



Novel Strategic Fight of India against COVID-19 Outbreak

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ABSTRACT

Viruses are potentially infective and dangerous microorganisms existing on earth. They possess unique properties, evolve rapidly and have high mutation rate. Novel zoonotic species of viruses are becoming a great challenge for the mankind all over the globe. Viruses that infect animals can sometimes be transmitted into human beings, evolve and become a new human virus. Three recent examples are coronaviruses, 2019-nCoV, SARS-CoV, and MERS-CoV. Novel corona virus identified in 2019 in China swiftly expanded through other parts of the world and in a short time infected and killed many people from various countries. Consequently on 11th March 2020, it was declared a pandemic by World Health Organization. All the countries and their government implemented all possible measures to stop the spread of the disease. Indian government adopted a novel strategy to break the chain of infection and contamination by observing nationwide self implemented public lockdown "Janta curfew" for a day on 22nd March 2020 amid the spurt of corona virus. It was later extended to 21 days strict nationwide lockdown. This is possibly a smart approach to impose social distancing which will eventually prevent the expansion of the disease among the communities.

Keywords: Novel corona virus; COVID-19; 2019-nCoV; Outbreak; Social distancing; Transmission

INTRODUCTION

Viruses are tiny parasite which rapidly replicate within a living cell. They possess RNA or DNA as their genetic material and uses the host cell machinery to replicate. Novel Corona virus belongs to the family Corona viridae of corona virus classified under nidovirales order. Novel corona virus was first detected in three people with acute respiratory illness working in seafood market in Wuhan, south china. ICTV observed some association of this virus with SARS virus identified earlier in 2003 and named it as SARS-CoV-2. According to the study in December, 2019, a series of pneumonia cases of unknown cause emerged in Wuhan, Hubei, China, with clinical presentations greatly resembling viral pneumonia. Deep sequencing analysis from lower respiratory tract samples indicated a novel coronavirus, which was named 2019 novel coronavirus (2019-nCoV) [1]. By the end of February many countries including USA and Europe

experienced the transmission. Coronaviruses are named for the crown-like spikes on their surface [2]. Human coronaviruses were first identified in 1960. There are seven coronaviruses that can infect human are:

- 229E (alpha coronavirus)
- NL63 (alpha coronavirus)
- OC43 (beta coronavirus)
- HKU1 (beta coronavirus)
- MERS-CoV (the beta coronavirus that causes Middle East Respiratory Syndrome, or MERS)
- SARS-CoV (the beta coronavirus that causes severe acute respiratory syndrome, or SARS)
- SARS-CoV-2 (the novel coronavirus that causes coronavirus disease 2019, or COVID-19).

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MATERIALS AND METHODS

SARS-CoV-2 consists of a single stranded helical RNA as its genetic material. RNA is surrounded by lipids and glycoprotein. Under electron microscope, Spike glycoprotein protruding outside the capsid gives a crown like morphology to the virus. The spike proteins help the virus in attachment to the host cell. Coronaviruses typically enter human cells when their protein spikes bind to the proteins on the host cell surface. SARS-CoV-2 binds to the Angiotensin-Converting Enzyme 2 (ACE2) on human cells with higher affinity than does the virus that caused Severe Acute Respiratory Syndrome (SARS) in 2003 [3]. This difference in affinity possibly explains why the novel coronavirus is more contagious than other virus. Some more membrane proteins E, M, HE is responsible for the pathogenesis (Figure 1) [4].

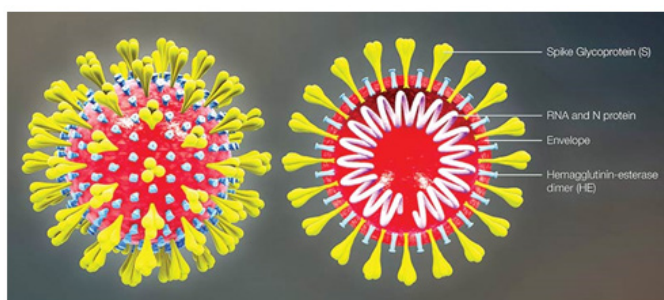


Figure 1: RNA genome consists of Replicase locus which is encoded within 5' end while structural proteins are encoded within 3' end. Viral replicase possesses 16 subunits which are required for replication and transcription.

The first images from India of the coronavirus causing the COVID-19 disease have been caught by scientists in Pune, using transmission electron microscope imaging. The images of Sars-Cov-2, the virus that Causes COVID-19, are from the throat swab of the first laboratory-confirmed case in India on January 30, 2020. The woman, among three students studying medicine in Wuhan, was diagnosed with COVID-19 after returning home. The images of the virus from the COVID-19 cases from Kerala show that the Sars-Cov-2 virus closely resembles the Mers-Cov virus that causes Middle East Respiratory Syndrome coronavirus in 2012, and the 2002 Sars-CoV virus that causes Severe Acute Respiratory Syndrome (SARS) coronavirus (Figure 2) [5].

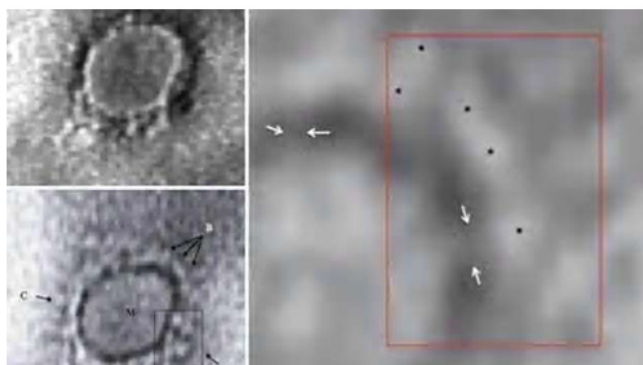


Figure 2: Electron microscopy imaging of COVID-19 (Indian Journal of Medical Research).

Transmission and Pathogenesis

According to Centre for disease control and prevention, there are three main modes of transmission.

- **Person to person contact:** Coronavirus are mainly transmitted through the aerosols. When a healthy individual comes in close contact (within 1 m) of an infected person showing respiratory symptoms, the virus is transmitted mainly through the droplets of sneezing, coughing or other nasopharyngeal secretions released by the infected person. Recent data from WHO reveals that 97% of transmission is through this route [6].
- **Household transmission:** This type of transmission is within the house from one infected person to other members of the family.
- **Contact with infected object or surface:** The virus is alive for few hours on inanimate object. Touching the viral contaminated surface can spread the infection.

Coronaviruses generally enters through the nasopharyngeal route and attach to mucous membrane of specific cellular receptors via the spike protein that triggers a conformational change in spike which then mediates fusion between the viral and host cell membranes which results in the release of the nucleocapsid into the cell. During infection with coronaviruses, as with all other RNA viruses, replication of genome and transcription of mRNAs must occur. Replication of the genome involves the synthesis of full-length negative-strand RNA that is present at low concentration and serves as a template for full-length genomic RNA.

After receptor interaction and fusion of viral and plasma membranes, virus-specific RNA and proteins are synthesized, probably entirely in the cytoplasm. Expression of coronaviruses starts with translation of two polyproteins, pp1a and pp1ab, which undergo cotranslational proteolytic processing into the proteins that form the replicase complex. This complex is used to transcribe a 3'-coterminal set of nested subgenomic mRNAs, as well as genomic RNA, that have a common 5' "leader" sequence derived from the 5' end of the genome. Proteins are translated from the 5' end of each mRNA. New virions are assembled by budding into intracellular membranes and released through vesicles by the cell secretory mechanisms. RER, rough endoplasmic reticulum; ER/GIC, endoplasmic reticulum/Golgi intermediate compartment [7].

- Clinical symptoms may appear 2-14 days after exposure to the virus.
- During the infection, the patient exhibits four levels of clinical manifestation.
- Level I-Mild fever, Diarrhea, fatigue, sore throat, sneezing and coughing.
- Level II-High fever, decreased WBC count, lower respiratory tract distress, pneumonia.
- Level III-Severe acute respiratory syndrome, lungs inflammation, decreased kidney functions.
- Level IV-Shock, Kidney failure, multiple organ failure, cardiovascular damage.

Early laboratory investigation is usually done by examination of upper and lower respiratory tract swab specimen, blood test,

serological test for detecting antibodies, viral sequencing, viral culture, nucleic acid amplification tests etc [8].

Statistical Data of the Disease

According to World Health Organization and CDC recent updates on March 22nd 2020, COVID-19 pandemic has affected 188 countries and territories across the world. Total 316,061 cases are reported. Out of which 95,892 have recovered and 13,597 were dead. 206,572 are still active cases suffering with mild to critical conditions (Figures 3 and 4).

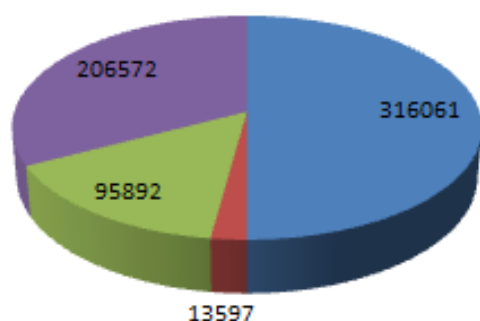


Figure 3: Chart showing the total number of COVID-19 outbreak cases in the world till March 22, 2020. **Note:** (■) Infected, (■) Deaths, (■) Recovered, (■) Active Cases.

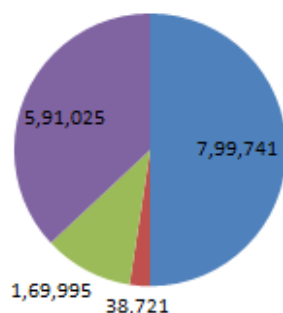


Figure 4: Chart showing the total number of COVID-19 outbreak cases in the world till March 31, 2020. **Note:** (■) Total Confirmed cases, (■) Deaths, (■) Recovered, (■) Active Cases.

The disease was first reported in China and has maximum number of infected population. The infection was transmitted by the people travelling to other countries or states for the purpose of work or tourism. Consequently the disease spread all over the world (Table 1) [9].

Table 1: Geographical distribution of COVID-19 cases as on 22nd March 2020.

Country	Total cases	New cases	Deaths	Recovered
China	81054	46	3261	72440
Italy	53578	6557	4825	6072
Spain	28572	3803	1725	2125
USA	26905	2698	348	178
Germany	23129	765	93	209
Iran	21638	1028	1685	7635
France	14459	-	562	1587
S.Korea	8897	98	104	2909
Switzerland	7725	362	80	131
India	360	28	7	24

In India, 20 states and 3 union territories have been reported to have COVID-19 cases. Maximum numbers of cases are reported in Maharashtra which is the business hub of the country. After few days, the number of confirmed cases increased drastically along with deaths in some states. Following chart shows the number of reported cases in various states of India on two different days (Table 2) [10].

Table 2: Distribution of COVID-19 cases in India till 21st March and 30th 2020.

State	Total cases	New cases (March 21 2020)	Total cases (March 30, 2020)	Total deaths till March 30, 2020
Chandigarh	1	0	13	-
Maharashtra	64	11	215	10
Kerala	49	18	213	-
Uttar Pradesh	43	11	88	-
Delhi	32	9	97	2
Telangana	22	4	69	6
Rajasthan	26	6	62	-
Haryana	20	3	33	-
Karnataka	17	0	88	3
Punjab	14	11	40	2
Gujarat	14	9	69	-
Ladakh	13	3	13	-
Madhyapradesh	4	0	47	2
Tamil nadu	6	2	67	-
Jammu Kashmir	4	0	45	-
Bengal	3	1	22	-
Uttarakhand	3	0	7	-
Andhra Pradesh	3	0	23	-
Bihar	2	1	15	1
Himachal Pradesh	2	0	4	-
Chhattisgarh	1	0	7	-
Pondicherry	1	0	1	-
Odisha	2	0	3	-

DISCUSSION

Preventive Measures and Strategies

Prevention of COVID-19 pandemic is done at two levels. Personal Prevention- It is done by avoiding contact with the infected or suspected person, washing hands with soap water or sanitizers, observing personal hygiene and coughing etiquettes.

Government preventive Measures-Government and health ministry of various countries is taking serious measures to prevent the exploration of the disease. WHO and IATA have released guidelines for the people who have travelled back from

the affected areas. 14 days quarantine has to be followed by all those who have travel history after December 2019 or have come in contact with the suspects.

There are four stages of Pandemic. The first stage is when cases of an infection are imported into a country which was not the source of the infection. In this case, all the countries outside of China which started reporting cases of coronavirus, reached Stage 1 of the outbreak as soon as they reported their first case. If an infection is contained after transmission to only a few countries, it does not become a pandemic, but if it cannot be contained in a short span of time and spreads across the globe, like COVID-19 did, it becomes a pandemic [11].

The second stage of an outbreak is when there are cases of local transmission in the country. This means that the person from whom the infection spread to another person is from the country itself. In this stage, the trajectory of the virus can be identified from the source to all the infected individuals.

Third stage of an outbreak is the community transmission. In this stage, large number of people gets infected and it becomes hard to track the chain of transmission of the virus. The virus starts circulating within the community and can also individuals who have neither travelled to a country affected by the outbreak nor have come into the contact of a person infected by the virus. In this case, a lockdown becomes highly important as any person can spread the virus, regardless of their travel history or the people they have come in contact with.

The fourth stage of an outbreak is when an infection becomes endemic in some countries and keeps resurfacing round the year, like malaria and dengue in India. This is a stage that the Indian government has taken into account in its plan to tackle the virus.

The first confirmed case of Novel Coronavirus has been reported from Kerala where a student studying in Wuhan University, China, has been tested positive with the deadly virus. India later reported its first three cases in Kerala, all of whom were students who had returned from Wuhan, China. The transmission escalated in the month of March, after several cases were reported all over the country, most of which were linked to people with a travel history to affected countries. On March 10, the total cases reached 50. On March 12, a 76-year-old man who had returned from Saudi Arabia became the first victim of the virus in the country. The total cases reached 100 on March 15 and 322 on March 21. The Indian Council of Medical Research (ICMR) started collecting random samples of people who display flu-like symptoms in order to check whether India is witnessing community transmission of the novel coronavirus (Figure 5).

India entered the third stage of pandemic on 20th March 2020. Prime minister Mr. Narendra Modi in his speech on television appealed to the Indian citizens, to observe a mass self implemented curfew or complete lockdown on Sunday, 22nd March 2020 from 7 am to 9 pm the strategy behind the "Janta curfew" is to break the circle of infection by social distancing to curb the spread of highly contagious virus. It is assumed that the virus cannot remain alive for more than 12 hours on surfaces. By staying at home maximum people will not come in contact of the virus and can prevent themselves from getting infected. On the request of prime Minister of India, all the people

clapped, whistled and rang bells from their balconies, terraces and windows to show gratitude for the Doctors, health workers and medical team at 5 pm on the same day. Everyone offered prayers from their homes. It is the first time in century when people secularly decided to fight against the deadly disease. Millions of people across the country stayed indoors, streets wore a deserted look and bare number of vehicles were on the road on Sunday in an unprecedented shutdown on Modi's appeal for a 'Janata curfew' to contain the spread of the novel coronavirus pandemic, which has claimed over 13,000 lives worldwide [12].

The Centre and state governments have decided to completely shutdown 75 districts across the country where coronavirus (COVID-19) cases have been reported. Interstate bus services and many trains have been shut down till March 31. But later looking to the rise in number of infected cases and death victims Prime Minister of India Mr. Narendra Modi declared a three-week (21 days) nationwide lockdown starting midnight Tuesday, explaining that it was the only way of breaking the COVID-19 infection cycle. "Social distancing is the only way to break the cycle of infection" [13]. This essentially extended the lockdown from most states and Union Territories to the entire country and provided a more definite timeline. According to CDC, There is currently no vaccine to prevent coronavirus disease 2019 (COVID-19). The best way to prevent illness is to avoid being exposed to this virus.

CONCLUSION

SCD and SMCs are a frequent phenomenon among the older population; in a sample of individuals older than 55 years, a considerable percentage reported cognitive complaints, concern about these, and even medical consultations. However, this phenomenon has multiple causes. SCD is partially associated with poor cognitive performance, but also with such other variables as mental health problems (particularly anxiety and depression), quality of life, pain, multimorbidity, certain diseases and disorders, and loneliness. Early detection of SCD and assessment of its causes are important. Individuals with SCD at risk of AD should be differentiated from those with other associated factors and less risk; the two groups require different management. It is also important to assist older people in proper understanding and evaluation of their memory lapses.

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