

Feature Article



What Impact Could the COVID-19 Pandemic have on Public Health?

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Abstract

Coronavirus disease (COVID-19) is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which is currently wreaking havoc across the globe. This virus is the 7th coronavirus to cause disease in humans and is the first to cause a full-blown global pandemic. The disease has now spread to 213 countries worldwide and its geographical range is rapidly expanding. This virus is spread through droplet transmission from the lungs and causes severe respiratory problems in humans. The World Health Organization (WHO) is playing a leading role in tackling this pandemic since the beginning. The present COVID-19 pandemic shares many similarities with the Spanish flu, which occurred over a century ago and killed 50-100 million people. The lessons learnt from the Spanish flu has major implications for the COVID-19 pandemic. Importantly, COVID-19 could have a major impact on public health by influencing many aspects, including hand hygiene, facemask use, social distancing, public health behaviour, among many others. These have been addressed in the present article.

Keynote: COVID-19; coronavirus; pandemic; public health.

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the etiologic agent of coronavirus disease (COVID-19), which is currently wreaking havoc worldwide. Coronavirus outbreaks are not new, as several have occurred in the past. However, none of them have been as deadly as the current pandemic, which is unprecedented in human history.

SARS-CoV-2: The Etiologic Agent of COVID-19

SARS-CoV-2, the etiologic agent of COVID-19, was previously called 2019 novel coronavirus (2019-nCoV). From a taxonomic perspective, this virus is classified as a severe acute respiratory syndrome-related coronavirus (SARSr-CoV).

SARS-CoV-2 has been identified as the 7th coronavirus capable of infecting humans. Other viruses include SARS-CoV-1, MERS-CoV, HKU1, NL63, OC43 and 229E. While SARS-CoV-1, SARS-CoV-2 and MERS-CoV cause severe disease, the other four cause mild disease. Mild symptoms include dry cough, fever, fatigue, and headache. Some of the severe symptoms include breathlessness, chest tightness accompanied by pain, difficulty speaking, and inability to move. The severest symptom, which occurs in the last stage is acute respiratory distress syndrome (ARDS), which often leads to death.

SARS-CoV-2 originated in the Wuhan 'wet market' where it 'jumped' from bats to pangolins and subsequently spread to humans as a result

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of undergoing a genetic mutation¹. The virus mutated again, which allowed it to transmit between humans.

Transmission of SARS-CoV-2 occurs via droplets or aerosols, emitted from the respiratory tract when a person coughs or sneezes. The virus can also be spread by touching contaminated surfaces. The average incubation period of SARS-CoV-2 is 5-6 days. This is why potentially infected individuals are being quarantined for 14 days. Epidemiological studies have revealed that a single SARS-CoV-2 infection causes approximately 2 to 4 infections in the absence of any preventive measures and lack of immunity against the virus.

The genetic material of SARS-CoV-2 is ribonucleic acid (RNA), which has a single strand and a positive polarity. The virus has a diameter of 50-200 nanometers and the length of its genome is approximately 30 kb or 30,000 base pairs. SARS-CoV-2, like other coronaviruses, constitutes of four structural proteins that make up the surface spikes (S), envelope (E), membrane (M), and nucleocapsid (N). The N protein binds to the genomic RNA, while the other proteins, namely, S, E and M constitute the outer covering of the virion (Fig. 1). Of these viral surface proteins, the S protein is crucial for infection. It is this S protein that is responsible for attachment and entry of the virus into a cell, thereby causing infection. Studies have shown that the cellular receptor of the S protein is angiotensin converting enzyme 2 (ACE2).

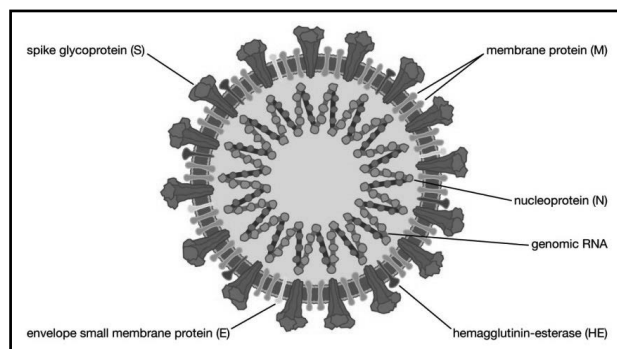


Fig. 1: SARS-CoV-2 Structure

COVID-19 Pandemic: Origin and Spread

A cluster of atypical pneumonia cases of unknown etiology was reported on 31 December 2019 from Wuhan in Hubei Province, China. These were

initially thought to be normal pneumonia cases, as a result of which the Chinese Government did not pay much attention. Consequently, by the beginning of January, the number of cases started to increase rapidly and in due course, spread to hitherto unaffected parts of the world. As a result, on 30 January 2020, the World Health Organization (WHO) Director-General declared the outbreak as a Public Health Emergency of International Concern (PHEIC)². SARS-CoV-2 had spread to 114 countries by 11 March 2020, resulting in 118,000 cases and 4,291 deaths. This prompted the WHO to declare COVID-19 as a pandemic – the first coronavirus pandemic in world history³. As of 26 May 2020 (10.12 PM, IST), the disease had spread to 213 countries and territories, with 5,637,367 cases and 349,290 deaths. At the same time point, the figures for India were 150,600 cases and 4,349 deaths. In Fig. 2, the total number of cases and deaths for the top five worst affected countries have been presented, along with India for comparison⁴.

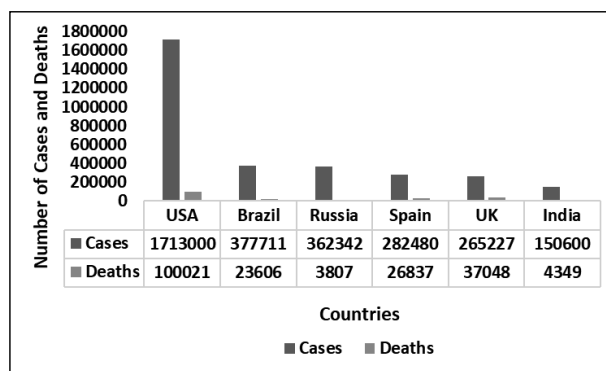


Fig. 2: Cases and deaths in the top five worst affected countries and India

COVID-19 Pandemic: Response of the WHO

The response of the WHO has been phenomenal. The WHO has developed and implemented the *Strategic Preparedness and Response Plan (SPRP)*⁵ to tackle the COVID-19 pandemic. The SPRP has put public health strategies on high priority, especially in developing countries that lack adequate health infrastructure, so that they can fight the pandemic on a war footing. The WHO is coordinating international efforts to develop a safe and effective vaccine against COVID-19, as well as expediting the development of effective drugs and therapeutics through its

global “Solidarity” Clinical Trial⁶, which, as of 20 May 2020, has enrolled over 3,000 patients in 320 hospitals across 17 countries worldwide.

Timeline of WHO’s Response

| Date | Response |
|------------------|---|
| 31 December 2019 | Cluster of atypical pneumonia cases of unknown etiology reported from Wuhan, China |
| 1 January 2020 | WHO asked for more information about the pneumonia cases from China and activated its Incident Management Support Team |
| 2 January 2020 | WHO informed the Global Outbreak Alert and Response Network (GOARN) |
| 5 January 2020 | WHO predicted that there could be human-to-human transmission |
| 11 January 2020 | <ul style="list-style-type: none"> • First genomic sequence of SARS-CoV-2 shared by China • First death from COVID-19 reported from China |
| 13 January 2020 | First COVID-19 case reported outside China (Thailand) |
| 22 January 2020 | Human-to-human transmission confirmed by WHO after visiting Wuhan |
| 30 January 2020 | COVID-19 outbreak declared as a Public Health Emergency of International Concern (PHEIC) by WHO |
| 4 February 2020 | WHO informed that there was a ‘window of opportunity’ as more than 99% of cases were still in China with only 176 cases in the rest of the world |
| 11 March 2020 | WHO declared COVID-19 as a ‘pandemic’ |
| 13 March 2020 | WHO stresses on a comprehensive approach to tackle COVID-19 – testing, contact tracing, quarantining, and social distancing |
| 8 April 2020 | WHO appeals to the world for national unity and global solidarity to defeat COVID-19 |

Key Lessons Learnt from the Spanish Flu and its Influence on the COVID-19 Pandemic⁷

The Spanish flu is the deadliest viral pandemic in human history, which occurred in 1918 at the end of the 1st World War. This gigantic pandemic was caused by a highly virulent influenza virus, which killed an astounding 50-100 million people - a number that was far greater than those who perished during the 1st World War. We have learnt many lessons from the Spanish flu, which are still relevant today with reference to the ongoing pandemic. These are briefly highlighted below:

Public Health Strategies are Indispensable for Fighting Pandemics

The concept of ‘Public Health’ was still in a nascent state at the time of the Spanish flu. Consequently, the underprivileged, economically weak, and deprived people in the society were the most affected and accounted for the highest number of fatalities. In fact, it was the Spanish flu that acted as a catalyst for the development of public health systems around the globe. This occurred due to increased awareness among scientists and doctors about the need for public health measures for tackling pandemics like the Spanish flu, which are so deadly that they can kill

by the millions. Interestingly, the public health measures being implemented in the current COVID-19 pandemic had their origins during the fight against the Spanish flu, over a century ago.

Pneumonia is Responsible for the Highest Mortality from Respiratory Viruses

Pneumonia is the major complication that results in death from COVID-19. Pneumonia primarily occurs due to a weakened immune system, which was also the case for the Spanish flu. However, one major difference between the two pandemics is that the mortality rate of the Spanish flu was much higher than that of the current COVID-19 pandemic.

Speed of Transmission Depends on the Mode of Transportation

At the time of the Spanish flu, the primary modes of transportation were by road, railways and ships. Air travel was practically unheard-of at the time. However, in the 21st century, everything has changed. Now we live in the ‘jet age’, which allows anyone to travel anywhere across the globe within a matter of 24 hours. This has been the primary reason why the present COVID-19 pandemic has spread at such a lightning speed. The Spanish flu, by comparison, spread much more slowly because the mode of transportation

was much slower at that time. During the current pandemic, international travel restrictions have been instrumental in halting the transmission of the virus to unaffected parts of the world.

Viruses Exhibit Specificity for Different Age Groups

The Spanish flu is often referred to as the “*greatest medical holocaust in history*”. This is not just because the death toll was so enormous, but because many of the victims were quite young and healthy. This highlights the fact that the virus was highly virulent, due to which it overwhelmed the immune system, killing even these healthy youths. Interestingly, during the Spanish flu, older people were by and large spared by the virus. This could stem from the fact that these aged individuals had survived a very similar strain of influenza virus that had ravaged human populations during the 1830s, when they were infants. In stark contrast, SARS-CoV-2 predominantly attacks the elderly. Other vulnerable populations include diabetics, heart patients, and immunocompromised individuals such as AIDS patients.

COVID-19 Pandemic: Potential Impact on Public Health

Once the current pandemic abates, the public health scenario as one knows it, could change forever. There are many aspects of public health that may be impacted, some of which are briefly highlighted below:

Handwashing Could Become Popular^{8, 9}

International organizations, such as the WHO and UNICEF, and national authorities like the Ministry of Health and Family Welfare have continuously advocated the frequent washing of hands with soap and water. It has been repeatedly stressed that frequent handwashing is one of the most effective ways of halting the transmission of COVID-19 to oneself and to others. The vital role of handwashing has, by now, become ingrained in the minds of the general public worldwide. This could lead to a change in people’s mindset, which could encourage them to wash their hands more frequently in order to maintain good personal hygiene.

Good hand hygiene is of the utmost importance for tackling helminthiasis, which is caused by

worms infesting the human intestine. The disease is predominantly spread through contaminated food and water, which can be prevented by handwashing, hands thoroughly with soap and water before eating and after using the toilet. Therefore, frequent handwashing with soap and water will not only be beneficial for tackling COVID-19, but could also help in bringing down the global burden of helminthiasis.

Wearing Masks May Become a Common Practice¹⁰

Wearing facemasks is quite common nowadays, especially in highly polluted cities in India, which is home to 21 out of the top 30 most polluted cities in the world. Moreover, due to the ongoing COVID-19 pandemic, the use of facemasks has become compulsory.

Interestingly, the mode of transmission of SARS-CoV-2 closely resembles that of tuberculosis (TB), which is a deadly respiratory disease caused by the bacterium *Mycobacterium tuberculosis (Mtb)*. Both SARS-CoV-2 and *Mtb* are transmitted by droplets or aerosols emitted from the respiratory tract when an infected person coughs or sneezes. Since the transmission patterns of both pathogens are similar, this will increase awareness among the public and help them to correlate between the two diseases and encourage them to wear facemasks. Therefore, the COVID-19 pandemic could be a blessing in disguise, as it could lead to increased use of facemasks, not only among COVID-19 patients, but also among TB patients. Hence, in due course, wearing masks could become a common practice across the world.

Social Distancing Could Become the Norm

‘Social distancing’ is a term that refers to the maintenance of a specified distance between two or more individuals in order to stop the transmission of an infectious agent, which in this case is SARS-CoV-2. This virus can spread very rapidly from person-to-person, especially in congested places such as markets, where mixing of people is very common. Social intermingling of people can be significantly reduced through standard public health measures, such as lockdowns, which can lead to an appreciable reduction in the overall number of cases.

The concept of social distancing is not new. It dates back to 1347 AD during the Black Death, the most devastating pandemic in human history that killed a staggering 75 to 200 million people worldwide. It was the deadliest bubonic plague ever known and was caused by the bacterium *Yersinia pestis*, which was spread by fleas living on black rats¹¹. Although in those medieval times, the notion of viruses and bacteria were non-existent, the doctors had a fair idea that preventing contact with the patients prevented the spread of the disease. Hence, it was the very first instance in history that public health measures such as social distancing and quarantining were implemented¹².

Later on, during the Spanish flu, social distancing was instrumental in containing the disease in the US⁷. A classic example of the power of social distancing measures was demonstrated in Philadelphia, Pennsylvania and St. Louis, Missouri. In Philadelphia, social distancing was not observed, which resulted in 10,000 deaths within one month of the onset of the pandemic. In contrast, in St. Louis, where social distancing measures were stringently implemented, less than 700 deaths occurred. Hence, this clearly demonstrates that social distancing was just as important and effective over a century ago as it is today.

Coming back to the current COVID-19 pandemic, Harvard University scientists have shown through disease modelling studies that social distancing measures may need to be maintained till 2022¹³, until effective vaccines and antivirals become available. Since people across the globe have become habituated to social distancing as a result of sustained public awareness programs, this could become the norm even after the pandemic is over.

Spitting in Public Could Stop¹⁴

Spitting in public places has recently been banned in a bid to reduce the transmission of COVID-19. The Ministry of Home Affairs (MHA), Government of India, which announced the ban during the second phase of the lockdown, has been implemented in accordance with Section 51(b) of the Disaster Management Act (2005). Spitting in public places will now be a punishable offence. In this regard, the Municipal Corporation of Greater

Mumbai (MCGM) has already imposed a fine of Rs. 1,000 if anyone is caught spitting in public. This ban on spitting is likely to bring about a change in mindset, accompanied by behavioural changes among the general public, which could eventually lead to stopping this filthy habit.

Health Sector Could Become Strengthened

Over the past five months, the health sector has witnessed dramatic changes, by way of financial and logistical support by the Government of India. This will tremendously help healthcare professionals to fight COVID-19 in a more effective way. Interestingly, all types of red-tapism that is usually the norm while taking government decisions have literally vanished. Decisions pertaining to the COVID-19 pandemic are being taken quickly, based on solid scientific evidence, which is rarely seen in government settings. The financial impetus that the health system has received within such a short span of time is unprecedented. This financial support has enabled a total revamping of the health infrastructure, including the creation of isolation rooms, expansion of the number of hospital beds, installation of quarantining facilities, as well as purchase of ventilators and other essential life-saving equipment.

Moreover, training of hospital staff has also been made possible through increased funding. All medical personnel, including doctors, nurses and paramedical staff have had first-hand training on tackling infections in a hospital setting within a very short time span. Hospital-acquired infections (HAI) have traditionally been a huge problem in healthcare settings in India. However, basic hand hygiene practices can play a vital role in reducing HAI in the long-term. Moreover, if these practices become ingrained in society, future generations will definitely reap the benefits and be thankful to us.

Demand for Telehealth Services Could Increase

Telehealth is a technology that enables patients to consult with their doctors through video conferencing and wireless communication. This technology also plays an important role in collection of health data from remote and hard-to-reach areas. Most importantly, the telehealth

platform overcomes problems, such as distance, transportation, and lack of manpower. Since e-learning, video conferencing, and working remotely have become essential components of day-to-day life over the past several months, these communication modalities could become the norm in the future and stimulate demand for telehealth services.

Medical Research Could See a Paradigm Shift

Medical research prior to the COVID-19 pandemic was very different from how it is currently being conducted. In the pre-COVID-19 era, research findings were kept a closely guarded secret prior to publication or filing a patent. Importantly, research was focused on academic and career advancements of the scientists. However, during this pandemic, there has been a sea-change in research protocols. Now, scientists across the world are working collaboratively by pooling all their resources together to solve a single problem – how to defeat COVID-19. In fact, this is the largest collaborative effort in the history of medical research. Scientists conducting basic research are trying to better understand the virus's pathogenicity, transmission, and behaviour, while translational researchers are trying to develop vaccines and therapeutics. Moreover, clinical researchers are designing and conducting clinical trials for evaluating these therapeutics in humans. Hence, research in the post-COVID-19 era is very likely to see greater all-round collaboration across the globe, which could bring about a paradigm shift in how medical research is conducted.

Mental Health Problems Could Increase

A negative impact of the COVID-19 pandemic is the potential increase in mental disorders. The stringent public health measures, such as lockdowns, that have been taken to tackle the pandemic have led to social isolation due to confinement within closed spaces. This has led to psychological problems among people, with children being the worst affected. Since children are not accustomed to staying indoors, they are suffering the most. Moreover, school closures have exacerbated the problem. Some of the mental health issues faced by children and adults alike, include stress, insomnia, anxiety, depression,

phobic disorders, and mood swings. In case of adults, mental disturbances can arise from decreased earnings or job losses, which can lead to behavioural changes that can result in alcohol abuse and domestic violence. Hence, this is an emerging problem that requires the immediate attention of mental health professionals.

Why will the World Never be the Same Again?¹⁵

In the aftermath of the pandemic, it is almost certain that the world will never be the same again. There are many factors that will have a direct or indirect impact on the post-pandemic society. The most important factor that will have a dramatic impact on the global community is the economic crisis. Leading economists indicate that the global economy will be shattered and the world will go into recession. This will evidently be accompanied by its many ramifications, including job cuts, loss of livelihoods, and devastation for daily wage earners.

The fate of the global economy will depend on how governments and societies across the world respond to the pandemic. The quicker the viral transmission can be stopped, the lesser harm that will be done to the global economy. Hopefully, this crisis will teach us to create an economy that is not just based on monetary aspects, but a holistic approach that is more humane and responsive to the basic needs of society, which can only be brought about by thoroughly revamping the global economy.

Conclusion

It is quite clear that the COVID-19 pandemic will impact our lives like never before. The impending economic recession will change the way we live by drastically curtailing spending and consumerism, largely arising from job cuts, loss of livelihoods and other factors. Moreover, the concept of public health is also likely to change, based on the new knowledge accrued during the pandemic. People will become more aware about pathogens and how they can wreak havoc across the globe, having no respect for international borders and sparing no one – rich or poor. Most importantly, the way medical research is conducted will also undergo a major transition – from national to global collaborations – to tackle health problems that affect the whole of humanity.

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