

## A current update on viral classification, diagnosis and available treatment of COVID-19

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### Abstract

In December of 2019, an outbreak of a disease began at Wuhan, China and would later be named the coronavirus disease 2019 (COVID-19) by the World Health Organization and further declared a global pandemic. Since the onset of this disease, the pattern of day to day activities had been disrupted in a bid to curb this menace to society. This paper touches on basic viral classification, as well as structure of the severe acute respiratory syndrome coronavirus 2, the main causative agent of COVID-19. This review work also sheds light on symptoms associated with this disease, mode of transmission, method of diagnosis and medications available in treating the symptoms. Potential vaccines available in India are also discussed here.

**Keywords:** coronavirus, COVID-19, SARS-CoV-2, pandemic, prevention, vaccine.

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### Introduction

COVID-19 also referred to as corona virus disease 2019 is a lethal infective and highly contagious respiratory illness caused by a strain of coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The first case of the disease known was identified at Wuhan, China in December of 2019 [1,2].

Since the onset of the corona virus disease 2019, the world as a whole has unfortunately been faced with an ongoing problem of a global pandemic. As at December 1, 2020, a total of 191 countries have at least one case of COVID-19 reported in its territory. Till date 63.3 million cases of COVID-19 have been reported worldwide; 1.46 million people dead and 40.6 million people have recovered. In January of 2020, WHO announced the outbreak as a public health emergency of international concern and by March of 2020, it was declared a pandemic [3,4].

National responses have included restricted free movement, containment measures such as quarantine and curfew. Border control policies have also been updated as a preventive tool to restrain the spread. As at March 2020, 1.3 billion were in complete lockdown in India [5,6].

The national responses have however resulted in the largest economic recession known since the Great

Depression of the 1930s since economic and social activities have been erratic [7,8]

### Viral classification

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) conversationally known as coronavirus, is the principal virus responsible for the cause of COVID-19 disease. It is a positive-sense single-stranded virus belonging to a group of RNA viruses that causes diseases in birds and mammals, such as respiratory tract infections that ranges from mild to lethal in severity.

SARS-CoV-2 comprises the subfamily Orthocoronavirinae, in the family Coronaviridae, order Nidovirales, and realm Riboviria. They are divided into four sub types such as alpha, beta, gamma and delta corona virus. Each of sub type corona viruses has many serotypes. Gamma and delta corona viruses predominantly infect birds. SARS-CoV-2 is of the beta corona specie.

### Structure of the virus

Corona virus is a rough large spherical pleomorphic particle with unique projections at the surface. It has an average molecular weight of 40,000 kDa and diameter of 80nm to 120nm. The sizes vary highly with known extremes diameter of 50nm to 200nm. They are bound

to an envelope immersed with protein molecules. The envelope is made up of a lipid bilayer and inside this envelope is nucleocapsid, which is formed from multiple copies of the nucleocapsid (N) protein. The lipid bilayer, proteins and nucleocapsid protects the virus outside its host cell.

The genome strand of SARS-CoV-2 ranges 26.4 to 31.7 and is one of the largest among RNA viruses[9,10].

### Symptoms

The symptom of covid-19 varies from person to person. While most individuals may have mild symptoms, others may have severe cases that include development of acute respiratory distress, blood clots, multiple organ failure and septic shock. An elderly person or people with underlying health conditions are at risk of developing more severe aggravations from this disease. Symptoms may appear between 2 to 14 days after coming in contact with the virus.

Common symptoms include,

- Fever
- Loss of taste and smell,
- Difficulty in breathing or shortness of breath,
- Sore throat,
- Cough,
- Fatigue,
- Running nose, etc.

Sometimes there are no symptoms in the case of asymptomatic people[11,12]

### Transmission

The coronavirus disease is thought to spread primarily through close contact between people or a person with covid-19, especially individuals that are physically near each other (that is, within 6 feet). The virus can spread as early as two days even before an infected person starts showing the symptoms. Asymptomatic people can still spread the virus too

Infection mainly occurs when a person comes in contact or gets exposed to the respiratory droplets from an infected person as a result of in spitting distance. Bodily fluids such as saliva and other excretions form respiratory droplets or aerosols when an infected person breathes, coughs, sneeze or talk.

The droplets vary in size from larger droplets that are visible, to smaller droplets. These droplets are capable of causing infection when inhaled or deposited on mucous membranes that line the nose and mouth[13,14]

### Diagnosis

A suspected case of covid-19 is characterized by sore throat, fever, fatigue, breathlessness, loss of sense of smell and taste, headache, cough and a travel history to

a place of high vulnerability. However some cases may be asymptomatic, without fever. A confirmed case is referred to as such when the suspect case has undergone molecular test that turns out positive.

A definite diagnosis is a specific molecular test of respiratory samples of nasopharyngeal swab, throat swab, sputum, etc.[15,16].

### Prevention

By disrupting the means of transmission of the disease, it can be curbed to some extent. Preventive measures in place to curb the spread of the disease includes, hand washing with medicated soap, use of hand sanitizers, use of face mask in public, social distancing and quarantining, covering of cough and sneeze with the elbow rather than the head, keeping unclean hands from the face.

### Treatment

Supportive care therapy and isolation is the treatment approach adhered to by health professionals. The management process involves isolation, treating the symptoms and supportive care like use of ventilators. Supportive therapy includes fluid management, mechanical ventilation or oxygen therapy as respiratory support, antipyretic, analgesic and antibiotics for bacterial infections. On the 22<sup>nd</sup> of October, 2020 FDA approved the use of Remdesivir for the treatment of Covid-19 in patients of ages 12 and older requiring hospitalization.

Remdesivir is an antiviral medication that is given via an intravenous route at the hospital. It acts by blocking the enzyme that is needed for the SARS-CoV-2 viruses to replicate. The antiviral Remdesivir is being studied in combination with other medications.

Initial management of this disease is vital to prevent its progression into septic shock and possible organ failure which can be prevented or avoided by the early detection of the suspect case[15,16].

### Drugs available for treating symptoms

In this section we will take a look at the medications used in treating COVID-19 in India. Since most of these drugs are still undergoing clinical trials, it has only been approved for emergency use or as off label drug during the pandemic.

#### Remdesivir

Remdesivir is an antiviral drug which was employed priority in the treatment of Ebola during its outbreak. Although still no proof in its efficacy against COVID-19 but the drug does help to prevent viral replication. It plays no role in prophylaxis and is only used in hospitalized conditions of moderate to severe cases with low pulse oximetry and requires oxygen. This drug is not to be administered at home as it has severe adverse effects on GIT, renal and hepatic system.

#### Vitamin c tablets

Vitamin c has an established antioxidant effect or property but its clinical significance has not been fully established. Although there are reports that a high dose of intravenous vitamin c is used as part of treatment of acute respiratory distress syndrome associated with COVID-19 infection[17,18]

#### **Antipyretic drugs**

It is used for the significant relief of fever, headaches and muscular pains. It is a compulsory step in the COVID-19 management protocol. Its use is only restricted to relief this symptoms as high doses of antipyretics and non-steroidal anti-inflammatory drugs may lead to gastric irritation, liver dysfunction, etc

#### **FabiFlu**

This drug was approved in Japan for use in influenza. This antiviral drug has shown potency in viral activity against SARS-COV-2. Nonetheless, there is no proof that this oral antiviral drug can provide a shielding against COVID-19. Some studies have shown that it reduces the duration of the COVID infection by only 2-3 days.

#### **Doxycycline/Azithromycin**

Antibiotics only work on bacterial infection. They do not have an effect on viruses. However, physicians in hospitals administer these drugs to treat and prevent bacterial infections that are as a result of complications from COVID-19 in severely ill patients[19,20]

#### **Dexamethasone**

This is one of the few drugs employed for use in the treatment of COVID-19 with WHO backing as it has shown strong evidence in providing benefits in the management of COVID. It's anti-inflammatory and immunosuppressant property makes it important in combating a variety of conditions. Studies have shown that treatment with dexamethasone reduces 28-day mortality in patients with COVID-19 who receive respiratory support. However, there are no benefits (and the possibility of harm) among patients who do not require oxygen. It should be started after one week of getting the illness. It should be started after one week of getting the illness. Typical side effects include high blood sugar level, acidity, gastric ulcer, exacerbation or superadded infection[21,22]

#### **Tocilizumab**

Approved as an "Off-label" drug, it is used for the treatment of moderate to severe COVID-19 patients. Works by countering the severe inflammation (cytokine storm), that occurs in some Covid-19 patients. Clinical trials have shown reduced immune inflammation. Tocilizumab works when the immune response is already inflamed and helps to arrest the impending cytokine storm, which affects other organ functions.

#### **Budesonide**

It is used in the management of bronchial asthma. Few reports have reported benefits of this drug in regards to COVID-19. Early administration of inhaled Budesonide reduces the likelihood of needing urgent medical care and reduces recovery time. If a patient is incessantly coughing, he/she can take it at home (23, 24).

#### **Vaccines available**

Vaccines currently available in India are Covaxin and Covishield. Covishield is an Oxford-AstraZeneca vaccine developed in the UK and manufactured locally by the serum institute of India. It is made from the weakened version of a common cold virus (adenovirus) gotten from chimpanzees and has been modified to resemble the novel corona virus. Once introduced into the body, the immune system starts making antibodies capable of attacking a corona virus infection.

#### **Conclusion**

Coronaviruses are spike-like RNA-positive sensory viruses. Various aspects of the transmission of COVID-19 are addressed in this review. The similarity of COVID-19 to the SARS-CoV genome is 79,5 percent. Flu-like symptoms are related with infection, and in disease pathogenesis the ACE2 recipients play an important role. Direct and indirect pollution can lead to spread of diseases. The usage of N95 masks is the other most effective strategy for limiting the spread of COVID-19, together with the testing/tracking process, cleanliness, quarantine, physical, and social separation. Masks are used to prevent both symptomatic and asymptomatic viral discharge from patients infected. However, mask use is not always related with full infection prevention, as at least to the best of our knowledge there is no such clinical data presently available. In addition, physicians are immediately needed to care for people with an affected pulmonary system and other pulmonary properties along with feverish presentations and respiratory, pneumonia-like illnesses. Moreover, as elderly people are regarded to be less predictive, care should be taken with regard to such instances.

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**Source of Support: Nil**

**Conflict of Interest: Nil**