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# CORONA VIRUS DISEASE – A SHORT REVIEW

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**ABSTRACT**
Coronaviruses are RNA viruses that are phenotypically and genotypically diverse. This virus will cause the antiviral T-cell response to be erratic, owing to the T-cell apoptosis activation, triggering the immune system to collapse. The transmission of virus mainly occurs through the respiratory droplets of the infected person as he sneezes. Most of the infected people experience mild to moderate respiratory symptoms and recover without any special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, or cancer are more likely to develop serious illness. Anyone can get infected with COVID-19 and become seriously ill or die at any age. Presentations of COVID-19 include fever, cough, shortness of breath, malaise and respiratory distress. The best way to prevent the disease and slow down its transmission is to be well informed about the disease and how the virus spreads.

**Keywords**: Structure, Symptoms, Transmission, Diagnosis, Treatment.

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## INTRODUCTION

### History

Human Coronaviruses were discovered in the 1960s using two different methods in the United Kingdom and the United States. E.C. Kendall, Malcolm Bynoe, and David Tyrrell working at the Common Cold Unit of the British Medical Research Council collected a unique common cold virus designated B814 in 1961. The virus could not be cultivated using standard techniques which had successfully cultivated rhinoviruses, adenoviruses and other known common cold viruses. In 1965, Tyrrell and Bynoe successfully cultivated the novel virus by serially passing it through organ culture of human embryonic trachea [**1**].

Many human coronaviruses have their origin in bats. The human coronavirus shared a common ancestor with a bat coronavirus (ARCoV.2). The ancestors of Severe Acute Respiratory Syndrome-Corona Virus (SARS-CoV) first infected leaf-nose bats of the genus Hipposideridae; subsequently, they spread to horseshoe bats in the species Rhinolophidae, then to Asian palm civets, and finally to humans. Origin of human coronaviruses with possible intermediate hosts **[2]**.

Coronaviruses vary significantly in risk factor. Some can kill more than 30% of infected individuals, such as MERS-CoV, and some are relatively harmless, such as the common cold. Coronaviruses can cause colds with major symptoms, such as fever, and a sore throat from swollen adenoids. Coronaviruses can cause pneumonia (either direct viral pneumonia or secondary bacterial pneumonia) and bronchitis (either direct viral bronchitis or secondary bacterial bronchitis). Many species of human coronaviruses are known, with one species subdivided into two different strains, making seven strains of human coronaviruses altogether: 1. Human corona virus OC43, 2. Human corona virus 229E, a-coV, 3. Human corona virus NL63 **[3-4].**

### Etymology

The name "coronavirus" is derived from Latin word corona, meaning "crown" or "wreath", itself a borrowing from Greek κορώνη korṓnē, "garland, wreath". The name was coined by June Almeida and David Tyrrell who first observed and studied human coronaviruses. The word was first used in print in 1968 by an informal group of virologists in the journal Nature to designate the new family of viruses. The name refers to the characteristic appearance of virions (the infective form of the virus) by electron microscopy.

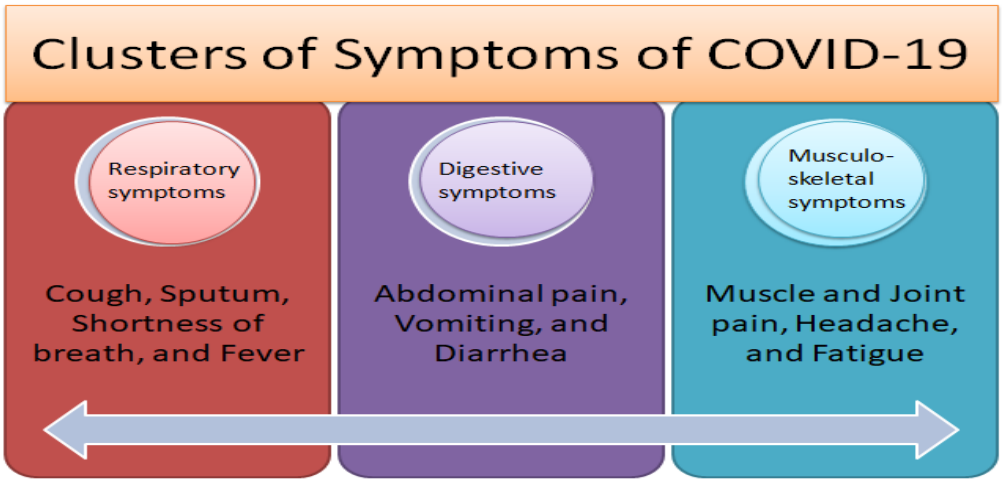


**Figure 1:** Clusters of symptoms of COVID-19.

The scientific name Coronavirus was accepted as a genus name by the International Committee for the Nomenclature of Viruses (later renamed International Committee on Taxonomy of Viruses) in 1971. As the number of new species increased, the genus was split into four genera, namely Alpha coronavirus, Beta coronavirus, Delta coronavirus, and Gamma coronavirus in 2009. The common name coronavirus is used to refer to any member of the subfamily Orthocoronavirinae [**5**].

**SIGNS AND SYMPTOMS**

Symptoms of COVID-19 are variable, ranging from mild symptoms to severe illness, Common symptoms include headache, loss of smell (anosmia) and taste (ageusia), nasal congestion and runny nose, cough, muscle pain, sore throat, fever, diarrhoea, and breathing difficulties. People with the same infection may have different symptoms, and their symptoms may change over time **[6-7]**. Three common clusters of symptoms have been identified: one respiratory symptom cluster with cough, sputum, shortness of breath, and fever; a musculoskeletal symptom cluster with muscle and joint pain, headache, and fatigue; a cluster of digestive symptoms with abdominal pain, vomiting, and diarrhoea shown in **Fig. 1**. In people without prior ear, nose, and throat disorders, loss of taste combined with loss of smell is associated with COVID-19 and is reported in as many as 88% of cases. Out of people who show symptoms, 81% develop only mild to moderate symptoms (up to mild pneumonia), while 14% develop severe symptoms (dyspnea, hypoxia, or more than 50% lung involvement on imaging) and 5% of patients suffer critical symptoms (respiratory failure, shock, or multiorgan dysfunction). At least one third of the people who are infected with the virus do not develop noticeable symptoms at any point in time. These asymptomatic carriers remain untested and can spread the disease. Other infected people will develop symptoms later, called "pre-symptomatic", or have very mild symptoms and can also spread the virus. The incubation period of COVID-19 is four to five days. Most symptomatic people experience symptoms within two to seven days after exposure, and almost all will experience at least one symptom within 12 days.

**STRUCTURE AND GENOME**

Coronaviruses are large, roughly spherical particles with unique surface projections. Their size is highly variable with average diameters of 80 to 120 nm. Extreme sizes are known from 50 to 200 nm in diameter. They are enclosed in an envelope embedded with a number of protein molecules. The lipid bilayer envelope, membrane proteins, and nucleocapsid protect the virus when it is outside the host cell. The viral envelope is made up of a lipid bilayer in which the membrane (M), envelope (E) and spike (S) structural proteins are anchored (**Fig. 2**). The E and M proteins are the structural proteins that combine with the lipid bilayer to shape the viral envelope and maintain its size. S proteins are needed for interaction with the host cells. But human coronavirus NL63 is peculiar in that its M protein has the binding site for the host cell, and not its S protein. Coronaviruses contain a positive-sense, single-stranded RNA genome. The genome size for coronaviruses ranges from 26.4 to 31.7 kilobases. The genome size is one of the largest among RNA viruses. The genome has a 5′ methylated cap and a 3′ polyadenylated tail **[8]**.

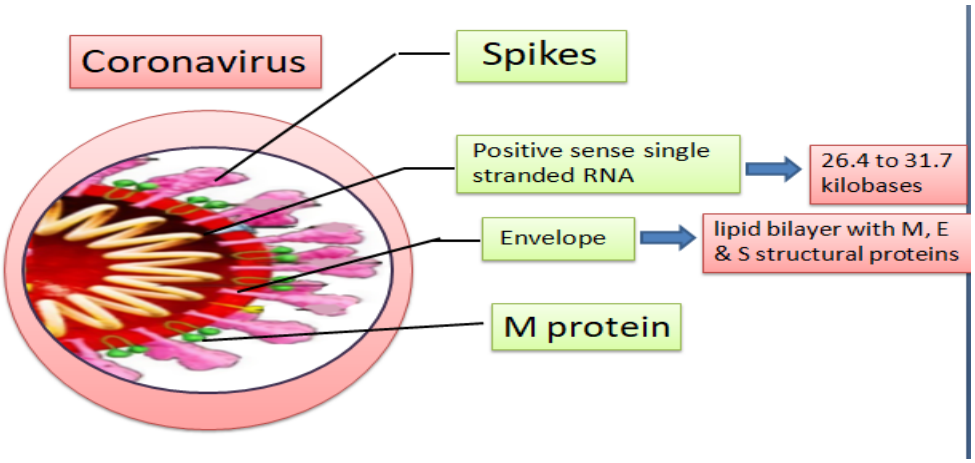


**Figure 2:** Structure of coronavirus.

**TRANSMISSION**

Coronavirus disease 2019 (COVID-19) is a contagious disease caused by (SARS-CoV-2). The first known case was identified in Wuhan, China, in December 2019. The disease has since spread worldwide, leading to an ongoing pandemic. Coronavirus disease 2019 (COVID-19) transmits when people breathe in air contaminated with droplets and small airborne particles containing the virus. The risk of transmission is highest when people are in close proximity, but it can also occur over longer distances, particularly indoors. Transmission can also occur if splashed or sprayed with contaminated fluids in the eyes, nose or mouth, and, rarely, via contaminated surfaces. People remain contagious for up to 20 days, and can spread the virus even if they do not develop symptoms [**9**].

**VACCINES**

A COVID-19 vaccine is a vaccine intended to provide acquired immunity against s (SARS-CoV-2), the virus that causes (COVID-19). The initial focus of SARS-CoV-2 vaccines was on preventing symptomatic, often severe illness. On 10 January 2020, the SARS-CoV-2 genetic sequence data was shared through GISAID, and by 19 March, the global pharmaceutical industry announced a major commitment to address COVID-19. The COVID-19 vaccines are widely credited for their role in reducing the severity and death caused by COVID-19. Many countries have implemented phased distribution plans that prioritize those at highest risk of complications, such as the elderly, and those at high risk of exposure and transmission, such as healthcare workers.

As of 17 January 2022, 9.68 billion doses of COVID-19 vaccines have been administered worldwide based on official reports from national public health agencies. By December 2020, more than 10 billion vaccine doses had been pre ordered by countries, with about half of the doses purchased by high-income countries comprising 14% of the world's population [**10**].

**Types of Vaccines**

As of 26 November 2021, the following vaccines have obtained EUL:

The Pfizer/BioNTech Comirnaty, 31 December 2020.

The SII/COVISHIELD and AstraZeneca/AZD1222 vaccines, 16 February 2021.

The Janssen/Ad26.COV 2.S developed by Johnson & Johnson, 12 March 2021.

The Moderna COVID-19 vaccine (mRNA 1273), 30 April 2021.

The Sinopharm COVID-19 vaccine, 7 May 2021.

The Sinovac-CoronaVac, 1 June 2021.

The Bharat Biotech BBV152 COVAXIN vaccine, 3 November 2021 (**Table 1**).

**Vaccine Selection**

All vaccines with WHO Emergency Use Listing are highly effective at preventing serious illness, hospitalization and death due to COVID-19. You should accept the vaccine you are offered first and get vaccinated as soon as it is your turn to reduce your risk. Do not delay getting vaccinated, unless advised to by your health care provider, as this could put you at risk of COVID-19. Getting vaccinated could save your life. In April 2020, WHO published the minimum criteria for how effective COVID-19 vaccines should be to make them useful for fighting COVID-19. All current vaccines authorized by WHO meet these criteria. To fully understand how effective different vaccines are, we need more real world data. This will come as more people are vaccinated. The best COVID-19 vaccine is the one available to you soonest [**11-12**].

**Immunity by Vaccination**

We are still learning about how long immunity to COVID-19 lasts from natural infection, and from vaccination. We are now starting to see evidence that the immunity you get after having COVID-19 can be strong. However, the type of immunity that is

developed after infection varies from person to person, making it less predictable than immunity after vaccination. Scientists are working hard to understand this better. What we do know is that COVID-19 is a life-threatening disease that can have long-term consequences. We also know that the WHO-authorized COVID-19 vaccines have been safely given to billions of people. It is much safer to get vaccinated than it is to risk getting COVID-19. Get vaccinated as soon as it's your turn and keep doing everything you can to protect yourself and others [**15]**. Several different types of potential vaccines for COVID-19 have been developed, including: 1. Inactivated or weakened virus vaccines, which use a form of the virus that has been inactivated or weakened so it doesn't cause disease but still generates an immune response., 2. Protein-based vaccines, which use harmless fragments of proteins or protein shells that mimic the COVID-19 virus to safely generate an immune response., 3. Viral vector vaccines, which use a safe virus that cannot cause disease but serves as a platform to produce coronavirus proteins to generate an immune response, 4. RNA and DNA vaccines, a cutting-edge approach that uses genetically engineered RNA or DNA to generate a protein that itself safely prompts an immune response.

**DIAGNOSIS**

COVID-19 can provisionally be diagnosed on the basis of symptoms and confirmed by reverse transcription polymerase chain reaction (RT-PCR) or other nucleic acid testing of infected secretions. Along with laboratory testing, chest CT scans may be helpful to diagnose COVID-19 in individuals with a high clinical suspicion of infection. Detection of a past infection is possible with serological tests, which detect antibodies produced by the body in response to the infection [**16, 17**].

**Testing Methods**

Several testing methods have been developed to diagnose the disease. The standard diagnostic method is by detection of the virus's nucleic acid by real-time reverse transcription polymerase chain reaction (rRT-PCR), transcription-mediated amplification (TMA), or by reverse transcription loop-mediated isothermal amplification (RT-LAMP) from a nasopharyngeal swab [**18**].

**Viral Testing**

The standard methods of testing for presence of SARS-CoV-2 are nucleic acid tests, which detects the presence of viral RNA fragments. As these tests detect RNA but not infectious virus, its "ability to determine duration of infectivity of patients is limited. The test is typically done on respiratory samples obtained by a nasopharyngeal swab; however, a nasal swab or sputum sample may also be used. Results are generally available within hours. The WHO has published several testing protocols for the disease. Several laboratories and companies have developed serological tests, which detect antibodies produced by the body in response to infection. Several have been evaluated by Public Health England and approved for use in the UK **[19].**

**TREATMENT**

There is no specific, effective treatment or cure for coronavirus disease 2019 (COVID-19), the disease caused by the SARS-CoV-2 virus. One year into the pandemic, highly effective vaccines have now been introduced and are beginning to slow the spread of SARS-CoV-2; however, for those awaiting vaccination, as well as for the estimated millions of immunocompromised persons who are unlikely to respond robustly to vaccination, treatment remains important. Thus, the lack of progress developing effective treatments means that the cornerstone of management of COVID-19 has been supportive care, which includes treatment to relieve symptoms, fluid therapy, oxygen support and prone positioning as needed, and medications or devices to support other affected vital organs [**20-21**].

Most cases of COVID-19 are mild. In these, supportive care includes medication such as paracetamol or NSAIDs to relieve symptoms (fever, body aches, cough), proper intake of fluids, rest, and nasal breathing. Good personal hygiene and a healthy diet are also recommended. The U.S. Centers for Disease Control and Prevention (CDC) recommend that those who suspect they are carrying the virus isolate themselves at home and wear a face mask [**22**].

**Passive Antibodies**

Transferring purified and concentrated antibodies produced by the immune systems of those who have recovered from COVID-19 to people who need them is being investigated as a non-vaccine method of passive immunization. Viral neutralization is the anticipated mechanism of action by which passive antibody therapy can mediate defence against SARS-CoV-2. The spike protein of SARS-CoV-2 is the primary target for neutralizing antibodies. AS of 8 August 2020, eight neutralizing antibodies targeting the spike protein of SARS-CoV-2 have entered clinical studies. It has been proposed that selection of broad-neutralizing antibodies against SARS-CoV-2 and SARS-CoV might be useful for treating not only COVID-19 but also future SARS-related CoV infections. Other mechanisms, however, such as antibody-dependent cellular cytotoxicity or phagocytosis, may be possible. Other forms of passive antibody therapy, for example, using manufactured monoclonal antibodies, are in development **[23]**.

## CONCLUSION

Many aspects of COVID-19 including transmission, infection, and treatment remain unveiled. Advances in prevention and effective management of Corona virus will require elementary and clinical investigation and public health. However preventive approaches are the best way to fight against the virus in conjunction with vaccination.

**Table 1:** Types of vaccines and their manufacturer.

| Name of vaccine | Type of vaccine | Manufacturer company/ country | Date |
|---|---|---|---|
| **Pfizer** | Genetic | (New York) BioNTech Comirnaty (Germany) | 31 December 2020 |
| **AstraZeneca** | Viral vector | University of Oxford | 16 February 2021 |
| **Janssen** | Viral vector | Johnson & Johnson/ Israel, Deaconess Medical Center (USA) | 12 March 2021 |
| **Moderna** | Genetic | USA | 30 April 2021 |
| **Sinovac-CoronaVac** | Protein based | China | 1 June 2021 |
| **Bharat Biotech** | Inactivated whole virus | Indian council of medical research and national institute of virology | 3 November 2021 |

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