

## COVID-19 in India - Impact and Mitigation Strategies

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The magnitude of the outbreak of coronavirus disease (COVID-19) is exponentially increasing in world causing significant mortality and morbidity. Like other parts of the world, India is also struggling with COVID-19 crisis. As per data by the ministry of health and family welfare (MoHFW) till June 4, 2020, India had total 2,26,770 confirmed cases of COVID-19, out of which 1,10,960 were active cases, 1,09,461 cured/discharged cases with 6348 deaths and one migration. This review deals with the impact of COVID-19 in India and the strategies adopted by the Indian government to mitigate the viral infection. The studies published in the English language and indexed in PubMed were searched using MeSH terms COVID-19, impact, India, and health strategies. Data about strategies were acquired from the government of India official websites, government official news, and documents. Apart from the threat to lives, temporary unemployment, home-schooling of children, and lack of physical contact with family have highly impacted psychosocial health. To curtail the spread of COVID-19 India has implemented staged lockdown, social distancing norms, social media for public awareness, cluster containment, COVID-19 testing and treatment, vaccine trials and non-pharmacological interventions. India is advocating for the global collaboration to deal with relentless virus spread.

**Keywords:** COVID-19, impact, India, strategies, mitigation.

The Coronavirus family comprises of highly diverse, positive sense, single-stranded RNA viruses that can be isolated in different animal species. The potential for these viruses to grow to become a pandemic worldwide represents a serious public health risk.<sup>1,2</sup>

The genome of SARS-CoV-2 or COVID-19 virus encodes for four structural proteins similar to other coronaviruses. These proteins are S (spike), E (envelope), M (membrane), and N (nucleocapsid), which are required to make complete virus particle. The S protein is responsible

for the attachment and entry of SARS-CoV-2 to the host target cell receptor, mainly human angiotensin-converting enzyme 2 (ACE2), and infects a wide range of human cells.<sup>3</sup>

The human-to-human transmission of COVID-19 among individuals takes place via direct inhalation of contaminated droplets released into the environment by sneezing or coughing, and contact transmission via oral, nasal, and eye mucous. Transmission may also happen through fomites. Intestinal infection and the presence of COVID-19 virus in faeces have been reported, but

there is not enough evidence to support feco-oral route of transmission of COVID-19.<sup>4</sup>

The severity of COVID-19 may vary from mild, moderate to severe. The patients with mild to moderate illness have symptoms very similar to seasonal flu which includes fever, headache, shortness of breath, cough, muscle aches, and tiredness that can be managed at home without the need for hospitalization. While patients with serious symptoms such as difficulty breathing, chest pain or pressure, and loss of speech or movement need urgent medical attention. Other disorders seen in acute conditions include hemoptysis, diarrhea, dyspnea, acute heart injuries, and ground-glass opacities. Previous studies have also reported that COVID-19 may damage CNS including symptoms like losing the senses of smell, taste or vision, and decreasing alertness.<sup>4</sup>

Investigation or diagnostic tests for suspected cases of COVID-19 includes nucleic acid test, ELISA, CT scan, and blood cultures. Investigation for COVID-19 patients includes complete blood count (CBC), assays investigating coagulation and fibrinolysis cascades (PT, aPTT, and D-dimers), and inflammation-related parameters (ESR, CRP, ferritin, and procalcitonin), and biochemical analysis.<sup>5,3</sup>

The control of disease is mainly based on symptoms that includes oxygen and mechanical ventilation. The available therapeutic agents used for the treatment of COVID-19 patients are antiviral agents including Remdesivir, Chloroquine, Tocilizumab, Hydroxychloroquine, Umifenovir, Lopinavir, Oseltamivir, and Favipiravir, and adjunctive agents such as zinc, vitamin D, Azithromycin, Ascorbic acid, Nitric oxide, Corticosteroids, IL-6 antagonists.<sup>5</sup>

### **The COVID-19 pandemic**

The magnitude of COVID-19 is increasing drastically and it is rapidly expanding in Europe, North America, Asia, and the Middle East. Considering the alarming level of spread and severity, on March 11, 2020, world health organization (WHO) declared COVID-19 situation as a pandemic.<sup>6</sup> As per WHO data, globally 64, 16, 828 confirmed cases of COVID-19 have been reported with 3,82, 867 deaths till June 4, 2020. According to WHO situation report, India has the highest number of COVID-19 cases among South-East Asian countries and transmission is mainly by

a cluster of cases which means experiencing cases clustered in time, geographic location and/or by common exposures.<sup>7</sup>

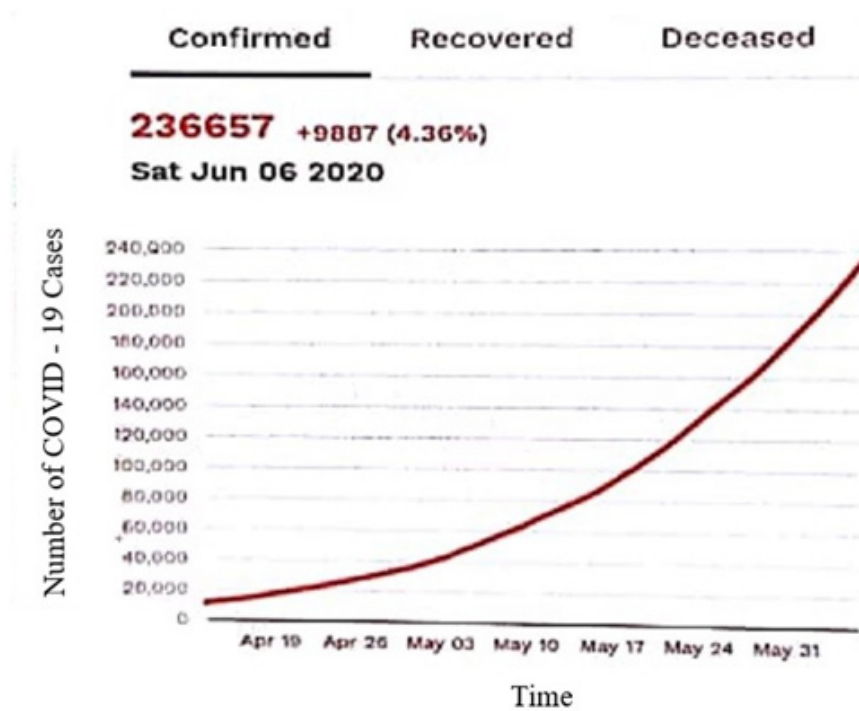
In India, the first case of COVID-19 was reported on January 30, 2020 in a student who returned to Kerala from Wuhan University (China). After steady growth, steep multi-fold increases in the cases were noticed. As per data of Ministry of health and family welfare (MoHFW), till June 4, 2020, India had total 2,26,770 confirmed cases of COVID-19, out of which 1,10,960 were active cases, 1,09,461 cured/discharged cases with 6348 deaths along with 1 migration. All states and union territories are affected by COVID-19 in India.<sup>8</sup>

This review deals with the impact of Covid-19 crisis in India and the strategies adopted by the Indian government to mitigate it. The studies published in English language and indexed in Pubmed were searched using MeSH terms COVID-19, India and Health strategies were included, data about strategies were acquired from government of India official websites, government official news and documents. Data about Covid-19 cases were retrieved from World health organization (WHO) and MoHFW official websites.

### **Impact of COVID-19 in India**

COVID-19 is highly contagious and its exponential growth has quickly impacted governments and public health systems. As WHO notes, "People, efforts, and medical supplies all shift to respond to the emergency". Emergencies like COVID-19 often lead to the neglect of basic and regular essential health services in countries like India. People with health problems unrelated to the epidemic find it harder to get access to health care services.<sup>9</sup>

Enormous health and economic resources are engrossed in diagnosis, treatment, prevention and containment of COVID-19 infection. Patients with chronic diseases are missing the prompt treatment either due to worry of contracting COVID-19 or facing difficulties in consulting doctors due to lockdown restrictions. These have eventually increased the possibility of complications and worsening of disease adding to the country's morbidity and mortality up to some degree. Moreover, several government hospitals are earmarked exclusively for COVID-19, thus, limiting the vast pool of less privileged



**Fig. 1.** Arogya setu app by GOI  
Source: Arogya Setu Application

who solely depend upon government facilities. Elective surgeries have been postponed that could lead to an adverse impact on the quality of life of patients. Cancer patients are struggling to get chemotherapy services as most are shut, and ones that are functioning cannot be reached due to travel restrictions. HIV patients are the other category, who are major hit during COVID-19. Patients can't take medicines due to non-visit to their antiretroviral therapy centres. Immunization and antenatal check-up services have also been affected in several states as they have suspended door-step vaccination services. However, primary health centres, district hospitals, and medical colleges are providing vaccination services but people are not taking children for immunization due to fear of contracting COVID-19.<sup>10</sup>

New evidence suggested that essential health services disruption due to COVID-19 can lead to a potential rise in maternal and child mortality in low income and middle-income countries.<sup>11</sup> COVID-19 has high mortality due to the virus, however; it is also likely to increase mortality indirectly. Disruption of essential preventative,

curative support and supplies resulting from suspensions in services and transportation systems, as well as by financial constraints affect maternal and child health.<sup>12,13</sup>

The case-fatality ratio is less than that seen in two recent epidemics due to SARS-CoV-1 and Middle East respiratory syndrome (MERS)-CoV, but greater transmissibility and rapidity of the spread are the observed characteristics of this virus. The data currently available indicates mild symptoms in almost 80 percent of the infected individuals and higher vulnerability of the elderly with comorbid illnesses.<sup>14</sup> Elderly with COVID-19 and previous history of cardiovascular disease seem to have terrible results. Therapies under trial for COVID-19 may have significant drug-drug interactions with cardiovascular medications (angiotensin-converting enzyme inhibitors, angiotensin receptor blockers) which have also emerged as a huge challenge for developing countries like India.<sup>15</sup>

Fear of contracting the coronavirus has restricted the mass movement in support of efforts to contain and slow down the spread of the virus.

Faced with new realities of working from home, temporary unemployment, home-schooling of children, and lack of physical contact with other family members, friends, and colleagues has negatively impacted mental as well as psychosocial health.

Health sector has commonly been unsusceptible to recessions. But the COVID-19 downturn is unique. India's annual gross domestic product (GDP) is approximated to diminish to 4.8 percent for the fiscal year 2020-2021 from five percent as estimated for the fiscal year 2019-2020. India's quarterly GDP is also estimated to a decline of over nine per cent between April and June 2020.<sup>16</sup>

Private emergency clinics and nursing homes that claim to be fully equipped and well prepared are also facing the burden of incurring additional costs due to COVID-19 preparation. A sharp decline of patients attending outpatient departments (OPD's), postponement of elective surgeries, diminution of international patients is eventually leading to the financial crisis in the private sector. Numerous little medical clinics and nursing homes have been compelled to close their activities since their incomes have evaporated. Any conceivable increase will be slow, taking in at least three quarters to come back to commonality. Besides, pay rates of clinical staff is being diminished or solidified, and some staff are being dismissed. There has been an expansion in joblessness protection claims from health insurance organizations too.<sup>17</sup>

India's medical tourism industry is severely hit. It has attracted tourists, especially from the neighbouring countries, with 50% visiting from Bangladesh. India is earning over \$2 billion annually from medical tourism and figure was projected to rise to \$9 billion by 2020.<sup>12</sup> As COVID-19 pandemic got spread globally by international travel, the writing on the wall is clear. The inrush of medical tourists will decline this year. Influx can probably pick up only next year, provided, recurrence of COVID-19 peak does not happen again universally, especially, in the winter months which are quite a likely scenario as predicted by recent studies.<sup>18</sup>

The medical devices industry has also endured a lot. Like many other nations, India also imports consumables, disposables, orthopaedic

inserts, gloves, syringes etc. from China. Because of the present crisis in China, India is short of raw material and electronic equipment which is adversely affecting the margins and profitability of Indian companies. This, in turn, is leading to a hike in prices of medical devices in the short run.

#### **Mitigation Strategies by India**

Government of India has been proactive in the planning and implementation of policies to curtail coronavirus disease spread. Containment plan of MoHFW outlines the scenario-based strategic approach to contain COVID -19 spread. It is a 20 pager document that states the strategies to be adopted government to curb the pandemic. It involves advisory on social distancing measures, suspension of mass gatherings, closing of school and colleges, suspension of public transport (trains/buses) and COVID-19 cases handlers' quarantine.<sup>19</sup>

#### **Social distancing and lockdown**

Shreds of evidence have shown that the social distancing and control strategy to reduce social mixing are the most effective measures for reducing outbreak of COVID-19.<sup>20</sup> Considering its impact, on 24<sup>th</sup> March, nationwide complete lockdown was announced by Honourable Prime Minister of India to curb the rampant spreading COVID-19 starting from midnight for 21 days. On 14<sup>th</sup> April 2020, lockdown was extended nationwide for another 14 days when COVID-19 cases surged across India. In consensus with state governments to prevent spread of COVID-19, lockdown 3.0 was announced from May 4 to May 17 by Ministry of Home Affairs which was extended till May 31 allowing many economic activities across the nation to stabilize the contracting economy due to COVID-19 crisis. Now, India has moved to Unlock 1.0 or Lockdown 5.0.

India implemented zone-based activity restriction till lockdown 4. Regions were divided based on COVID-19 cases number into 3 zones till lockdown 3:<sup>21</sup>

- i) RED zone (Hotspot): area with active cases, its classification depends upon active cases, doubling rate of confirmed cases, extent of testing, and surveillance feedback.
- ii) GREEN zone: Districts with zero case or no confirmed case in past 21 days.
- iii) ORANGE zone: Districts that can be defined neither as red nor as green zone.

As Red zone was hotspot of COVID-19,

containment measures were strict with activity prohibition in this region. Green zone with no COVID-19 case was therefore permitted with most of the activities. In orange zone, essential activities and certain non-essential activities were allowed to some extent. Under lockdown 4.0, two more zones were added in classification: Buffer zone and Containment zone. Buffer zone was large and delineated around each containment zone. Containment zone activities are operational in lockdown 5.0 too. Containment zone was demarcated within Red and orange zones by States/union territories and district administrators. In these regions, no activity by population was permitted as per government order. Containment zone activities undertaken by local authorities in Red zone/orange zone are meticulous and directed towards curtailing the relentless COVID-19. These activities are: contact tracing, home or institutional quarantining of person based on presence of symptoms, contact with confirmed cases and travel history, testing of all cases with symptoms of covid-19 or severe acute respiratory illness (SARI), house to house surveillance by a special team, clinical management of all cases as per protocol, counselling and educating people and sanitization.

India has planned for staged unlock implemented from June 1 to 30. Unlock 1.0 or Lockdown 5.0 entails lockdown restricted to containment region only. Most of the activities are allowed during this phase except for International travel of passenger except permitted by MHA, Metro Rail service, Cinema Hall, Gymnasiums, swimming pool, entertainment parks, theatres, bars, assembly halls and auditorium, social/political/sports/entertainment/religious/cultural or other large congregations. Stay at home advice for protection of the vulnerable population (Pregnant mother, elderly >65 year, children aged <10 year) has also been issued in public interest.

Reopening of schools and colleges will be decided based on situation and parental feedback during the next phase of unlocking (Unlock 2.0).<sup>22</sup>

#### **Lockdown effect**

Government of India (GOI), shows desired flattening of COVID-19 growth curve during lockdown -1 and sudden rise with the relaxation of subsequent lockdown versions can be noticed in the graph.

An editorial article published in lancet

mentioned about the disadvantage of sudden enforcement of lockdown. Amid lockdown, many people who work as daily wage workers are in trouble due to cessation of their source of income which leads to a mass exodus of migrant workers and also raised concern about starvation among them. To aid migrant workers Government distributed food among them at various points. In solidarity, many local organizations and people provided food to daily wagers and facilitated their travel.<sup>23</sup>

#### **Screening and surveillance**

Advisory related to screening of International travellers from China was issued by MOHFW on January 17, 2020, at Delhi, Mumbai, and Kolkata airports thereby subsequent temporary suspension of Chinese Visa was announced by February 3, 2020. On March 4, 2020, Universal screening of passengers from COVID-19 affected countries became mandatory at arrival which was later extended with the mandatory filling of self-declaration form by passengers. India suspended all the international to and fro flights on March 23, 2020.<sup>8</sup>

#### **Cluster containment**

Containment plan of India stipulated COVID-19 mitigation strategies. Cluster of human cases is formed when there is local transmission. Cluster containment mainly involves geographical quarantine, home quarantine of contacts and isolation of cases to break the chain of infection. Quarantine refers to the separation of individuals who are not yet ill but have been exposed to COVID-19 case and hence are potential to spread infection. Isolation refers to separation of ill, suspected, or confirmed COVID-19 cases.<sup>21,24</sup>

#### **Public Awareness to contain COVID-19**

MOHFW, Government of India (GOI) has issued advisory in interest to the general public to prevent COVID-19 spread among general public. GOI is creating awareness with the motto "Help us to Help you". These measures include:<sup>25</sup>

- 1) Providing information related to self-identification of symptoms and prevention of COVID-19 to the general public during dialling a phone call (caller tune).
- 2) Awareness video to stop spitting at public places and creating awareness about its consequences.
- 3) Dissemination of information at social media emphasizing on respiratory hygiene, frequent hand

washing, social distancing (maintain a distance of 2 *gaz* or 2 meter), wearing a face mask whenever in public to prevent COVID-19 spread including.

4) MOHFW has released toll-free helpline 1075/011-23978046 throughout India to provide COVID-19 related information. GOI also released WhatsApp helpline number to answer the query related to COVID-19.

5) Launching of Arogya setu applications. Arogya setu app installation by all government officials and people residing in Red/Containment zone has become mandatory. This app features all awareness videos issued by GOI and health status of individual related to COVID-19. The app pops up the risk level of the individual.

6) GOI has also focused on Non-pharmacological Interventions to boost immunity of individual to fight against COVID-19 infection. AYUSH ministry has released videos of immunity booster *Kaadha*, use of *turmeric milk*, drinking warm water and use of Unani and Ayurvedic medicinal products which help to strengthen immunity. AYUSH ministry has also launched “Ayush sanjivani” app to provide information about non-pharmacological interventions.<sup>26,27</sup>

#### Testing, Vaccine Trials and therapy

National Institute of Virology, Pune is the nodal laboratory for coordinating test for COVID-19 throughout India. India has designated government and private labs for testing of COVID—19. The strategy of upgrading the private labs to test for COVID-19 is partially successful mainly because of the cost associated with setting up the facility. A cost of 15 to 20 Lakh rupees for polymerase chain reaction (PCR) thermocyclers along with expensive certification for biosafety and PCR cabinets makes it difficult to achieve in all the laboratories across the country. The availability of well trained and experienced clinical microbiologist and molecular biology experienced technicians is also a major challenge across the country.<sup>23</sup> (28) As per data by Indian Council of Medical Research (ICMR), till June 6<sup>th</sup>, a total of 45,24,317 COVID-19 tests had been performed with 1,37,938 tests conducted within 24 hours, total operational labs (including government and private labs) for COVID-19 were 742.<sup>29</sup>

Many nations are involved in developing the vaccine for this dreadful virus including India. Indian Council of Medical Research

(ICMR) has provided approval for registering trials on vaccines’, use of hydroxychloroquine and convalescent plasma therapy protocols. Convalescent plasma therapy is believed to be effective in patient with severe symptoms. This therapy includes the utilization of plasma from donors of high neutralizing antibody titre against the virus. Vaccine and therapy development against COVID-19 is major task ahead of all nations.<sup>30</sup>

#### Quarantine centers

A study on international health regulations from 182 countries reported that 81(45%) countries had preventive capacities and 78 (43%) has response categories at level of enabling function and operational readiness to handle this kind of epidemiological crisis. No countries in South East Asia are at the level of operational readiness. Indian households are often congested because of joint family norms and self-isolation in case of quarantine is difficult. India has converted railway compartments, schools, and other spaces as quarantine centers but the capacities and functionality of these quarantine centers are unknown.<sup>31</sup>

#### World collaboration to fight against COVID-19

Recently India called for G20 summit to access essential medicines, treatments and vaccines at an affordable price as this unprecedented situation calls for solidarity. G20 constitutes 19 countries and one European Union. It focuses on the governance of the global economy. India called G20 nations to agree to provide diagnostic equipment, protective equipment and also health care professionals to the nations who need it more.<sup>32</sup>

#### Financial support for people

India outlined a 20 lakh crore stimulus to aid economic slowdown amid lockdown. To support social protection response of India against COVID-19, World Bank has also approved USD 1 billion aid to India. The package was disclosed in 4 steps by Finance Minister and it is being overlooked as an economy booster. The mainstay is to ease small firms, MSME and agriculture, Provident fund relief, and relieve in total tax deductions (TDS). In a recent address to nation Prime Minister Narendra Modi unveiled “*Atmanirbhar Bharat Abhiyan*” for self-reliant India to boost economic collapse. The programme entails supporting state governments and promoting state reforms, technology-driven education with equity during and post- COVID,

supporting public sector enterprises new policies for self-reliant India, corporate law measures to boost businesses.<sup>33</sup>

### CONCLUSION

It was at first accepted that the COVID-19 downturn would be short; however, the situation apparently looks like tip of an iceberg. As the community spread of the virus has started, it won't be all right for individuals to reconnect. It is unlikely for the health economy to settle in India until the COVID-19 crisis is stabilized. Effective lockdown strategies combined with social distancing, awareness, and education through mass media will be extremely helpful to contain the virus when implemented properly. As per the current scenario in India, the opening of the transport facilities can hamper the containment of virus and sharp elevation in the number of cases. A travel screening program should be in place to track the passengers after the travel, before starting travel and long-distance journey. Similarly, opening of lockdown should not hamper the social distancing norms and containment measures.

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None

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