

COVID-19 pandemic: Challenges and risk factors of public health in India

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Abstract

Coronaviruses belong to a large family of viruses known to cause illness in animals or humans. In humans these may affect the respiratory systems, leading to diseases like SARS and MERS etc. Recently another coronavirus was detected to cause severe outbreak in Wuhan, China, in December 2019 that resulted severe acute respiratory syndrome among a huge number of people. This new virus is recognized as SARSCoV-2, and the disease connected to it was named by the WHO as COVID-19. This virus has swept the world, infecting more than 9633898 persons and killing over 490494 lives worldwide. WHO has declared the COVID-19 outbreak as a pandemic. As of 27 June 2020, the Health Ministry, Govt. of India has confirmed 197387 active cases of coronavirus infection and 15685 deaths in the country so far. Any vaccine against this RNA virus is yet to be discovered, and the patients are being treated symptomatically. It has thus become a universal challenge for the scientists to discover exact antidote of this extremely infective disease. Government of India, keeping good coordination with different state governments, and taking into account the directives of WHO, IMA, ICMR etc, has taken several initiatives to combat this pandemic.

Keywords: COVID-19; SARSCoV-2; Pandemic; People; Prevention

1 Introduction

Coronaviruses, belong to the subfamily Orthocoronavirinae, in the family Coronaviridae, order Nidovirales, and realm Riboviria [1,2]. The name Corona originated from the Latin word corona, meaning "crown" or "wreath" because of appearance of crown-like spikes on the outer surface of the virus. The size of coronaviruses ranges from approximately 27 to 34 kilobases (diameter ranging from 80 to 120 nm) and contain a single-stranded RNA as the nucleic acid with a lipid envelope decorated with club shaped projections (Fig. 1a and b) [3,4]. Coronaviruses are a collection of allied viruses that cause diseases in mammals and birds. Till now six coronavirus species are known to cause human disease. Human coronaviruses were first exposed in the late 1960s [5]. Other family members of coronaviruses have been identified, including SARS-CoV in 2003, HCoV NL63 in 2004, HKU1 in 2005 and MERS-CoV in 2012. SARS-CoV-2 is a new strain of coronavirus first identified in Wuhan, Hubei Province, China, in December 2019 that has not been previously identified in humans,

hence it was initially called 2019 Novel Corona virus [6]. Later on Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is the name given to it. The disease associated with SARS-CoV-2 was named as COVID-19, following the World Health Organization (WHO) best practice external icon for naming of new human infectious diseases. Here 'CO' stands for 'corona,' 'VI' for 'virus,' and 'D' for disease. With the current information available, it is suggested that the route of human-to-human transmission of SARS-CoV-2 is either via respiratory droplets or via contact [7]. Any person who is in close contact (within 1 meter) with someone who has respiratory symptoms (e.g., sneezing, coughing, etc.) is at risk of being exposed to potentially infective respiratory droplets [WHO interim guidance January 2020] [8,9]. It may so happen that, if any person touches a surface or object that already contains viable virus on it, and touches his/her own mouth, nose, or possibly eyes, the virus may spread through the mucus membrane and infect the person.

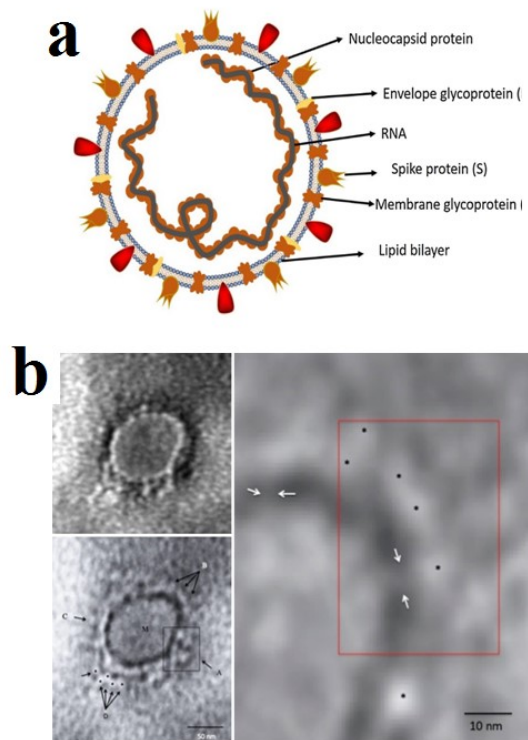


Figure 1: (a) Structure of coronavirus. (b) Transmission electron microscopy imaging of COVID-19. [4]

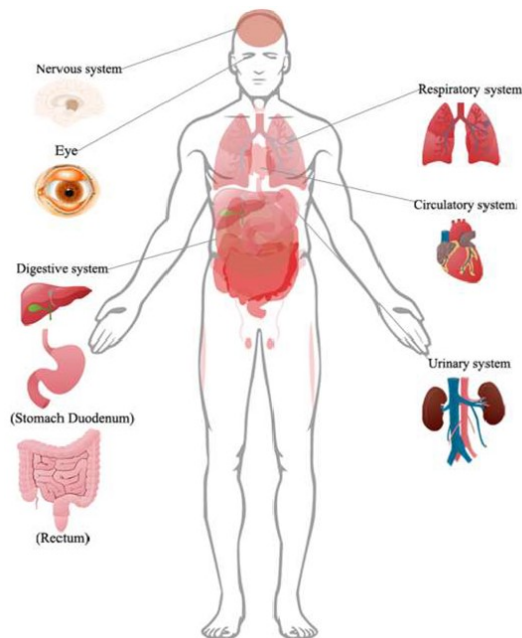


Figure 2: Organ involvements confirmed by clinical features or biopsy in COVID-19.

Diagnosis of other coronaviruses like 229E, NL63, OC43, or HKU1 is not the same as a COVID-19 diagnosis. Unlike other coronaviruses, patients with COVID-19 need to be evaluated and cared for differently. Coronavirus disease 2019 (COVID-19) is a respiratory illness that can spread from person to person. The clinical spectrum ranges from mild disease with non-specific signs and symptoms of acute respiratory illness such as fever, cough, fatigue, shortness of breath, to severe pneumonia with respiratory failure and septic shock (Fig. 2) [10,11]. It has also been reported that many infected patients remain asymptomatic. The World Health Organization (WHO) has officially labeled the outbreak of COVID-19 a global Pandemic on 11th March 2020. As per the latest update of WHO on 27th June 2020, COVID-19 had spread in more than 200 countries & territories, and approximately 490,494 people had died after contracting the respiratory virus out of nearly 963,389 confirmed cases [WHO website] [12]. It posed enormous threat to global public health. The impact of COVID-19 on Indian population, several risk factors, preventive measures being taken and needs to be taken for facing the toughest challenge of the century are discussed in this paper.

2 Materials and method

Many currently available literature was reviewed for COVID-19 infection and their impact caused by SARS-CoV-2 at the time of writing the paper (27th June 2020). The defined search period from 30 January 2020 to 27th June 2020 was selected to compare the studies regarding the first outbreak and findings. A literature search was performed using the database, different websites, news bulletins, circulars, instructions, audio-visuals for creating awareness of several authentic Govt. and non Govt. organizations, agencies, professional bodies like WHO, UNICEF, Indian Medical Association, Indian Council of Medical Research, Health Ministry of India etc. The authors have also collected data from different national and international reputed journals. Authors have followed different orders and directives issued by the Govt of India and different state govt.

Different methods, adopted by the central and state governments in India during its fight against the coronavirus, have been taken into consideration, and the data found therein have been suitably incorporated in the present study. Given the nature of the review, no ethical approval was required.

3 Result and discussions

International scenario: The pandemic has already created deep scars in all the continents except Antarctica. As of June 27, 2020, the outbreak of COVID-19 has resulted in 9633898 confirmed cases and 490494 deaths globally, which is more than those was caused by SARS and MERS in 2003 and 2012, respectively. After a long battle of about three months with COVID-19 and costing more than 84409 lives China has seen a rapid decrease in new cases of coronavirus. But it is increasing rapidly in other countries, especially in USA, India, Italy, France, Brazil, Iran etc. and there are lots of doctors and healthcare personnel engaged in combating it [13-15]. USA is the most effected country with more than 2407590 confirmed cases and more than 124161 deaths on June 27. Comparative studies of COVID-19 infection of USA with other highly affected countries are shown in figure 3.

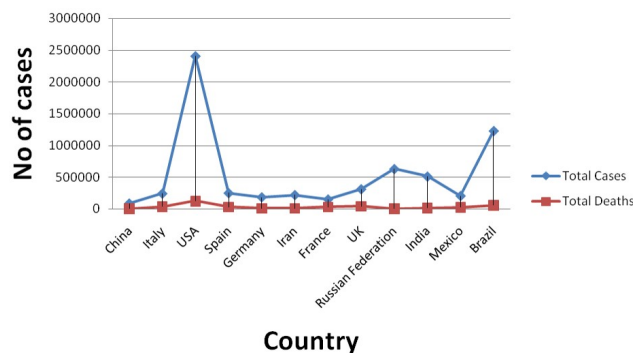


Figure 3: The comparative study of COVID-19 cases of USA with other Country. (Source: WHO 2020, Accessed date: 05 June 2020)

Coronavirus cases in India: The first case of coronavirus infection in India was reported on 30 January 2020. The first case was confirmed in Kerala's Thrissur district when a student had returned home from Wuhan University in China [16]. Since the student came from the COVID 19 stricken Wuhan city and had developed certain symptoms within himself, was immediately quarantined and underwent clinical examination. According to the report from China, the major symptoms of COVID-19 infection were mainly cough, fever and dyspnea. Similar symptoms were observed in the student. In February only two cases were reported when two more students of Kerala returned home from Wuhan, China [16,17]. No significant rise in cases was seen in the rest of February in India. On 4 March 22 new cases came to light, including those of an Italian tourist group with 14

infected members [18]. On 12 March, a 76-year-old man who had returned from Saudi Arabia became the first victim of COVID-19 in the country [19]. Initially, most of the confirmed cases had a travel history to China, especially from Wuhan and subsequently connections with other COVID-19 affected countries were also observed. According to the report of the Ministry of External Affairs, Govt. of India, there were only 276 confirmed Indian cases abroad as of 18 March. Most of them were in Iran (255), with others in United Arab Emirates, Italy, Kuwait, Sri Lanka, Rwanda and Hong Kong [20]. One Indian died in Iran on 20 March 2020 [21]. In this situation, few health care workers had been reported to be infected by COVID-19. Few mass gathering events also supposed to increase the COVID-19 cases in India. As per the report of the Union Health Ministry in India as of 27th June 2020, the number of COVID positive cases has reached 508953 out of which 295880 people have been discharged from hospital after recovery, and 15685 persons had deceased.

In India 33 states and union territories have been affected by the disease. Maharashtra is the highest infected state (152765 total positive cases and 7106 death) of the country followed by Delhi (77240 positive case with 2492 death). Although the 1st COVID-19 case was found in Kerala, this state has shown remarkable progress in its fight against this highly contagious disease. The death rate from COVID-19 in Kerala (0.8%) is lowest in the country (national death rate 3.36%). Although the number of confirmed cases of COVID-19 in India is increasing day by day at a significant rate, the situation seems to be less alarming like China, Italy, USA, Spain, Iran etc and there is still a decent scope for India to improve the situation in controlling the spreading of the disease (Fig. 3).

Prevention and control of the disease: India, the second most populated country in the World, has a population of nearly 133.92 crores. Population density in India is nearly 455/ sq. Km. Due to very high population density, the coronavirus is likely to spread rapidly in India. As it is a new virus, nobody has prior immunity which in theory means that the entire human population is potentially susceptible to COVID-19 infection. The epidemiology of COVID-19 shows that 82% of the affected are likely to develop only mild symptoms, severe illness in 15%, critical illness in 3% and death 2%. Severe infection and mortality are seen only in high-risk groups like elderly and those with chronic lung disease, heart disease, liver disease, renal disease, malignancies, immune compromised, pregnancy, post-transplant, hematological

disorders, HIV and in those on chemotherapy and long term steroids. In majority of patients' with mild symptoms, there is no need for hospitalization of symptomatic management. Some elderly COVID-19 infected patients with pre-existing diseases may lead to pneumonia in both lungs, multi-organ failure and in some cases death. Since there is no specific medication or vaccine for COVID-19, it has been recommended by WHO and other superior medical bodies, to take precautionary measures so as to resist its transmission. Ministry of Health, Indian Medical association, ICMR along with many other govt. and non govt. organizations have been continuously recommending people to abide by the following measures in order to maximally prevent the spread of the virus. People can help protect themselves from respiratory illness including COVID-19 with everyday preventive actions, such as-

- Frequently washing hands with soap and water or alcohol based hand rub/sanitizers for at least twenty seconds, especially when returning home from outside, after using toilet etc.
- Maintaining cough etiquettes
- Maintaining at least 1 meter distance from a coughing or sneezing person
- Not touching mouse, nose or eyes without properly washing hands
- Compulsory wearing of mask or face cover
- Eating foods after cooking well
- Keeping an infected or suspected person isolated for 14 days

Different print and electronic media in India are in constant transmission of these precautionary measures to the people.

As shown in Fig. 4, during a public health emergency, the smooth coordination between the government, medical care and the masses is very important. It is noteworthy to mention that the central government had taken initiatives to avoid spreading of this disease in India by taking some measures that include screening persons coming from infected countries at the international airports, harbor, borders etc, and treating the affected person keeping in isolated wards. WHO in its recent bulletin emphasized on "Triple T & I" (i.e Trace the infected, Test him/her, Treat accordingly if infected & Isolate from the main stream) to prevent transmission of COVID-19. Different state governments keeping good coordination with the central govt. in India have thus taken the policy to test the suspected COVID-19 cases followed by treatment at isolated wards, keeping the persons who came in close contact with them home quarantined, keeping

international passengers self-isolated for 14 days, and suggesting common people to maintain social distancing.

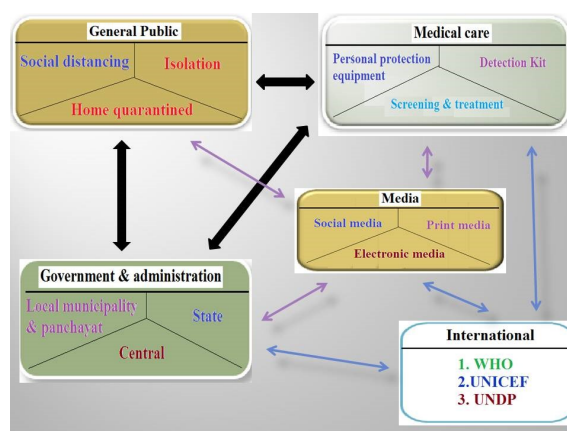


Figure 4: Interactions in society during the COVID-19 pandemic.

At the end of second week of March most of the state governments in the country decided to close schools, colleges, universities and academic institutes at different time durations. The central government introduced 'Janta curfew' i.e curfew maintained by the common people on Sunday, 22 March 2020 from 7 am to 9 pm to help reduce community spreading of COVID-19 in India, and it was spontaneously observed by the citizens. Ministry of foreign affairs suspended all tourist visas till 3rd May, as a majority of the confirmed cases were linked to other countries. International flights were ceased from 23rd March. Finally the central govt. announced complete lock down of the entire country from 25th march midnight which after two successive extensions will continue up to 31th May 2020, with relaxation to essential services and commodities.

Government has been constantly convincing common people to stay at home and to maintain social distancing so as to restrict the transmission of the virus. A number of isolation wards developed throughout the country, many new testing centers have been approved, and infrastructural facilities are being improved for the treatment and prevention of the disease. Based on the number of infected persons in a particular region, government has categorized the country into three different colour zones, namely red, orange and green. Lock down is meant for identifying and isolating the infected persons followed by treatment. For this reason, a number of hospitals have been converted to COVID hospital, several isolated beds and ventilators have been arranged throughout

the country on an emergency basis. Some auditoriums, stadiums, offices and even railway coaches have been converted into make shift isolated wards for the treatment of the infected.

Many health workers have faced violent onslaughts from people in the society. So Union Cabinet has passed an ordinance to protect health workers under attack during covid-19 pandemic. Central govt. of India has sanctioned a relief fund amounting one lakh seventy thousand crores of Indian Rupees to meet the expenditure related to the fight against COVID-19. Private sectors, celebrities, industrialists and common people are coming forward to raise fund. Public and private sectors have come forward for making temporary hospitals, and isolation wards. COVID-19 Test kits have been purchased and some are being manufactured by the national companies on an emergency basis. Central and state governments have decided to provide basic amenities such as rice, pulse, oil, wheat, free LPG to the poor people till the crisis ceases.

Number of tests has been increased to identify the infected. Quarantine centers have been developed in different parts of the country for isolating the primary and secondary contacts of the COVID infected persons. In order to contain the spread of the disease in the areas where any confirmed case has been found, are declared as "Containment Zone" where residents are asked to keep themselves completely restricted inside their homes. Migrant labourers who were confined to their working places, along with the interstate students have been sent to their respective states of residence under strict surveillance of the local as well as central administration. Adequate testing have been done and precautionary measures have been taken by the respective state governments to make it sure that no further infection be spread from them. In this connection the different government and private testing labs have increased number of COVID detection tests. Health care professionals, police personnel and other frontline COVID warriors have also been brought under special insurance coverage.

Treatment and new findings: There is neither any specific treatment, nor any vaccine to protect against COVID-19 has yet been developed. People with COVID-19 can seek medical care to help relieve symptoms. Different govt. and non govt. research organizations in India have been in constant investigation of antidotes of the virus. WHO has recommended that frequent test for detection of infected persons and isolation of infected persons could stop spreading the disease. Recently Indian

Council of Medical Research (ICMR), New Delhi, the apex body in India for the formulation, coordination and promotion of biomedical research, in its circular dated 23.03.2020 notified that Hydroxy-chloroquine has been found to be effective against coronavirus in laboratory studies and in-vivo studies. Its use in prophylaxis is derived from available evidence of benefit as treatment and supported by pre-clinical data, The National Taskforce for COVID-19 recommends the use of hydroxy-chloroquine for prophylaxis of SARS-CoV-2 infection for asymptomatic healthcare workers involved in the care of suspected or confirmed cases of COVID-19 and asymptomatic household contacts of laboratory confirmed cases. They also made it mandatory for medical stores and suppliers to sale the drug strictly on the basis of prescription of doctors.²² Remdesivir, an antiviral drug initially developed for Ebola treatment, has showed positive result in COVID-19 disease. On 1st May the U.S. Food and Drug Administration issued an emergency use authorization for remdesivir for the treatment of COVID-19 patients who have been suffering from severe symptoms like low blood oxygen levels or requiring oxygen or ventilator.²³ Many a countries have started clinical trials of the possible vaccines. Apart from direct human to human transmission through respiratory droplets, fomites play an important role in spreading the disease through the community as a whole. It is thus important to know how long the virus can survive outside the host body i.e human body.

Recently in an analysis indicate that aerosol and fomite transmission of SARS-CoV-2 is plausible, since the virus can remain viable and infectious in aerosols for hours and on surfaces up to days.²⁴ There is another controversy regarding the fact that whether the effectiveness of the virus like flu or other seasonal viruses would slow down at forthcoming summer in India. Scientists are not unanimous in this regard. So far, there is no concrete evidence to say that the virus would die off in summers [25]. So many researches are going on throughout the world regarding COVID-19, some of the findings are really highly appreciating. But since the virus is very new, and it has been continuously mutating itself, it is too early to draw any final conclusion regarding this virus. A number of research works is going on throughout the world regarding the mode of transmission, rate of spread, temperature dependence and conditions of survival of SARS-CoV-2. Different countries have already started clinical trial of the possible vaccines against this virus. Convalescent plasma treatment has shown some positive effect towards neutralisation

of the virus by restricting its replication. Recently some of the hospitals and research centres in India have started using convalescent plasma treatment to some critically ill COVID-19 patients, and it has been found to show some satisfactory results.

Future plans: After five weeks of lockdown, the Ministry of Health, Government of India, claims to get benefit of the lockdown to a certain extent. According to their claim, although the number of infected persons and death toll is increasing day by day, the time required for doubling the total infected case has increased from 2.4 days (on 24th March, before lockdown) to 12.4 days. But it is hard reality that lock down can't sustain for indefinite period, especially in the developing country like India. It is therefore a matter of prime importance to strengthen the research & development sections of our country. For the sake of quick development of vaccines, monitory and infrastructural facilities need to be provided to the research institutions and universities so as to facilitate the COVID-19 related research. Apart from the constant untiring efforts of our scientists to develop effective antidote of the disease, emphasis have also been given on enhancing individual immunity levels through intake of healthy diets, fresh vegetables, natural anti-oxidants along with regular exercise and meditation. Certain natural products containing immune enhancing ingredients in this regards might be helpful. Recently the Ministry of AYUSH, Govt. of India, being driven by Ayurveda, the plant based science, has recommended regular intake of certain plant based natural ingredients such as turmeric, cinnamon, coriander, cumin, black peeper, dry ginger, basil leaves etc, as a preventive health care measure for boosting immunity levels of individuals with special reference to respiratory systems. Regular intake off foods containing vitamin C, zinc and antioxidants help fight COVID-19 by raising one's immunity level. Polysaccharides isolated from edible mushrooms are natural immunomodulators, antioxidants and have been found to be effective for its fight against certain viral diseases [26-28]. Since these exert their antiviral effects directly by activating the natural defence system of the host, intake of mushrooms might have some beneficial effects in this regard. Nobody knows when the vaccine will be developed, or it will be developed at all or not. So people need to develop the practice of wearing masks, washing hands, maintaining social distancing -cough etiquettes- personal hygiene as parts of their life. Maintaining healthy lifestyle, regular exercise, and healthy diet might boost the immune systems as well, that will help protect from the disease. After the lock down is over a second wave of

infection is likely to attack the country. Government therefore needs to take initiatives for implementing the following measures for the next one year-

- i) Imposing restriction on large mass gathering of any type
- ii) Restricting movement from COVID stricken countries
- iii) Imposing temporary ban on travel to other countries
- iv) Making it mandatory to wear masks and maintaining cough etiquette
- v) Continuously sensitizing people to maintain social distancing and personal hygiene

4 Conclusion

It is a challenging task for the world, and also for India to stop COVID-19 from spreading. Central and different state governments in India in true sense have left no stone unturned in their effort to prevent the disease. This highly transmissible disease has affected the world economy very badly, and its impact on a developing country like India is really a matter of great concern. The fight against COVID-19 will definitely cost a lot to Indian economy. Production has gone down, trade became minimal, and the sensex has been greatly hit. Although India govt. took all the initiatives well ahead of transmission of the disease inside the country, there is clearly a hope that it will surely overcome the problem in near future. Till the development and application of the vaccine to the entire population, the people in general have no other option than to survive with SARS-CoV-2. Our citizens need adopting the practice of wearing masks, washing hands, maintaining social distancing-cough etiquettes-personal hygiene Maintaining healthy lifestyle, regular exercise, and healthy diet might boost the immune systems as well. Intake of certain immune modulating plant derived materials may also effectively protect from the virus to a certain extent. Research and development sectors of govt and private research institutions should be encouraged. The governments ought to increase allotment in health sectors for development of infrastructure and human resource in near future.

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