHEIC) by WHO on January 30, 2020 (Bhatia et al., 2020; Huang et al., 2020; Lu et al., 2020; Wang et al., 2020). Thus, the virus was a new form and caused major concern because health researchers had no prior knowledge about it.
As of December 8, 2020, more than 68 million people from 239 nations had been infected, with a death toll of 1.5 million, the recovery rates vary from place to place. Due to excessive human interaction and technology including biometric entry systems, elevators, public washrooms, and other utilities, the United States became the topmost country, with more than 15.5 million confirmed cases and over 290,000 deaths (Chinazzi et al., 2020; Lu et al., 2020). In China, the proportion of deaths due to COVID-19 increased from 4.5% to 15% in early January 2020 (Boulos & Geraghty, 2020; Chinazzi et al., 2020) but was later reduced by timely tests and treatment (Liang et al., 2020). Globally, the pandemic also resulted in extreme financial crises, i.e., the closure of markets and industries, as well as the postponement and cancellation of sports, religious, political, and cultural events. Transmission of this deadly disease (see Fig. 7.1) affected not only humans but also the global economy (Blake & Wadhwa, 2020). The education sector was also disturbed, as schools, colleges, and universities in 193 nations were closed wholly or in part, and as a result, more than half of the students worldwide no longer attended school (UNESCO, 2020).

China is the most highly affected of the countries neighboring Pakistan and a centerpiece of the corona outbreak globally. Italy and the southwestern part of Iran had the highest number of deaths due to COVID-19 at one point (Boulos & Geraghty, 2020; Saqlain et al., 2020, pp. 1–2). The pandemic had worldwide effects throughout the year and brought the epidemiological fight to Pakistan’s doorstep. A high level of vulnerability can create an extreme death toll due to local culture, poverty, and infrastructure-related weaknesses. In addition, Pakistan already had public health-related concerns in terms of dengue (Liang et al., 2020; Chohan, 2020a). The economic sector in Pakistan already faced problems due to debt, the trade deficit,
An algorithm designed by the experts at Imperial College London in the first quarter of 2020 predicted a worst-case scenario for Pakistan of 79,000 deaths by early August 2020 and projected that deaths from COVID-19 would peak at 2.3 million in early 2021 (Mawngat, 2020; Saqlain et al., 2020, pp. 1–2). Table 7.1 is showing the number of cases and deaths in United States, Brazil, India and Pakistan as of August 2020. This erroneous and shocking framework assumed that Pakistan’s weak economy, regional security, and structural inequalities would perhaps create a public health disaster with a high death toll never seen before. Nevertheless, after 6 months, in early August, Pakistan’s death toll stood far below the prediction of the doomsday algorithm of Imperial College London. The country had recorded 6200 deaths by early August, which was 92% less than what had been forecast by the model. Pakistan also recorded one of the best recovery rates, and its management of the pandemic situation was considered much better than in the United States, India, and Brazil (Chohan, 2020a,d).

This study focuses on investigating the trend of COVID-19 in Pakistan. As a developing country with limited resources, Pakistan faced a more challenging fight against the deadly disease. Pakistan, as a country neighboring China and having trade and communications with it, was vulnerable, and the first confirmed COVID-19 cases emerged 3 months after its outbreak in China (Chohan, 2020a,d). The spread of infectious disease is a major concern worldwide, i.e., MERS, SARS, influenza, Ebola, and now COVID-19 (Barro et al., 2020; Bernard, 2018; Budhwani & Sun, 2020; Chohan, 2020d; Santos et al., 2019; Fung et al., 2019; Mawngat, 2020; Quwaider & Jararweh, 2016). These infectious diseases affect people physically close to patients or items used by patients. For effective measures to control the virus, health experts conducted research related to different themes for controlling the outbreak in the early stages. A geographic information system (GIS) is a significant tool to evaluate a virus’s spatial variation and distribution for monitoring and controlling its spread (Bernard, 2018; Boulos & Geraghty, 2020; Chinazzi et al., 2020; Gibson & Rush, 2020). GIS technology is helpful for real-time monitoring of such health disasters, including cases reported, risk mapping, contact tracing across time and space, and monitoring spread, with defined quarantine areas to restrict COVID-19 patients (Santos et al., 2019; Fung et al., 2019; Mollalo et al., 2018; Perc et al., 2020).

### TABLE 7.1 COVID-19 statistics as of mid-August 2020.

| Country    | Cases     | Deaths |
|------------|-----------|--------|
| United States | 5,600,000 | 176,000|
| Brazil     | 3,600,000 | 114,000|
| India      | 300,000   | 60,000 |
| Pakistan   | 292,000   | 6200   |

*From the Government of Pakistan COVID-19 Dashboard.*

2. COVID-19 pandemic and Pakistan

In Pakistan, the first COVID-19 case was reported in mid-March 2020; subsequent cases occurred in three peak periods recorded during three waves (Fig. 7.2). From the first wave...
of COVID-19 in Pakistan, more than one million (1.085 m) cases had been reported as of August 12, 2021. Of the reported cases, 0.975 m were complete recoveries. The data further reveal that on August 12, 2021, active COVID-19 cases in Pakistan totaled 85,636, whereas deaths totaled 24,187. In the first wave, the reported number of COVID-19 cases rose until it peaked in mid-June 2020. Then gradually, the number of cases decreased. Similarly, a second wave started at the end of October 2020 and reached its climax by mid-December 2020. Likewise, a third wave started at the end of March 2021 and reached its maximum level during the last part of May 2021. It was found from the data that the third wave had a great number of fatalities, with daily mortality crossing 200. Correspondingly, a fourth wave began in early August 2021, with 4783 cases and 73 deaths reported on August 14, 2021.

2.1 Hotspot analysis

This section analyzes COVID-19 hotspot data, including data for provinces and regions, namely, Punjab, Sindh, Khyber Pakhtunkhwa, Baluchistan, Capital Territory Islamabad, Gilgit-Baltistan, and Azad Jammu and Kashmir. The province of Sindh remained a hotspot during the entire COVID-19 period in terms of both confirmed and active cases, while the province of Punjab is another hotspot, the number of total cases is slightly less than Sindh but with more death cases than Sindh. The analysis revealed that 22% of the country’s population resides in the province of Sindh, whereas it accounted for 56% of the country’s total active cases (48,214) and 26% of its deaths (Fig. 7.3). Similarly, Capital territory Islamabad remained a hotspot in terms of deaths and reported confirmed cases. Punjab province accounts for 52% of the country’s population but accounted for only 34% of reported confirmed COVID-19 cases, whereas it accounted for 47% (1292) of the country’s total deaths of 24,187. Paralleling this, the Azad Jammu and Kashmir and Gilgit-Baltistan regions have also remained hotspots since March 2020.

The regional cum provincial analysis indicates that throughout the COVID-19 period, the province of Sindh remained in the leading position in terms of the absolute number of confirmed COVID-19 cases, COVID-19 recoveries, total active cases, and reported deaths.
It was found from the analysis that in terms of total inhabitants, the province of Punjab accounted for nearly 50% of the total population. However, total deaths in Punjab province accounted for the largest share of deaths among the provinces. The data further revealed that almost half (47%) of the country’s deaths were reported from Sindh province.

Hotspot were also identified at the local level, as shown in Fig. 7.4 the distribution of Covid-19 cases is mostly concentrated in the populous urban areas with influence on surrounding rural areas. In Sindh province, Karachi, a primate city and hub of commercial and industrial activity, remained a major hotspot of COVID-19 reported cases and deaths. Similarly, in Punjab province, the capital city of Lahore was a hub and hotspot of deaths and confirmed and active cases. Likewise, in the province of Khyber Pakhtunkhwa, the capital city of Peshawar remained a hotspot followed by Mardan, Abbottabad, and Swat. Throughout the COVID period, the capital territory of Islamabad was a hotspot for all types of COVID-19 cases. Similarly, the capital city of Azad Jammu and Kashmir, “Muzaffarabad,” and the capital city of Gilgit-Baltistan, “Gilgit,” were hotspots. The analysis revealed that all the provincial and regional capital cities were COVID-19 hotspots. The main reasons for this concentration are population and congestion, further confirming that areas with higher population density and absolute population levels remained hotspots in the country. Conversely, nearly all the hotspot regions were fully equipped with standard health infrastructure, and some COVID-positive people shifted to major cities where more health infrastructure was available.

FIGURE 7.3 Pakistan, total confirmed COVID cases, recoveries, active cases, and deaths as of August 12, 2021. From the Government of Pakistan COVID-19 Dashboard.
FIGURE 7.4 Geographical distribution of COVID-19 in Pakistan as of December 12, 2020. From the Government of Pakistan COVID-19 Dashboard.

I. Overview and national governance response
Soon after the outbreak of COVID-19 in Pakistan, various clinics and hospitals started working to control the virus, return life to normal, and fight the spread of the deadly disease. For treating patients and providing early medical aid, the government established 35 hospitals throughout the country especially designated for COVID-19 patients. Other hospitals especially designated for treating COVID-19 patients included 1 in Islamabad, the capital city of Pakistan, 4 in Gilgit-Baltistan, 3 in Azad Jammu and Kashmir, 6 in Punjab, 4 in Sindh, 7 in Khyber Pakhtunkhwa, and 10 in Baluchistan (Hashim, 2020).

3.1 Designated hospitals

The government specified hospitals at various locations throughout the country to treat COVID patients with nearly all the required medications and facilities. In each designated hospital, an Infection Counteraction and Control (IPC) group was trained to ensure proper implementation of standard operating procedures (SOPs) and other required measures. The following are some of the National IPC rules/SOPs that drafted, circulated, and executed:

i. SOPs were created and distributed to the executives at emergency clinics and air terminals. Neighborhood SOPs were to be set up and accessible in all HCFs with suitable training of the staff appointed to deal with the waste.

ii. Purification and environmental sterilization SOPs were created.

Disconnection wards were constructed throughout Pakistan to prepare for the COVID-19 pandemic. These disconnection wards are located in the designated hospitals for treatment of COVID-19, so the number of disconnection wards is the same as the number of designated hospitals in different regions. The number of beds in the disconnection wards totaled 23,557, including 350 in Islamabad, 10,948 in Punjab, 2100 in Sindh, 5897 in Baluchistan, 2760 in Khyber Pakhtunkhwa, 972 in Gilgit-Baltistan, and 530 in Azad Jammu and Kashmir (Tv G. Coronavirus updates, 2020).

Disconnection was crucial to isolate and detach sick or infected people from others to restrict the spread of the disease. As it is one of the most contagious diseases, and communication between infected and noninfected people can result in further spread, social distancing and isolation were very important in disease control. Therefore, isolation wards and centers were established throughout the country to control disease transmission.

3.2 Testing facilities in Pakistan

Globally, polymerase chain reaction (PCR) tests are recognized as the best and simplest technique to diagnose COVID-19, and thus, the government of Pakistan adopted those testing kits. Moreover, the government established 15 COVID-19 testing centers with the help of the National Institute of Health (NIH) throughout the country including 1 in Islamabad, one in Baluchistan, 2 in Khyber Pakhtunkhwa, 4 in Punjab, 5 in Sindh, 1 in Azad Jammu and Kashmir, and 1 in Gilgit-Baltistan. The daily testing limit in Pakistan was enhanced from 30,000 to 280,000, and efforts were made to increase the daily level to 900,000. The National Disaster Management Authority (NDMA) worked with the NIH to increase the number of tests and establish new COVID-19 testing centers throughout the country.
The government reserved personal protective equipment (PPE) for paramedics and frontline staff and dispatched PPEs for paramedics and research center staff to address deficiencies. The NDMA would enlist 100 lab specialists with skills in subatomic sciences to be engaged in the testing facilities in Pakistan (Tv G. Coronavirus updates, 2020; WHO, 2020b).

4. COVID-19 resilience

Globally, at the end of 2019, a pneumonia of obscure etiology flared up and was accounted for; later, the cases would end up being attributed to COVID-19, which had spread quickly (Reuters, 2020). Before long, WHO understood the seriousness of the situation and declared a “Public Health Emergency of International Concern” on January 30, 2020. Within a short period, the number of reported cases increased sharply as the virus spread to various parts of the world; subsequently, WHO proclaimed COVID-19 a “pandemic” on March 11, 2020 (India and Pakistan Crack, 2020). As a result of the disease’s continued rapid spread, on July 19, 2020, WHO announced 14,043,176 confirmed cases in 216 countries, with 597,583 deaths (DAWN, 2020; WHO, 2020a). The first case of COVID-19 in Pakistan was recorded on February 26, 2020. From March 15, 2020, onwards, the number of confirmed cases started to quickly rise, with the major cause being travel by people from other countries, especially Iran via the Taftan border. Further, from March 15 to 25, 2020, the number of cases increased from 53 to 1078 (Hunter, 2020; WHO, 2020c). From that point forward, cases increased dramatically in stepwise fashion in various parts of the country. As of July 20, 2020, 265,083 confirmed cases had been accounted for in Pakistan, of which 5599 were deaths. The current information shows that the Sindh territory alone accounted for 42.63% (113,007) of confirmed cases, followed by the Punjab region at 34.02% (90,191).

As far as Pakistan’s resilience in handling the pandemic, certain factors make the population less resilient and more vulnerable to the disease. These include overpopulation, poverty, congestion, lack of awareness, culture, and joint family systems. The country’s population is growing sharply—the majority of the country’s people are poor, and they perform labor and engage in small businesses and jobs for the survival of their families. Therefore, rather than isolating themselves and taking care of the transmission of the disease, they focus on engaging in activities for earning their livelihoods. In urban areas, the poor people live in slums, many people share small houses, and the markets and workplaces are congested. These factors make the population more vulnerable to infection. The local culture and beliefs of most people further aggravate the situation, as in the culture, people gather in cases of deaths and disease. Even when people are infected by COVID, according to the culture, relatives and friends will visit them and care for them. In Pakistan, especially in rural areas, there is a joint family system where people live together in a big house, spend the time together, eat together, and engage in all their activities with all family members. In Pakistan, the common people normally do not care to wear masks, encourage social distancing, or isolate themselves or family members in cases of infection. This situation makes people less resilient and increases their vulnerability to disease.

Conversely, some factors in Pakistan make people more resilient to fight the pandemic. Pakistan’s recovery rate is one of the highest in the world. The lifestyle of the people makes them immune to such diseases, and after infection, most patients easily recover. Generally,
people are more proactive to help others and the needy in cases of emergency and lockdown. Due to volunteer work, more people were engaged to test people and provide early medical relief. In developed countries, advanced technology—like biometric entry to buildings, offices and residential buildings, self-fueling of cars at filling stations, etc.—made people less resilient, while Pakistan mostly has a traditional system and lacks such facilities, and therefore, people have been more resilient to the pandemic.

It can be concluded that the resilience level of the country’s people depends on crowding, poverty, lack of awareness, and culture. The topography of the country and difficulties in communication made people less resilient to the pandemic. At the opposite end, people had stronger immunity and the will to help each other in cases of emergency, and the lack of certain advanced technologies for entering buildings, trains, etc., makes them more resilient.

5. Conclusion

COVID-19 is a very contagious disease, which has made it a bit of a challenge to control throughout most of the world. During the scenario, developed countries like the United States and those of Europe faced a speedier spread. In economically less developed countries, the situation was more challenging due to poverty, overpopulation, cultural factors, and lack of awareness. The pandemic, apart from health effects, adversely affects economies, communications, and politics. Different countries have implemented different plans to control the spread of the disease by encouraging social distancing and the isolation of affected persons. Pakistan, being vulnerable due to its population density and low standard of living, especially in the slum areas of cities, responded well in such difficult times. Karachi, the largest city in Pakistan, experienced the first case of COVID-19 in February 2019, and cases reached a peak in June 2019. But the government of Pakistan responded in a rational manner to minimize the spread of the COVID cases by providing an option of lockdown to the provinces, all of which availed themselves of that option. Currently, due to overpopulation, poverty, cultural factors, and lack of awareness, Pakistan is among the most vulnerable states in Asia. Hence, the option of a smart lockdown is now being applied in all the provinces of Pakistan. Pakistan is planning and preparing various policies to fight the pandemic more effectively. There is the need for a comprehensive approach involving all stakeholders on national and international levels to control this pandemic and once again make the world a global village in which all people live peacefully and with good health.

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I. Overview and national governance response