

SHORT COMMUNICATION

A WIDE-BASE POPULATION PYRAMID AND OTHER FACTORS EXPLAIN LOW MORTALITY IN PAKISTAN DURING COVID-19 PANDEMIC

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World is experiencing an unprecedented pandemic of COVID-19 for over a year. This viral infection outbreak originated in December 2019 at Wuhan, China and within three months became a global pandemic. The outbreak has affected over 200 countries and territories of the world. Despite of having well-established health care system, countries such as China, Italy, Iran, Spain, France, Germany and USA have experienced a high death toll in this pandemic. Pakistan although being geographic neighbour of China and Iran, is somehow protected from the otherwise expected high case-fatality of COVID-19. This paper explains what factors have protected Pakistan from a high mortality in this pandemic.

Keywords: Coronavirus; COVID-19; Pandemic; Mortality; Case-fatality; Population pyramid

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INTRODUCTION

Coronaviruses are a group of RNA viruses that are responsible for common colds in humans. The recent coronavirus disease (COVID-19) is known for it causing a severe acute respiratory syndrome. This disease became an epidemic during December 2019 at Wuhan, China and later became a global pandemic by March 2020.

As of 7th April, 2021, globally at least 133,153,721 individuals were reported to be affected with COVID-19 infection. Of these 107,382,658 (97%) have already recovered and 2,889,450 (3%) have died. The status of presently infected 22,881,613 individuals reveals that 22,781,916 (99.5%) are likely to recover owing to their mild condition but the other 99,697 (0.5%) are in critical condition and have a high risk of death.¹

In simple terms, coronavirus disease has a mortality rate of around 3%. Findings from the Report of the WHO-China Joint Mission² show that mortality rate in laboratory confirmed cases is 3.5%.

However, when the statistics are stratified on the basis of age,³ a different picture is revealed. Nearly 21.9% of the people who died with coronavirus disease, were >80 years of age. (Table-1)

The COVID-19 has affected over 200 countries and territories of the world and the counts are rising on an exponential manner. Countries are managing this pandemic with various strategies including promotion of social distancing, lock-down of cities and putting strict restrictions on people's movement. With the availability of vaccines, the transmission is yet to be controlled. Authorities in Pakistan too are concerned regarding the prevention and

management of COVID-19 outbreak. The challenges in Pakistan are manifold. Poor literacy, poor compliance of hand hygiene, unavailability of clean water, resource restraint economy, densely populated areas, frequent congregation of people in large numbers at places of worships, limited numbers of hospitals with proper facilities (including ventilators etc.) are some of the major issues. Another challenge for Pakistan is its geographic location. Pakistan is a neighbour with China and Iran. All of these factors pose Pakistan at a greater risk of spread of coronavirus disease. In Pakistan, to date over so far 700,188 people have been found COVID-19 positive, 15,026 deaths recorded and another 3,769 patients are present in critical condition. Nearly 620,789 have already recovered from the infection.⁴ Comparing this with USA, whose population is about 1.5 times that of Pakistan; it's alarming to observe that in USA over 31,561,743 individuals were reported COVID-19 positive and the death tally was 570,224. The deaths count in USA were way to high despite of an excellent healthcare system.

Considering the factors mentioned above, the COVID-19 numbers in Pakistan are strikingly low for a country of 220 million people. What could be reasons of Pakistan's low counts of infection and low mortality in the present pandemic? Following factors could explain this observation:

1- **A wide-base population pyramid:** Pakistan is a country comprising mainly of young and adolescent people. This is different from western countries where elderly people are major part of the population. The proportion of >60 years old in population of Italy, France, Spain, USA and China are 26.4%, 23.6%, 23%, 23.8% and 17.1%, respectively. Even Iran has 10.1% of its population is over 60 years of age. These countries

have experienced a high case-fatality in recent COVID-19 outbreak. Pakistan has only 6.6% people in this category. (5) Hence, younger population resulted in better host defense against infections. Figure 1 shows the comparison of Pakistan with USA in this regard.

2- Lack of tourism by foreigners: Immigration in western countries has imported the COVID-19 infection from travellers and tourist coming from China. Pakistan due to its negative reputation of being affected with external terrorism in last decade has low tourism by foreigners. Even Chinese engineers coming to Pakistan for China-Pakistan economic corridor initiative work don't freely mingle in the society. They live in their designated colonies under strict security provided by the law enforcement agencies of Pakistan. Hence, low chances of exposure of general population. However, a big number of Pakistani residing abroad visit their homeland or those visiting back from places of worship abroad could be attributed for importing the virus.

3- Resource restraint living: A large proportion of population lives in rural areas where they neither have resources nor have an access to COVID-19 screening. In case of infection, they are likely to bear the symptoms, at most go to various sorts of faith healers, quacks, practitioners of eastern medicine or general medical practitioners or indulge in self-medication etc. With two weeks of acquiring infection, most individuals would recover without being reported to the health department. One could speculate that the actual COVID-19 positive counts are much higher, but only a small proportion will ever get tested and reported. Most cases will recover spontaneously and develop immunity without being ever notified. Only a mass level screening could identify the actual counts of patients in the country.

4- Cross immunity due to other infections/ vaccines: Recent data indicate that mortality with COVID-19 is low in countries where malaria is endemic. However, no scientific explanation is accepted as yet. Similarly, old BCG vaccine is believed to provide cross-immunity to corona virus disease. Again, these observations need to stand the test of science. In any case, principle of Herd immunity has been responsible in protecting the catastrophe from COVID-19 in Pakistan (via large number of asymptomatic patients with antibodies against virus and other pathogens that provide partial cross immunity).

Although, the COVID-19 pandemic is in full swing the numbers are likely to change depending upon the compliance on the protective measures.⁴ The most suitable way for general Pakistanis to mitigate the current outbreak is to strictly follow the government policies made under the guidelines provided by the infectious disease epidemiologists and public health experts. A low compliance will not only adversely affect the weak health care system but will also harm the economy of the developing country.

5- Less Virulent strain of the COVID-19 in Indian sub-continent:

Pakistan is not the only country which has shown low death counts in the current pandemic. India and Bangladesh have shown similar trends too. This has led to hypothesis that either the strain of virus that has affected Indian subcontinent is less virulent or there were some viral mutations rendering the virus less lethal.^{6,7} Alternatively, other factors such as life style, dietary factors or immune response among people of Indian sub-continent could also be attributed to be responsible for protection against a mass fatality. The genome of the SARS-CoV2 virus belonging to different geographical origins (India, USA and China) have been studied and it was observed that all the genomes had 99% similarity with Chinese virus. However, unique mutations were observed for virus found at different geographical regions. At host defense level, it's understood that the anti-viral micro RNAs of the host affect the pathogenesis of the disease. Interestingly, hsa-miR-27b is a unique miRNA which has a target gene in the Indian COVID-19 virus.⁷ The Indian Council of Medical Research (ICMR) is planning to study whether the virus strain in India has experienced any mutation.⁸ The virus strain in UK is the one health professionals are concerned about as the present vaccine may not work against it.

6- Community circulation of related viruses and resultant immunity:

Another explanation of the low case-fatality in Pakistan and India could be a result of prior exposure /community circulation of non-SARS-CoVs viruses and their antigenic epitopes, leading to an antibody-dependent enhancement against COVID-19.⁹ It's the antibody-dependent enhancement that is responsible for the sustained inflammation, lymphopenia, and/or cytokine storm in the affected individuals.¹⁰ This might explain the observed geographic discrepancies among cases. Moreover, in this context, it could be speculated that the ethnicity and geographical belonging of the host decides the course of the events for virus affected individual. A small burden of coronavirus ideally has a higher chance of stimulating a protective immune response than a high one. Especially the pre-viral exposure immunity that could cross-react with coronavirus, could influence the outcome of the infection.⁹ Hence, it is possible for this to act like a secondary immune response that is similar to a vaccine. However, this is yet to be demonstrated scientifically.

Vaccination and the way forward:

Like other countries, the vaccination drive in Pakistan is in full swing. So far health care professionals and people above 60 years of age are being offered two shots of vaccine at 3 weeks interval. Keeping in perspective of the high population of the country, it will take a lot of time, energy and resources to vaccinate the entire country.

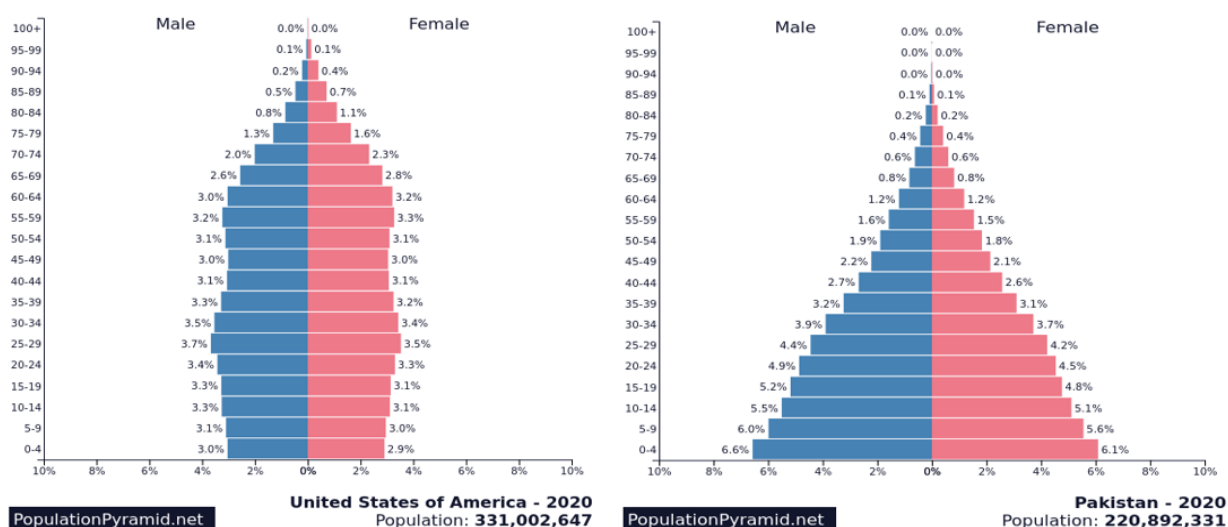


Figure-1: Population pyramids of USA and Pakistan taken from www.populationpyramid.net

Table-1: COVID-19 Fatality Rate by Age

AGE	DEATH RATE confirmed cases	DEATH RATE all cases
80+ years old	21.9%	14.8%
70-79 years old		8.0%
60-69 years old		3.6%
50-59 years old		1.3%
40-49 years old		0.4%
30-39 years old		0.2%
20-29 years old		0.2%
10-19 years old		0.2%
0-9 years old		No fatalities

*Death Rate = (amount of deaths / number of cases) = probability of dying if infected by the virus (%). The percentages do not have to add up to 100%, as they do NOT represent share of deaths by age group.

Source: <https://www.worldometers.info/coronavirus/coronavirus-age-sex-demographics/>

CONCLUSION

Pakistan shares border with countries that are highly affected with coronavirus such as China, an epicenter of the disease, and India which has the second largest number of coronavirus cases in the World. Despite of this geographical location, Pakistan was reporting very a smaller number of coronavirus cases. This can be attributed to wide-base population pyramid, lack of tourism by foreigners, cross immunity due to other infections or other vaccines and less virulent strain of COVID-19.

Disclaimer: This paper has never been previously presented or published in any conference or meeting. The data shown in tables/ figures have been obtained from public domain.

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