



## A BREAKTHROUGH TO CONTROL THE CORONAVIRUS DISEASE: OVERVIEW

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### ABSTRACT

*Coronavirus disease 2019 is also known as COVID-19, which is a kind of viral pneumonia which is caused by severe acute respiratory syndrome coronavirus 2, also called as SARS-CoV-2. Coronavirus disease 2019 (COVID-19) was first identified amid an outbreak of respiratory illness cases in Wuhan City, Hubei Province, China. It was initially reported to the WHO on December 31, 2019. On January 30, 2020, the WHO declared the COVID-19 outbreak a global health emergency. On March 11, 2020, the WHO declared COVID-19 a global pandemic, its first such designation since declaring H1N1 influenza a pandemic in 2009. It is transmitted by inhalation or contact with infected droplets. The incubation period ranges from 2-14 days. As reported by worldometer.info dated on 6<sup>th</sup> June on 10:00AM, 2020, total no of active cases was 6859597, out of which no of deaths was 398244 in the world. Where as reported by government of India dated on 6<sup>th</sup> June on 10:00AM, 2020, total no of active cases 115942, out of which no of deaths was 6642.*

**Keywords:** Breakthrough of Corona virus, COVID-19, Pathophysiology, Wuhan.

### INTRODUCTION

Coronaviruses are a large family of viruses which may cause illness in animals or humans.

In humans, several coronaviruses are known to cause respiratory infections ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The most recently discovered coronavirus causes coronavirus disease COVID-19.

COVID-19 is the infectious disease caused by the most recently discovered coronavirus. This new virus and disease were unknown before the outbreak began in Wuhan, China, in December 2019. COVID-19 is now a pandemic affecting many countries globally. Illness caused by SARS-CoV-2 was termed COVID-19 by the WHO, the acronym derived from "coronavirus disease 2019 [1]. As reported by worldometer.info dated on 6th June on 10:00AM, 2020, total no of active cases was

6859597, out of which no of deaths was 398244 in the world [2]. Whereas reported by government of India dated on 6th June on 10:00AM, 2020, total no of active cases 115942, out of which no of deaths was 6642 [3].

### History

The first cases were seen in Wuhan, China, in late December 2019 before spreading globally. The first mention in the medical press about the emerging infection was in the British Medical Journal (BMJ) on 8 January 2020 in a news article, which reported "outbreak of pneumonia of unknown cause in Wuhan, China, has prompted authorities in neighboring Hong Kong, Macau, and Taiwan to step up border surveillance, amid fears that it could signal the emergence of a new and serious threat to public health". On 9 January 2020, the World Health Organization confirmed that

SARS-CoV-2 was the cause of the new disease [4, -6].

Novel coronavirus-induced pneumonia, which was named as coronavirus disease 2019 (COVID-19) by the WHO on the February 11, 2020, has rapidly increased in epidemic scale [7]. On the same day, the international virus classification commission announced that the novel coronavirus was named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). COVID-19 is not the first severe respiratory disease outbreak caused by the coronavirus. Just in the past two decades, coronaviruses have caused three epidemic diseases, namely, COVID-19, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS) [8]. At present, the cases of COVID-19 have been found in many countries around the world [9]. According to the latest data, up to the March 1, 2020, the number of confirmed cases in China reached 79,968, of which 2,873 were dead, and 41,681 were cured [10-12].

Actual goal of this review is to explain the pathogenesis, diagnosis and management of COVID-19 and its breakthrough.

### **Epidemiology**

As of early June 2020, the number of cases of confirmed COVID-19 globally is over 6 million affecting virtually every territory, other than isolated South Pacific island states and Antarctica, according to an online virus tracker created by the medical journal, The Lancet, and hosted by Johns Hopkins University. As of June 2020, the United States had more than 1.5 million cases, with more than ten other countries with >100,000 cases [13].

### **Etiology**

On 9 January 2020, the World Health Organization (WHO) confirmed that SARS-CoV-

2 was the cause of COVID-19 (2019-nCoV was the name of the virus at that time). It is one of the two strains of the SARS-CoV species known to cause human disease, the other being the original severe acute respiratory syndrome coronavirus (SARS-CoV), the cause of SARS. It is a member of the *Betacoronavirus* genus, one of the genera of the *Coronaviridae* family of viruses. Corona viruses are enveloped single-stranded RNA viruses that are found in humans, mammals and birds. These viruses are responsible for pulmonary, hepatic, CNS, and intestinal disease. Six coronaviruses are known to cause human disease. Two are zoonoses: the severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), both of which may sometimes be fatal. The remaining four viruses all cause the common cold [14, 15].

### **Pathophysiology**

The SARS-CoV-2 virus, like the closely-related MERS and SARS coronaviruses, affects its cellular entry via attachment of its virion spike protein (a.k.a. S protein) to the angiotensin-converting enzyme 2 (ACE 2) receptor. This receptor is commonly found on alveolar cells of the lung epithelium, underlying the development of respiratory symptoms as the commonest presentation of COVID-19. It is thought that the mediation of the less common cardiovascular effects is also via the same ACE-2 receptor, which is also commonly expressed on the cells of the cardiovascular system [16].

### **Transmission OF COVID-19**

Although originating from animals, COVID-19 is now considered to be an indirect zoonosis, as its transmission is now primarily human-to-human. It is predominantly transmitted in a similar way to the common cold, via contact

with droplets of infected individuals' upper respiratory tract secretions, e.g. from sneezing or coughing [17].

People can catch COVID-19 from others who have the virus. The disease spreads primarily from person to person through small droplets from the nose or mouth, which are expelled when a person with COVID-19 coughs, sneezes, or speaks. These droplets are relatively heavy, do not travel far and quickly sink to the ground. People can catch COVID-19 if they breathe in these droplets from a person infected with the virus. This is why it is important to stay at least 1 meter) away from others. These droplets can land on objects and surfaces around the person such as tables, doorknobs and handrails. People can become infected-by touching these objects or surfaces, then touching their eyes, nose or mouth. This is why it is important to wash your hands regularly with soap and water or clean with alcohol-based hand rub [18].

The novel corona virus disease has been rapidly spreading across the world, which made world health organization to declare it as pandemic. The name indicates because it has been never seen before and corona because it looks like the corona of sun. It's basically a severe acute respiratory syndrome. A zoonotic disease, originated in bats initially and then got transmitted to humans through unknown animals for the first time in wuhan, China. It is transmitted by inhalation or contact with infected droplets. The incubation period ranges from 2-14 days. The severity of disease may lead to pneumonia, acute respiratory distress syndrome and multi-organ dysfunction. The symptoms of disease are not very distinctive and include fever, cough, sore throat, breathlessness, fatigue, etc. Thus easy and early diagnosis of disease is difficult. All they can do is rely on quarantine, isolation, infection

control measures to prevent disease spread and on supportive care for those who become ill. But lack the specific antiviral agents to treat the infected and to optimally decrease viral spreading and subsequent transmission [19].

COVID-19 causes a fever, cough, and trouble breathing.

#### **Some people might have [18]:**

- a sore throat
- chills
- repeated shaking with chills
- muscle pain
- headache
- a loss of taste or smell

#### **SYMPTOMS OF COVID-19**

The most common symptoms of COVID-19 are fever, dry cough, and tiredness. Other symptoms that are less common and may affect some patients include aches and pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell or a rash on skin or discoloration of fingers or toes. These symptoms are usually mild and begin gradually. Some people become infected but only have very mild symptoms.

#### **Clinical manifestation of COVID-19 [4, 20, 21]**

##### **Common Symptoms and signs:**

- Fever (85-90%)
- Cough (65-70%)
- Disturbed taste and smell (40-50%)
- Fatigue (35-40%)
- Sputum production (30-35%)
- Shortness of breath (15-20%)

**Less common:**

- Myalgia/arthralgia (10-15%)
- Headaches (10-36%)
- Sore throat (10-15%)
- Chills (10-12%)
- pleurisy pain

**Diagnosis of COVID-19**

Clinical diagnosis of COVID-19 is mainly based on epidemiological history, clinical manifestations and some auxiliary examinations, such as nucleic acid detection, CT scan, immune identification technology (Point-of-care Testing (POCT) of IgM/IgG, enzyme-linked immunosorbent assay (ELISA)) and blood culture. However, the clinical symptoms and signs of patients infected with SARS-CoV-2 are highly atypical, including respiratory symptoms, cough, fever, dyspnea, and viral pneumonia. Therefore, auxiliary examinations are necessary for the diagnosis of COVID-19, just as the epidemiological history [12].

**MEDICAL CARE & TREATMENT NEED**

Most people (about 80%) recover from the disease without needing hospital treatment. Around 1 out of every 5 people who gets COVID-19 becomes seriously ill and develops difficulty breathing. Older people, and those with underlying medical problems like high blood pressure, heart and lung problems, diabetes, or cancer, are at higher risk of developing serious illness. However, anyone can catch COVID-19 and become seriously ill. People of all ages who experience fever and/or cough associated with difficulty breathing/shortness of breath, chest pain/pressure, or loss of speech or movement should seek medical attention immediately. If

possible, it is recommended to call the health care provider or facility first, so the patient can be directed to the right clinic. If anyone has minor symptoms, such as a slight cough or a mild fever, there is generally no need to seek medical care. Stay at home, self-isolate and monitor your symptoms. Follow national guidance on self-isolation. However, if anyone live in an area with malaria or dengue fever it is important that you do not ignore symptoms of fever. Seek medical help. When you attend the health facility wear a mask if possible, keep at least 1 meter distance from other people and do not touch surfaces with your hands. If it is a child who is sick help the child stick to this advice. Seek immediate medical care if you have difficulty breathing or pain/pressure in the chest. If possible, call your health care provider in advance, so he/she can direct you to the right health facility [18, 22-28].

**The most effective ways to protect yourself and others against COVID-19 are to:**

- Clean your hands frequently and thoroughly
- Avoid touching your eyes, mouth and nose
- Cover your cough with the bend of elbow or tissue. If a tissue is used, discard it immediately and wash your hands.
- Maintain a distance of at least 1 metre from others.

The time between exposure to COVID-19 and the moment when symptoms start is commonly around five to six days but can range from 1 – 14 days [18].

**Current treatment strategies for COVID-19**

Just like SARS-CoV and MERS-CoV, there is currently no clinically proven specific antiviral agent available for SARS-CoV-2 infection. The supportive treatment, including oxygen therapy, conservation fluid management, and

the broad-spectrum antibiotics has been used to cover secondary bacterial infection, remains to be the most important management strategy. According to the research on molecular mechanisms of coronavirus infection and the genomic organization of SARS-CoV-2, there are several potential therapeutic targets to repurpose the existing antiviral agents or develop effective interventions against this novel coronavirus [22-26].

No specific treatment or vaccine exists for COVID-19 (May 2020). Therefore resources have been concentrated on public health measures to prevent further interhuman transmission of the virus. This has required a multipronged approach and for individuals includes meticulous personal hygiene, social distancing, the avoidance of large crowds/crowded environments and where necessary, self-isolation<sup>[27]</sup>.

### **Antiviral therapy**

Whilst specific antiviral therapies for SARS-2-CoV do not currently exist, the combination of the protease inhibitors, ritonavir, and lopinavir, or a triple combination of these antiviral agents with the addition of ribavirin, showed some success in the treatment of SARS, and early reports suggested similar efficacy in the treatment of COVID-19. However, a more recent randomized, controlled open-label trial failed to demonstrate any added benefit of lopinavir-ritonavir combination therapy [28-30].

Remdesivir, a drug originally developed to treat Ebola virus and shown to be effective against MERS-CoV and SARS-CoV, showed promising in vitro results against SARS-CoV-2 and is undergoing phase III trials. Other antivirals in phase III trials include oseltamivir,

ASC09F (HIV protease inhibitor), lopinavir, ritonavir, darunavir, and cobicistat [31-33].

### **NSAIDs**

Emerging expert opinion is that non-steroidal anti-inflammatory drugs (NSAIDs) [34] are relatively contraindicated in those with COVID-19. However, it is important to note that there is currently (March 2020) no published scientific evidence showing that NSAIDs increase the risk of developing COVID-19 or worsen established disease. Also, at least one report shows antiviral activity by indomethacin (an NSAID) against SARS-CoV (cause of SARS).

### **Passive immunity**

Treatment with convalescent plasma (plasma from patients who have recovered from COVID-19 which therefore contains anti-SARS-CoV-2 antibodies) or hyperimmune immunoglobulin (purified antibodies prepared from convalescent plasma) has shown some success in some critically ill patients. Reports are still preliminary and about a small number of patients. A Cochrane review in May 2020 failed to find convincing evidence that convalescent plasma was an effective treatment, but this will be kept under active review [35-38].

### **Vaccines**

Effective SARS-CoV-2 vaccines are essential for reducing disease severity, viral shedding and transmission, thus helping to control the coronavirus outbreaks. There are several vaccination strategies against SARS-CoV, MERS-CoV tested in animals, including a live-attenuated virus, viral vectors, inactivated virus, subunit vaccines, recombinant DNA, and proteins vaccines. These studies are in progress, but it requires months to years to develop the vaccines for SARS-CoV-2.

Currently, there may be many promising targets for SARS-CoV-2, but more laboratory and clinical evidence still should be explored. The WHO is working with Chinese scientists to launch more than 80 clinical trials on potential treatments for SARS-CoV-2. Traditional Chinese medicine seems to have some effects in the supportive treatments [39-40].

### Conclusion

In conclusion, the incidence and progress of SARS-CoV-2 depend on the statement between the virus and the individual's immune system. Viral factors include virus type, mutation, viral load, viral titer, and viability of the virus in vitro. In the early stages of the epidemic, accurate diagnosis helps control the spread of the disease. Some new pharmaceutical drugs, vaccines, including HIV drugs and stem cells, were testified in those clinical trials.

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