

Factors Affecting COVID-19 Incidence and Mortality in Pakistan

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Abstract

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The earliest case of this infection is dated back to 17 November 2019 in Wuhan, China. The virus later spread to other countries all over the world through human-to-human transmission. On 11th March 2020 the WHO declared it a pandemic. SARS-CoV-2 is a positive-sense single-stranded RNA virus that is contagious in humans. It is the successor to SARS-CoV-1, the strain that caused the 2002–2004 SARS outbreak. The case fatality ratio for COVID-19 has been much lower than SARS of 2003, but the transmission has been significantly greater, with a significant total death toll. The virus is primarily spread between people during close contact, most often via small droplets produced by coughing, sneezing, and talking. On 26th February, Pakistan confirmed its first two cases of the coronavirus. Lockdown was announced by different provincial governments on 21st March and it remained till 9th of May all over the country. In early June, case numbers began rising far faster. As of June 22nd 2020, Pakistan has 185,034 confirmed cases, Sindh has the highest number of confirmed cases at 71,092 closely followed by Punjab at 68,308. Khyber Pakhtunkhwa has 22,633 cases, Islamabad capital territory has 11,219 cases, Balochistan has 9,587 cases, Gilgit Baltistan has 1326 cases, and Azad Kashmir has 869 cases. Major cities in Pakistan have the highest number of COVID-19 cases. Males have comparatively high COVID-19 incidence and mortality in Pakistan at 74.06% and 73.92% respectively. The comparatively higher COVID-19 incidence in males seems related to lack of social distancing measures. COVID-19 incidence is highest in 20-40 age group in both genders and 45% of confirmed cases belong to this age group. Also this age range usually lags behind following social distancing measures. Mortality is comparatively less in this age group but this age range can still transmit infection to more vulnerable age groups. Although the age group of 50-69 makes up only 21.61% of COVID-19 confirmed cases, this age range has the highest mortality and constitutes 55.14% of COVID-19 associated deaths as older people and people with pre-existing medical conditions are more vulnerable to becoming severely ill with the virus. Since early June, after the relaxation of lockdown measures there is a sharp increase in COVID-19 cases in Pakistan, which also relates to lack of precautionary measures by citizens. The best way to prevent COVID-19 is to avoid being exposed to this virus by maintaining good social distance and proper sanitization.

Key Words

COVID-19, Pakistan, Incidence, Mortality, Population, Gender, Age, COVID-19 Demographic

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Introduction

Coronavirus disease 2019 (COVID-19) is an infectious disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The earliest case of this infection is dated back to 17 November 2019 in Wuhan, China [1]. The virus later spread to other countries all over the world except Antarctica through human-to-human transmission. On 30th January 2020, the SARS-CoV-2 outbreak was declared a Public Health Emergency of International Concern by the WHO, and on 11th March 2020 the WHO declared it a pandemic [2,3]. SARS-CoV-2 is a positive-sense single-stranded RNA virus that is contagious in humans [4]. It is the successor to SARS-CoV-1, the strain that caused the 2002–2004 SARS outbreak [5]. The case fatality ratio for COVID-19 has been much lower than SARS of 2003, but the transmission has been significantly greater, with a significant total death toll [6]. The virus is primarily spread between people during close contact, most often via small droplets produced by coughing, sneezing, and talking [7]. It mainly enters human cells by binding to the receptor angiotensin converting enzyme 2 (ACE2) [8]. The basic reproduction number of the virus has been estimated to be between 1.4 and 3.9 [9]. This means each infection from the virus is expected to result in 1.4 to 3.9 new infections when no members of the community are immune and no preventive measures are taken. The reproduction number may be higher in densely populated conditions [10]. As of 22 June 2020, worldwide there have been 9,100,090 total confirmed cases of SARS-CoV-2 infection in the ongoing pandemic. The total number of deaths attributed to the virus is 472,216. Many recoveries from confirmed infections go unreported, but at least 4,528,780 people have recovered from confirmed infections.

On 26th February, Pakistan confirmed its first two cases of the coronavirus. The first patient was a student from Karachi, Sindh, while the second patient was from the federal territory of the country. Both patients had recently returned from Iran [11]. On 13th March a 52-year-old patient in Sindh, marked the first case of local disease transmission, as the patient had travelled from Islamabad [12]. To prevent the spread of COVID-19, government announced the closure of educational institutes all over the country on 13th March and educational institutes were instructed to switch to online educational system. Also, Pakistan temporarily sealed its land border from Iran, Afghanistan and China in the month of March. All international flights were suspended from March 21 till June 20 but special international flights were scheduled from April 10 to 13 to bring back the stranded Pakistanis from abroad. Screening also started for domestic travelers at Karachi Jinnah Airport on 21 March. Lockdown was announced by different provincial governments on 21st March and it remained till 9th of May all over the country. During Lockdown public transport, markets, offices, shopping malls, restaurants, and public areas were to be closed. It included a complete ban on all kinds of social and religious gatherings or any public or private event. Exemptions included essential services like pharmacy and grocery stores. To further enforce lockdown, the Sindh govt restricted movement between 8AM and 5PM, while all grocery stores were ordered to be closed by 5 PM. Pakistan Day Parade, scheduled to be held on 23 March, was cancelled. On 14th April a national broadcast education channel was inaugurated to mitigate the loss faced by the students due to the closure of educational institutions till May 31 in the wake of coronavirus pandemic. On 22nd April Pakistan crossed a critical mark of the outbreak in the country as the total number of cases surged above 10,000. It was reported that 58% of the cases had been locally transmitted in Pakistan. In early June, after testing began to pick up once again, case numbers began rising far faster. June 3 was the first day in which more than 4,000 people tested positive for COVID-19. The ratio of positive cases to tests also increased, hovering around 20 - 25% in the first few days of June. On 18th June, government imposed smart lock down in selected areas to curb the increasing spread of COVID-19.

As of June 22nd 2020, Pakistan has 185,034 confirmed cases, 73,471 recovered cases and 3,695 reported deaths. 1126761 total tests have been done. Sindh has the highest number of confirmed cases at 71,092 closely followed by Punjab at 68,308. Khyber Pakhtunkhwa has 22,633 cases, Islamabad capital territory has 11,219 cases, Balochistan has 9,587 cases, Gilgit Baltistan has 1326 cases, and Azad Kashmir has 869 cases [13].

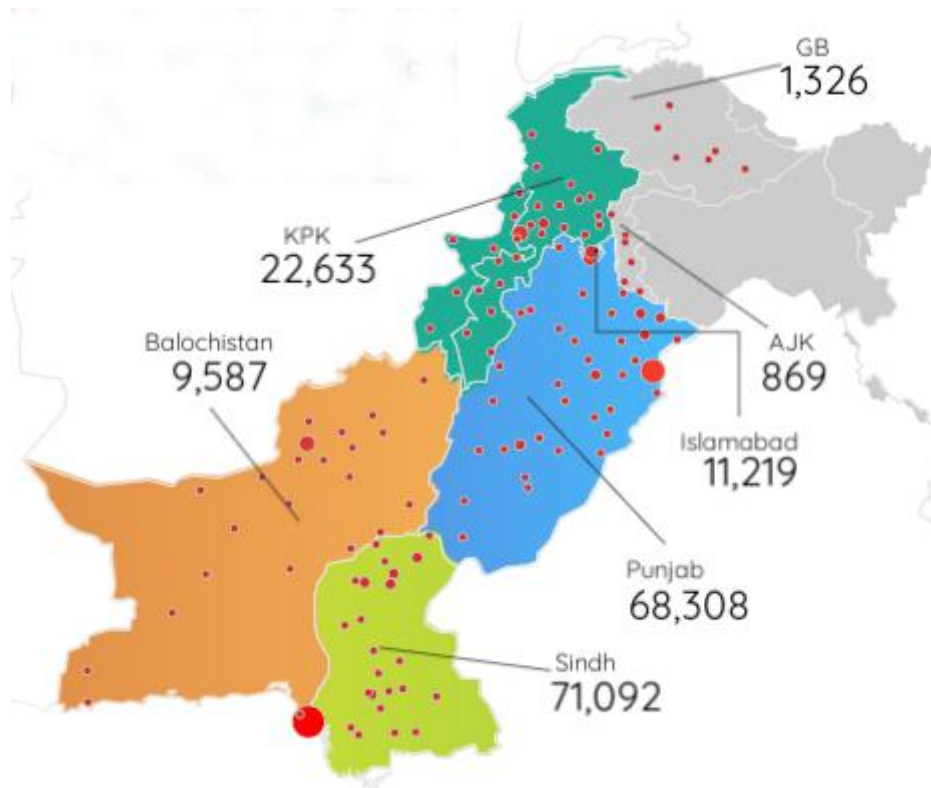


Fig 1. COVID-19 Cases in Pakistan till 22nd June 2020
Source: covid.gov.pk

Region	Confirmed Cases	Active Cases	Deaths	Deaths Percentage	Recoveries	Recoveries Percentage
Pakistan	185034	107868	3695	2%	73471	39.7%
AJK	869	497	22	2.53%	350	40.27
GB	1326	358	22	1.66%	946	71.34%
Islamabad	11219	6101	106	0.94%	5012	44.67%
Balochistan	9587	5813	104	1.08%	3670	38.28%
KPK	22633	14921	843	3.72%	6869	30.35%
Punjab	68308	47233	1495	2.18%	19580	28.66%
Sindh	71092	32945	1103	1.55%	37044	52.1%

Table 1. COVID-19 Cases in Pakistan till 22nd June 2020
Source: covid.gov.pk

Incidence

Incidence of COVID-19 in Different Regions of Pakistan

The incidence of COVID-19 varies in different geographical regions of Pakistan. Sindh and Punjab are the most highly affected. Densely populated major cities like Karachi, Lahore, Peshawar and Quetta are more affected with COVID-19. Currently the number of COVID-19 cases in different regions of Pakistan are directly proportional to the population of the region as there are more number of people as well as more chances of spreading infection. The COVID-19 reproduction number may be higher in densely populated conditions [10].

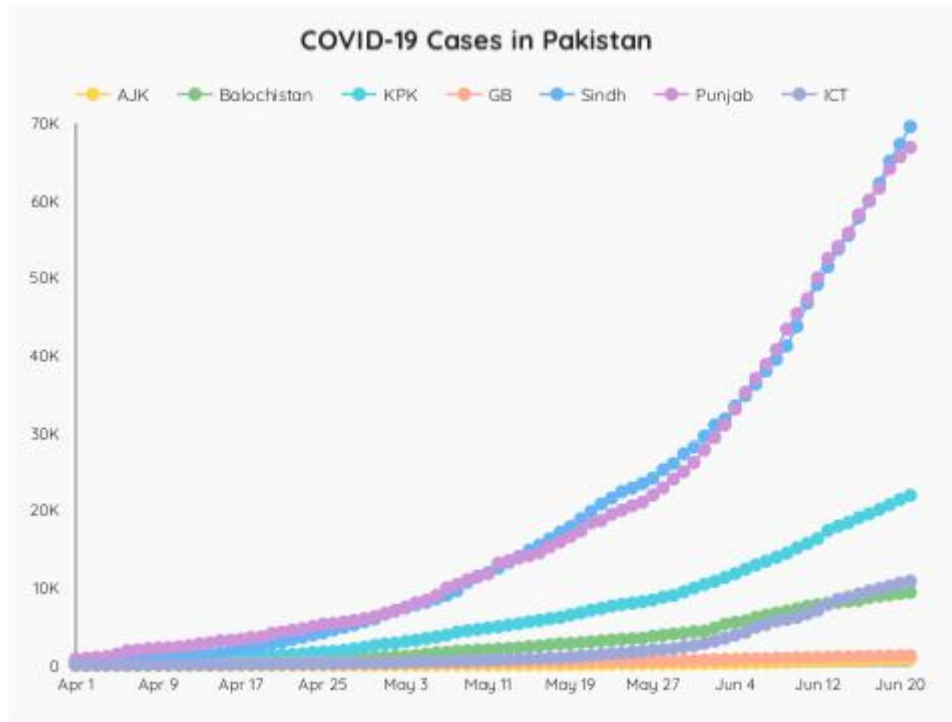


Fig 2. COVID-19 Cases in Different Regions of Pakistan

Source: covid.gov.pk

Date	AJK	Balochistan	KPK	GB	Sindh	Punjab	ICT
April 1	9	169	274	187	743	845	62
April 9	33	219	617	215	1128	2279	107
April 17	48	335	1075	250	2217	3391	163
April 25	55	722	1793	308	4232	5378	235
May 3	71	1218	3129	364	7465	7524	415
May 11	86	2061	4875	457	12017	11869	716
May 19	133	2885	6554	556	17947	16685	1138
May 27	219	3781	8483	651	24206	22307	2015
June 4	299	5582	11890	852	33536	33144	3946
June 12	574	7866	16415	1044	49256	50087	7163
June 20	813	9328	21444	1278	67353	65739	10662
June 21	845	9475	21997	1288	69628	66943	10912
June 22	869	9587	22633	1326	71092	68308	11219

Table 2. COVID-19 Cases in Different Regions of Pakistan

Source: covid.gov.pk

City	Total Cases
Karachi	20192
Lahore	11463
Peshawar	3794
Quetta	3365
Islamabad	1719
Multan	1300
Faisalabad	1219
Sukkar	865
Sialkot	773
Khairpur	718
Larkana	637
Mardan	586

Table 3. Cities in Pakistan having more than 500 COVID-19 total Cases till 22nd June 2020
Source: covid.gov.pk

The Incidence of COVID-19 in Pakistan According to Gender

Males are more affected than females as 74.06% males are affected in all age brackets as compared to 25.95% females and the male versus female ratio is around 3:1. Majority of the women stay at home in Pakistan or work in educational institutes that have switched to online learning or so it's easier for them to keep social distancing measures but the majority of men go out to work that may contribute to less social distancing and more number of cases.

In China, the number of male patients was higher initially, but no significant gender difference was observed as case number increased. Women were about 50% more likely to practice protective behaviors during pandemics, such as hand washing, face mask use and avoiding crowds compared to men which may be in part responsible [14].

The Incidence of COVID-19 in Pakistan in Different Age Ranges

People with the age range of 20-40 has the highest incidence of getting infected with COVID-19 in Pakistan as 45% percent of total COVID-19 patients in Pakistan belong to this age group. 20-40 is usually the most active working age range and therefore the social distancing measures are difficult to follow. Females are most affected in the age range of 20-29 (6.09%) while males are most affected in the age range of 30-39 (17.81%). There is less incidence of COVID-19 in children in Pakistan and the same has been observed in in China and US, also children were less symptomatic than adults in US and China but among the children, infants were the most affected, although comparatively less than adults. [14].

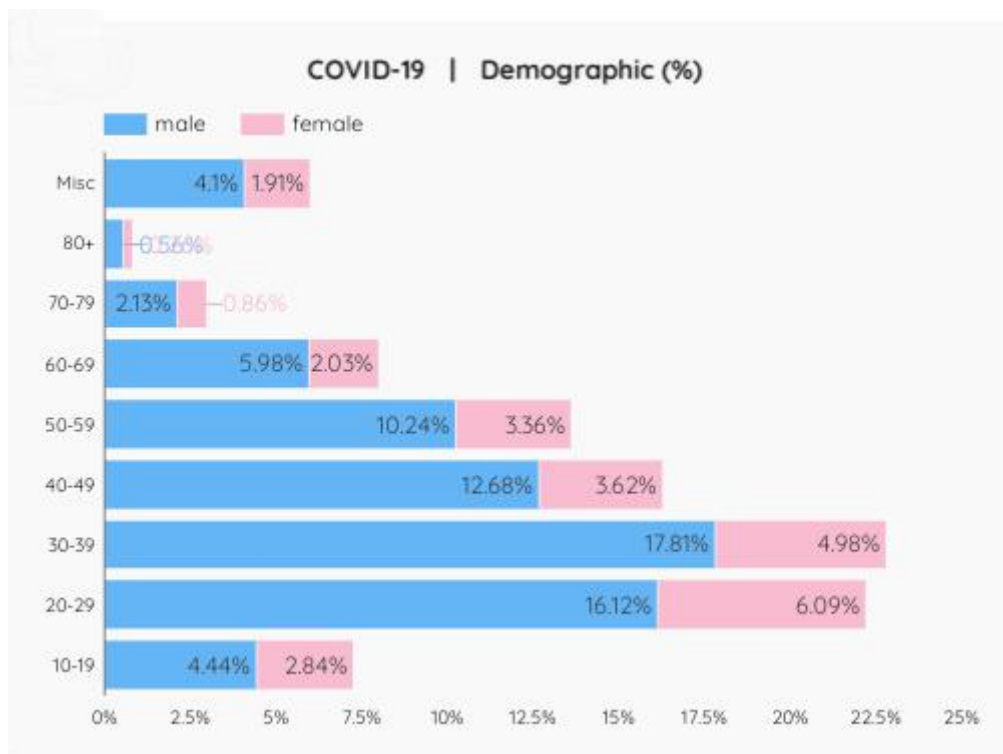


Fig 3. The Incidence of COVID-19 in Pakistan Depending On Age and Gender
Source: covid.gov.pk

Age	Male	Female	Total
10-19	4.44%	2.84%	7.28%
20-29	16.12%	6.09%	22.21%
30-39	17.81%	4.98%	22.79%
40-49	12.68%	3.62%	16.3%
50-59	10.24%	3.36%	13.6%
60-69	5.98%	2.03%	8.01%
70-79	2.13%	0.86%	2.99%
80+	0.56%	0.26%	0.82%
Misc	4.1%	1.91%	6%
Total	74.06%	25.95%	100%

Table 4. The Incidence of COVID-19 in Pakistan Depending on Age and Gender
Source: covid.gov.pk

Mortality

Case Fatality Rate

The Case Fatality Rate (CFR) is the ratio between confirmed deaths and confirmed cases that can only be considered final when all the cases have been resolved (either died or recovered). As Pakistan still has unresolved active COVID-19 cases, only preliminary case fatality rate can be measured. Till June 22, 2020 Pakistan's COVID-19 Preliminary Case Fatality Rate is 2%..

Confirmed Cases	Deaths	Case Fatality Rate
185034	3695	2%

Table 5. COVID-19 Preliminary Case Fatality Rate in Pakistan as on June 22, 2020

Source: covid.gov.pk

Outcome of Total Closed Cases - Death Rate vs Recovery Rate

From the outcome of total closed cases of COVID-19 in Pakistan, it can be observed that recovery rate is considerably higher than death rate. Also, during early April the death rate was as high as 22.46% and recovery rate was as low as 77.54% but with better management strategies, in June 2020 the death rate has been reduced to 4.78% and recovery rate has been increased to 95.22%.

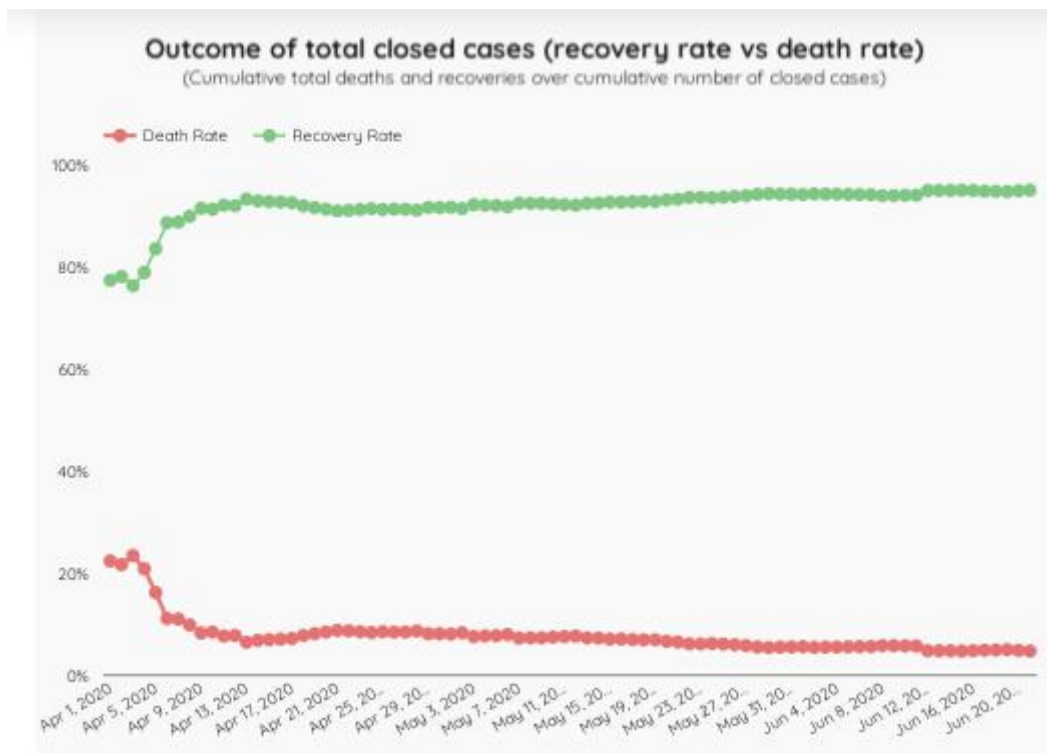


Fig 4. Outcome of total closed cases (recovery rate vs death rate)
(Cumulative total deaths and recoveries over cumulative number of closed cases)

Source: covid.gov.pk

Date	Death Rate	Recovery Rate
April 1	22.46%	77.54%
April 5	16.29%	83.71%
April 9	8.32%	91.68%
April 13	6.51%	93.49%
April 17	7.24%	92.76%
April 21	8.84%	91.16%
April 25	8.58%	91.42%
April 29	8.18%	91.82%
May 3	7.63%	92.37%
May 7	7.31%	92.69%
May 11	7.62%	92.38%
May 15	7.12%	92.88%
May 19	6.99%	93.01%
May 23	6.18%	93.82%
May 27	5.86%	94.14%
May 31	5.59%	94.41%
June 4	5.56%	94.44%
June 8	5.84%	94.16%
June 12	4.85%	95.15%
June 16	4.84%	95.16%
June 20	4.9%	95.1%
June 21	4.78%	95.22%
June 22	4.79%	95.21%

Table 6. Outcome of total closed cases (recovery rate vs death rate)
(Cumulative total deaths and recoveries over cumulative number of closed cases)
Source: covid.gov.pk

The Mortality of COVID-19 in Pakistan According to Gender

The mortality of COVID-19 in Pakistan according to gender is quite similar in comparison with the gender specific incidence. With the incidence of 74.06%, males have the mortality of 73.92%. Females having COVID-19 incidence of 25.95% have the mortality of 26.08%.

The Mortality of COVID-19 in Pakistan in Different Age Ranges

Although the incidence of COVID-19 is considerably less in the age group of 50-69 and makes up only 21.61% of COVID-19 confirmed cases, this age range has the highest mortality and constitutes 55.14% of COVID-19 associated deaths. It appears that older people are more vulnerable to becoming severely ill with the virus. In China, about 80 percent of deaths were recorded in those aged over 60, and 75 percent had pre-existing health conditions including cardiovascular diseases and diabetes [15].

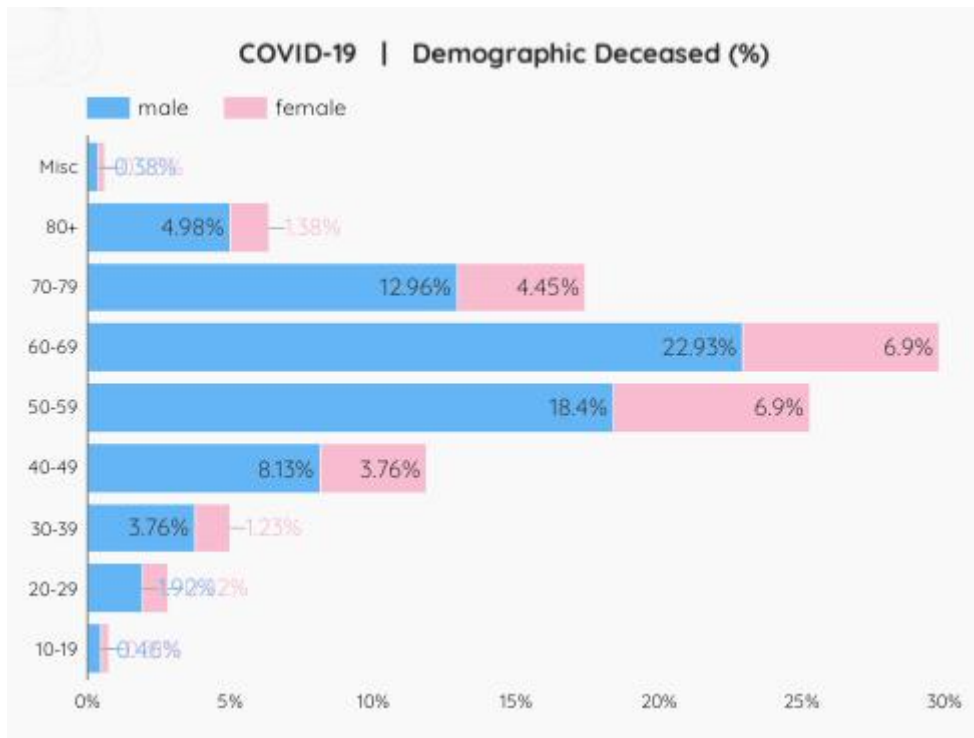


Fig 5. COVID-19 | Demographic Deceased (%)
Source: covid.gov.pk

Age	Male	Female	Total
10-19	0.46%	0.31%	0.77%
20-29	1.92%	0.92%	2.84%
30-39	3.76%	1.23%	4.98%
40-49	8.13%	3.76%	11.89%
50-59	18.4%	6.9%	25.31%
60-69	22.93%	6.9%	29.83%
70-79	12.96%	4.45%	17.41%
80+	4.98%	1.38%	6.37%
Misc	0.38%	0.23%	0.61%
Total	73.92%	26.08	100%

Table 7. COVID-19 | Demographic Deceased (%)
Source: covid.gov.pk

Trends

Although there has been a steady increase in COVID-19 cases since February 26th but since the month of June, the number of cases has increased many folds. Although wearing face masks have been made mandatory, as the Lockdown has ended, people have tried to resume their regular activities ignoring social distancing measures at many places. To curb this increasing spread of infection, government has again imposed smart lock down on selected COVID-19 hot spots mostly in major cities of Pakistan.

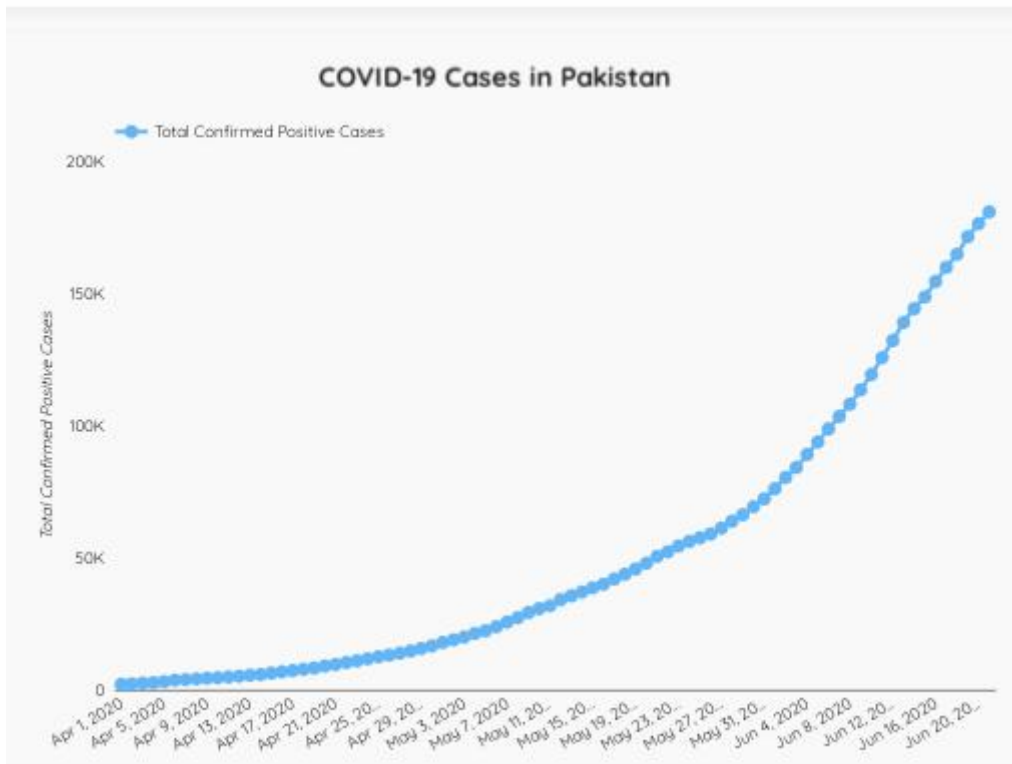


Fig 6. COVID-19 Cases in Pakistan
Source: covid.gov.pk

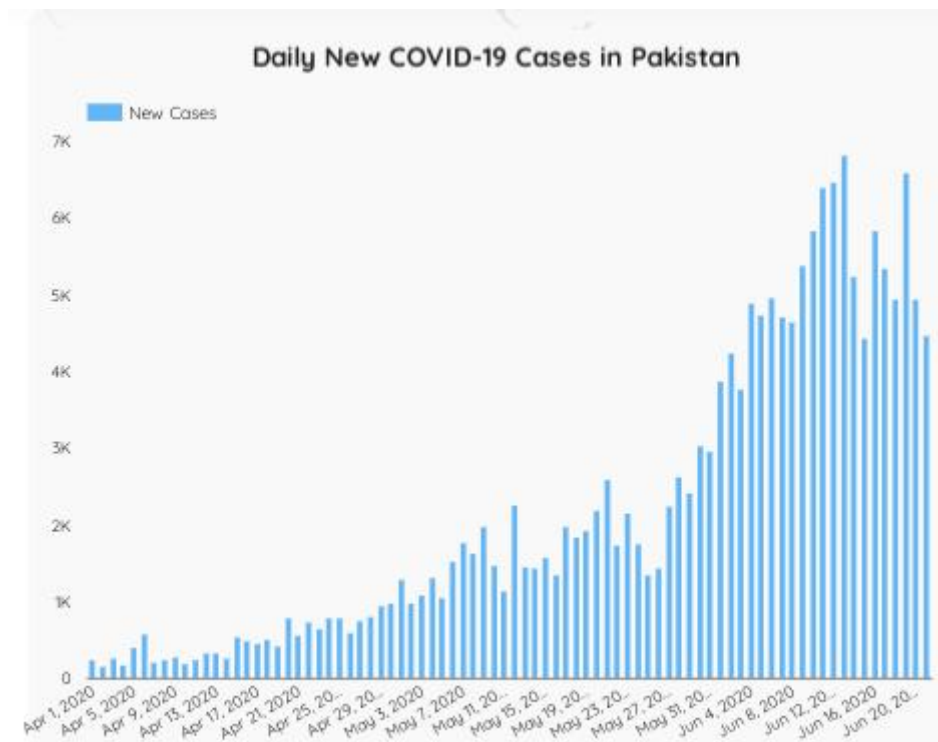


Fig 7. Daily New COVID-19 Cases in Pakistan
Source: covid.gov.pk

Date	Total Confirmed Cases	Daily New Cases
April 1	2289	250
April 5	3287	407
April 9	4598	281
April 13	5716	342
April 17	7479	463
April 21	9771	555
April 25	12723	783
April 29	15827	942
May 3	20186	1083
May 7	25837	1764
May 11	32081	1140
May 15	38799	1581
May 19	45898	1932
May 23	54601	2164
May 27	61392	2241
May 31	72460	2964
June 4	89249	4896
June 8	108317	4646
June 12	132405	6472
June 16	154760	5839
June 20	176617	4951
June 21	181088	4471
June 22	185034	3946

Table 8. Total Confirmed Cases and Daily New Cases in Pakistan
Source: covid.gov.pk

Conclusion

From this study, it can be concluded that major cities in Pakistan have the highest number of COVID-19 cases. Males have comparatively high COVID-19 incidence and mortality in Pakistan at 74.06% and 73.92% respectively. The comparatively higher COVID-19 incidence in males seems related to lack of social distancing measures. COVID-19 incidence is highest in 20-40 age group in both genders and 45% of confirmed cases belong to this age group. Also this age range lags behind following social distancing measures Mortality is comparatively less in this age group but this age range can still transmit infection to more vulnerable age groups. Although the age group of 50-69 makes up only 21.61% of COVID-19 confirmed cases, this age range has the highest mortality and constitutes 55.14% of COVID-19 associated deaths as older people and people with pre-existing medical conditions are more vulnerable to becoming severely ill with the virus. Since early June, after the relaxation of lockdown measures there is a sharp increase in COVID-19 cases in Pakistan, which also relates to lack of precautionary measures by citizens. The best way to prevent COVID-19 is to avoid being exposed to this virus by maintaining good social distance and proper sanitization.

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