

## CURRENT NOVEL CORONA VIRUS COVID-19- A REVIEW

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### ABSTRACT

This review mainly focuses on the recent outbreak novel corona virus in Wuhan, China. Covid-19 most likely spreads via contact with virus-laden droplets expelled from an infected person's cough, sneeze or breath. Coronaviruses cause colds with major symptoms, such as fever and sore throat from swollen adenoids, primarily in the winter and early spring seasons. Coronaviruses can cause pneumonia either direct viral pneumonia or a secondary bacterial pneumonia and may cause bronchitis either direct viral bronchitis or a secondary bacterial bronchitis. The 2019-nCoV infection was of clustering onset, is more likely to affect older males with comorbidities, and can result in severe and even fatal respiratory diseases such as acute respiratory distress syndrome.

**KEYWORDS:** Corona virus, Pneumonia, Acute respiratory distress syndrome, Bronchitis.

### INTRODUCTION

COVID-19 is the official name declared by WHO<sup>[3,4,5]</sup> for the novel corona virus<sup>[1]</sup> which has been responsible for pneumonia outbreak in China in the year 2019.<sup>[2]</sup> Corona viruses are a large family of viruses which are known to cause diseases in mammals and birds. In humans they cause diseases ranging from mild respiratory infections such as common cold to fatal diseases. The virus was first isolated in 1937 in birds which causes infectious bronchitis. It was first isolated in 1960 in noses of humans with common cold. The causative agent of COVID-19 is novel strain of corona viruses which has not been identified previously in humans. These viruses are zoonotic in nature, capable of transmitting from animals to humans. The virus responsible for COVID-19 is officially named as Severe acute respiratory syndrome (SARS CoV-2) by International Council on Taxonomy of Viruses (ICTV).

Corona virus belong to sub family *coronavirinae*, family *coronaviridae*.<sup>[6,7]</sup> They are spherical in shape with a diameter of 120-160 nm, with an outer envelope of 2nm bearing club shaped protein spikes which collectively resemble a solar corona or crown. The name Corona virus is derived from Latin Word *Corona* meaning "halo" or "crown". They are enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry. The genome size of coronaviruses ranges from approximately 27 to 34 kilobases, the largest among known RNA viruses.<sup>[8]</sup> The whole genomic sequence of the new COVID-19 — now known as COVID-19—and found that its genome sequence is 79 percent similar to the SARS-CoV, about 51.8 percent similar to the MERS-CoV, and about 87.6-

87.7 percent similar to other SARS-like CoVs from Chinese horseshoe bats (called ZC45 and ZXC21). These findings clearly suggest that the virus originated from bats.<sup>[9]</sup>

### TYPES OF CORONA VIRUS

Seven strains of human coronaviruses are known. Human coronavirus 229E (HCoV-229E), Human coronavirus OC43 (HCoV-OC43), Severe acute respiratory syndrome coronavirus (SARS-CoV), Human coronavirus NL63 (HCoV-NL63, New Haven coronavirus), Human coronavirus HKU1, Middle East respiratory syndrome-related coronavirus (MERS-CoV), previously known as *novel coronavirus 2012* and *HCoV-EMC*, Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), previously known as 2019-nCoV or "novel coronavirus 2019". The coronaviruses HCoV-229E, -NL63, -OC43, and -HKU1 continually circulate in the human population and cause respiratory infections in adults and children world-wide.<sup>[10]</sup>

### TYPES OF COVID-19

By analysing 103 genomes of patients infected with COVID-19, scientists found that the virus has evolved into two main types, which they called "S" and "L." The "ancestral" S type accounted for 30% of the samples, while the L type, which seemingly evolved from it later, made up the remaining 70%. That led researchers to conclude that the S type is less transmissible and slower to replicate than the "L" type, which also had a much higher number of derived mutations, suggesting a higher rate of replication.<sup>[16]</sup>

### SOURCE OF COVID-19

The virus was first thought to be transmitted from “wet market” in Wuhan where hygiene standards are difficult to maintain due to dense packaging of animals. Original host is thought to be bats but bats are not sold in Wuhan. Snakes and other live animals infected by bats are thought to be mediators. Bats hosts other viruses like EBOLA and HIV. The study published in the Journal of Medical Virology, revealing the likely snake host, also found that a change to one of the viral proteins in 2019-nCoV allows the virus to recognize and bind to receptors on certain host cells. This ability is a critical step to entering cells, and the researchers said that the change in this particular protein may have helped the virus hop from snakes to humans.<sup>[19-26]</sup>

### GENOME PACKING OF COVID-19

Researchers in the US and China say the “genomic packing” mechanism of COVID-19 may be more like Ebola and HIV. The new coronavirus has an “HIV-like mutation” that gives it novel properties. Because of this mutation, the packing mechanism of the 2019-nCoV may be changed to being more similar to those of MHV, HIV, Ebola virus (EBoV) and some avian influenza viruses.<sup>[11]</sup>

COVID-19 belongs to a subset of viruses known as coronaviruses—so called for the ‘crown’ of proteins that dot the viral surface. Underneath its royal exterior lies a lengthy strand of ribonucleic acid (RNA), which serves as the viruses’ genetic material. When COVID-19 infects a cell, it hijacks the existing molecular machinery to create long chains of proteins required by the virus to generate even more copies of itself. These long viral proteins, however, only become functional when cut into smaller pieces by proteases. Thus, coronavirus proteases like that of COVID-19’s play an integral role in propagating the virus.<sup>[15]</sup>

### WHY COVID-19 IS MORE INSIDIOUS THAN OTHER CORONAVIRUSES

The Nankai University researchers suggest that COVID-19’s ability to bind to cells is as much as 1,000 times

greater than SARS’ ability. Like COVID-19, SARS is also a coronavirus. SARS and the novel coronavirus share about 80 percent of their genetic structure. COVID-19 attacks a protein called furin — the same protein that is attacked by Ebola and HIV, which are not coronaviruses.<sup>[12]</sup> The spikes crowning the new coronavirus that causes COVID-19 atypical pneumonia are divulging how they attach, fuse and gain entry to cells. Analysis of the spike architecture and its mechanics is locating the virus’ vulnerabilities, and revealing other information that could prompt the discovery of countermeasures against this virus.<sup>[13]</sup> The spike is also the main target of neutralizing antibodies, so it’s very important for vaccine and therapeutic design.<sup>[13,14]</sup>

By closely examining the structure of the new coronavirus spike protein, the researchers did uncover something that sets it apart from the other SARS-related coronaviruses. The research team unexpectedly found a furin cleavage site at a boundary between two subunits of the spike protein in the newly emerged coronavirus. It is not yet known if this difference is expanding the kinds of cells the new coronavirus could infect or enhancing its transmissibility, in a way that might be similar to that of highly pathogenic avian flu viruses.<sup>[14]</sup>

### SYMPTOMS

COVID-19 typically causes flu-like symptoms including a fever and cough. In some patients - particularly the elderly and others with other chronic health conditions - these symptoms can develop into pneumonia, with chest tightness, chest pain, and shortness of breath. It seems to start with a fever, followed by a dry cough. After a week, it can lead to shortness of breath, with about 20% of patients requiring hospital treatment.

Notably, the COVID-19 infection rarely seems to cause a runny nose, sneezing, or sore throat (these symptoms have been observed in only about 5% of patients). Sore throat, sneezing, and stuffy nose are most often signs of a cold.<sup>[33]</sup>

Chen et al<sup>[17]</sup> studied epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China.

Signs and symptoms at the time of admission (Chen et al study)	
Fever	83%
Cough	82%
Shortness of breath	31%
Muscle ache	11%
Confusion	9%
Headache	8%
Sore throat	5%
Rhinorrhoea (runny nose)	4%
Chest pain	2%
Diarrhoea	2%
Nausea and vomiting	1%
More than one sign or symptom	90%
Fever, cough and shortness of breath	15%

Haung et al<sup>[18]</sup> studied Clinical features of 41 patients infected with 2019 novel coronavirus in Wuhan, China.

COMMON SYMPTOMS AT THE ONSET OF DISEASE(Haung et al)	
<b>Fever</b>	98%
<b>Cough</b>	76%
<b>Myalgia (musclepain)or Fatigue</b>	44%
LESS COMMON SYMPTOMS:	
<b>Sputum production(coughing up material)</b>	28%
<b>Headache</b>	8%
<b>Haemoptysis (coughing up blood)</b>	5%
<b>Diarrhoea</b>	3%

### INCUBATION PERIOD

Understanding the incubation period is very important for health authorities as it allows them to introduce more effective quarantine systems for people suspected of carrying the virus, as a way of controlling and hopefully preventing the spread of the virus.

2-14 days represents the current official estimated range for the novel coronavirus COVID-19. However, a case with an incubation period of 27 days has been reported by Hubei Province Local Government On Feb. 22.<sup>[28]</sup> In addition, a case with an incubation period of 19 days was observed in a JAMA study of 5 cases published on Feb. 21.<sup>[29]</sup> An outlier of a 24 Days incubation period had been for the first time observed in a Feb. 9 study.<sup>[30]</sup> Period can vary greatly among patients.

Mean incubation period observed<sup>[35]</sup>

3.0 days (0 - 24 days range, study based on 1,324 cases)

5.2 days (4.1 - 7.0 days range, based on 425 cases).

Mean incubation period observed in travelers from wuhan<sup>[34]</sup>

6.4 days (range from 2.1 to 11.1 days).

The WORLD HEALTH ORGANIZATION (WHO) reported an incubation period for 2019-ncov between 2 and 10 days.<sup>[31]</sup> China's NATIONAL HEALTH COMMISSION (NHC) had initially estimated an incubation period from 10 to 14 days.<sup>[32]</sup> The United States' CDC estimates the incubation period for 2019-ncov to be between 2 and 14 days.<sup>[33]</sup> Dxy.Cn, a leading Chinese online community for physicians and health care professionals, is reporting an incubation period of "3 to 7 days, up to 14 days". The Chairperson of WHO said in a press conference on February 10 that: a very long incubation period could reflect a double exposure.

### HOW LONG DO SYMPTOMS LAST

Using available preliminary data, the report of the WHO-CHINA Joint Mission published on Feb. 28 by WHO<sup>[36]</sup>

In Mild cases: approximately 2 weeks. In Severe or critical disease: 3 - 6 weeks The time from onset to the development of severe disease: 1 week. Among patients who have died, the time from symptom onset to outcome ranges from 2 - 8 weeks.

### TRANSMISSION

- Coughing and sneezing of infected person may spread droplets with virus into air.
- Touching or shaking hands with infected persons can spread the disease.
- Making contact with a surface or object on which virus is present can cause the disease.
- Some animal coronaviruses may spread through contact with faeces.

### TRANSMISSION RATE

The *attack rate* or *transmissibility* (how rapidly the disease spreads) of a virus is indicated by its reproductive number ( $R_0$ , pronounced *R-nought* or *o-zero*), which represents the average number of people to which a single infected person will transmit the virus. WHO's estimated (on Jan. 23)  $R_0$  to be between 1.4 and 2.5.<sup>[45]</sup>

Other studies have estimated a  $R_0$  between 3.6 and 4.0, and between 2.24 to 3.58.<sup>[46]</sup>

Preliminary studies had estimated  $R_0$  to be between 1.5 and 3.5.<sup>[42,43,44]</sup>

An outbreak with a reproductive number of below 1 will gradually disappear.

For comparison, the  $R_0$  for the common flu is 1.3 and for SARS it was 2.0.

### FATALITY RATE

Fatality rate is calculated as No. of Deaths occurred/ No. of cases reported.

The novel coronavirus case fatality rate has been estimated at around 2%, in the WHO press conference held on January 29, 2020.<sup>[39]</sup> However, it noted that, without knowing how many were infected, it was too early to be able to put a percentage on the mortality rate figure.

A prior estimate<sup>[40]</sup> had put that number at 3%.

Fatality rate can change as a virus can mutate, according to epidemiologists.

For comparison, the case fatality rate for SARS was 10%, and for MERS 34%.

Based on all 72,314 cases of COVID-19 confirmed, suspected, and asymptomatic cases in china as of February 11, a paper by the Chinese CCDC released on February 17 and published in the Chinese Journal Of Epidemiology has found that<sup>[41]</sup>

- 80.9% of infections are mild (with flu-like symptoms) and can recover at home.
- 13.8% are severe, developing severe diseases including pneumonia and shortness of breath.
- 4.7% as critical and can include: respiratory failure, and multi-organ failure.
- In about 2% of reported cases the virus is fatal.

Based on Age, Sex, preexisting disease conditions the fatality rate is found to be.<sup>[36,41]</sup>

AGE	DEATH RATE
80+ years old	14.8%
70-79 years old	8.0%
60-69 years old	3.6%
50-59 years old	1.3%
40-49 years old	0.4%
30-39 years old	0.2%
20-29 years old	0.2%
10-19 years old	0.2%
0-9 years old	No cases has been reported

SEX	DEATH RATE
Male	2.8%
Female	1.7%

PRE-EXISTING CONDITION	DEATH RATE
Cardiovascular disease	10.5%
Diabetes	7.3%
Chronic respiratory disease	6.3%
Hypertension	6.0%
Cancer	5.6%
No pre-existing conditions	0.9%

**DIAGNOSIS**

The FDA has approved more widespread use of a rapid test RT-PCR<sup>[38]</sup> for COVID-19. The test, which was developed by the CDC, uses samples from the nose, throat, or lungs. It enables fast, accurate diagnosis of the virus. The test is now allowed to be used at any CDC-approved lab across the country.<sup>[37]</sup>

There are a few ways that a lab may get a sample for testing.

- **Swab test.** A health care provider will use a special swab to take a sample from your nose or throat.
- **Nasal aspirate.** A health care provider will inject a saline solution into your nose, then remove the sample with gentle suction.
- **Tracheal aspirate.** A health care provider will put a thin, lighted tube called a bronchoscope down your mouth and into your lungs, where a sample will be collected.
- **Sputum test.** Sputum is a thick mucus that is coughed up from the lungs. You may be asked to cough up sputum into a special cup, or a special swab may be used to take a sample from your nose.
- **Blood.** A health care professional will take a blood sample from a vein in your arm.

**WHAT COVID-19 DOES TO OUR BODY?**

After entering into our body a sequence of events takes place, it attacks different organs right from lungs to entire immune system.

**LUNGS**

The lungs are the main organs affected by COVID-19. But in serious cases, the rest of the body can also be affected. This damage to the organs isn't always directly caused by the infection, but can result from the body's response to infection. In lungs they mainly affect goblet cells and ciliated cells. These viruses choose both the cells for replication as host cells. The goblet cells are responsible for secretion of mucus and moistening the upper respiratory tract, when virus attacks goblet cells the mucus lining gradually depletes resulting in dry cough. The ciliated cells prevent entry of nasty materials like bacteria or other microbes into the lungs through inhaled air, attacking ciliated cells provides easy entry of microbes into lungs. These cause damage to the lungs, which leads to fluid leaking from small blood vessels in the lungs. The fluid collects in the lungs' air sacs, or alveoli. This makes it difficult for the lungs to transfer oxygen from the air to the blood.

**STOMACH AND INTESTINES**

Some people with COVID-19 have reported gastrointestinal symptoms, such as nausea or diarrhoea, although these symptoms are much less common than problems with the lungs. While coronaviruses seem to have an easier time entering the body through the lungs, the intestines aren't out of reach for these viruses.

**HEART AND BLOOD VESSELS**

COVID-19 can also affect the heart and blood vessels. This may show up as irregular heart rhythms, not enough blood getting to the tissues, or blood pressure low enough that it requires medications. So far, though, there's no indication that the virus directly damages the heart.

**LIVER AND KIDNEYS**

When liver cells are inflamed or damaged, they can leak higher than normal amounts of enzymes into the bloodstream. Elevated liver enzymes aren't always a sign of a serious problem. Doctors says it's not clear, though, if the virus or the drugs being used to treat the person caused the damage. Some people hospitalized with COVID-19 have also had acute kidney damage, sometimes requiring a kidney transplant. Some people hospitalized with COVID-19 have also had acute kidney damage, sometimes requiring a kidney transplant. When you have pneumonia, you have less oxygen circulating, and that can damage the kidneys.

**IMMUNE SYSTEM**

With any infection, the body's immune system responds by attacking the foreign virus or bacteria. While this immune response can rid the body of the infection, it can

also sometimes cause collateral damage in the body. This can come in the form of an intense inflammatory response, sometimes called a “cytokine storm.” The immune cells produce cytokines to fight infection, but if too many are released, it can cause problems in the body. A lot of [the damage in the body during COVID-19] is due to what we would call a sepsis syndrome, which is due to complex immune reactions. The infection itself can generate an intense inflammatory response in the body that can affect the function of multiple organ systems.

Another thing about the immune system is that, so far, there are almost no cases of COVID-19 in children under 9 years old. Scientists aren't sure whether young children aren't getting infected or their symptoms are so mild that no one notices it.

Scientists says children also have a less severe illness than adults during other kinds of infections, including measles and pneumococcal infections. This may be because children have a “straightforward immune response,” whereas older people can sometimes have an “over-response.” It's this excess immune response that causes some of the damage during infections.

#### REMEDIES<sup>[27]</sup>

Exact treatment for corona virus is not yet known, but for symptomatic relief

- Resting and avoiding overexertion
- Drinking enough water
- Avoiding smoking and smoky areas
- Taking acetaminophen, ibuprofen, or naproxen for pain and fever
- Using a clean humidifier or cool mist vaporizer
- Supplemental oxygen and Mechanical ventilation in case of Acute respiratory distress syndrome.

#### PREVENTION<sup>[27]</sup>

- Avoid close contact with people who are sick.
- Avoid touching your eyes, nose, and mouth.
- Stay home when you are sick.
- Cover your cough or sneeze with a tissue, then throw the tissue in the trash.
- Clean and disinfect frequently touched objects and surfaces using a regular household cleaning spray or wipe.
- Facemasks should be used by people who show symptoms of covid-19 to help prevent the spread of the disease to others.
- Wash your hands often with soap and water for at least 20 seconds, especially after going to the bathroom; before eating; and after blowing your nose, coughing, or sneezing.
- If soap and water are not readily available, use an alcohol-based hand sanitizer with at least 60% alcohol. Always wash hands with soap and water if hands are visibly dirty.

#### CONCLUSION

Studies found that only 2% of people suffering with COVID-19 have been died so far. Older people and people with comorbidities are more vulnerable than healthy volunteers. Following preventive measures may reduce the risk of infection to a greater extent. Safe handling of raw materials, uncooked foods and avoid consuming raw or undercooked animal products may help in preventing the spread of virus.

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