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# Virological Features, Diagnosis and Treatment: a Review of Covid-19

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## Abstract

A new coronavirus, designated COVID-19, emerged in Wuhan, China, in December 2019, causing respiratory, digestive and systemic problems that affect human health. In symptomatic patients, the clinical manifestations of the disease usually begin within a week, and consist of fever, cough, nasal congestion, fatigue and airway problems, which can lead to pneumonia. The virus also appears in patients who do not have symptoms, and it is quite difficult to quantify them. In this work, a review of the virological characteristics of COVID-19 has been carried out, both of its clinical sign, its diagnosis and its treatment.

**Keywords**: COVID-19; Pandemic; Clinical sign; Diagnosis; Treatment

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## Introduction

Coronaviruses (CoV) are a group of single-stranded, enveloped RNA viruses. Like other RNA viruses, they exhibit, in relation to DNA viruses, a wide capacity for genetic mutation and recombination that enables them to adapt to different ecological niches and to evade the host-generated immune response. They are classified within the order Nidovirals, family Coronaviridae and subfamily Orthocoronavirinae.

Four distinct genera can be distinguished: alpha, beta, gamma and Deltacoronavirus (of these, the first two can infect humans).

It was shown that there was 99.8-99.9% nucleotide identity in five patient isolates and the sequence results showed the presence of a new strain of beta-CoV [1]. The genetic sequence of COVID-19 showed an identity of more than 80% with SARS-CoV and 50% with MERSCoV [1]. In addition, both SARS-CoV and MERS-CoV originate from bats. Therefore, evidence from phylogenetic analysis shows that COVID-19 belongs to the genus betacoronavirus, which includes SARS-CoV, which infects humans, bats and wild animals [2].

So far, data suggest that bats are the initial cause of the current CoV outbreak (2019nCoV), which originated in a seafood market [3]. This new coronavirus has caused millions of infections and thousands of deaths worldwide. Although this problem originated in China, it has rapidly expanded globally, affecting virtually every country in the world.

There are several subtypes of coronaviruses that can infect humans. Beta coronaviruses can cause death and quite serious disease, while alpha coronaviruses usually cause asymptomatic or very mildly symptomatic infections. SARSCoV-2 belongs to the B lineage of beta-coronaviruses, can infect type II pneumocytes and epithelial cells, and is closely related to the SARS-CoV virus [4,5].

Similar to SARS-CoV, SARS-CoV-2 uses the cell receptor of angiotensin-converting enzyme 2, which is expressed in the epithelium of the airway, lung parenchyma, vascular endothelium, kidney, heart, brain, testicular tissue, and intestine. Cells such as the hepatocyte may be infected with SARS-CoV, and these do not have expression of the angiotensin 2 converting enzyme cell receptor. Therefore, patients with SARS-CoV-2 may also have multisystemic involvement.

It is thought that both SARS-CoV and MERS-CoV can persist on contaminated surfaces (such as metal, glass, or plastic) for up to 9 days, but can be efficiently inactivated with the application of disinfectants such as ethanol (62-71%), hydrogen peroxide (0.5%), or sodium hypochlorite (0.15%) [6].

There are four endemic human coronaviruses (HCoVs) that usually cause cold-type upper respiratory infections: HCoV-229E, HCoVNL63 (both Alphacoronavirus) and HCoV-OC43 and HCoV-HKU1 (both Betacoronavirus of the subgenus Embevovirus) [7].

The high transmissibility of COVID-19 has been associated with a mutation in the ORF1ab region (Open Reading Frame 1ab) affecting nonstructural protein 2 (nsp2) [8]. However, the exact route of initial transmission to humans remains unknown, although live contaminated animals have been suggested as the most likely option [9].

On 30 January, the WHO declared the problem a health emergency

and subsequently, on 11 March 2020, due to its rapid spread and the number of deaths, it was classified as an international pandemic [10].

## Clinical Sign, Diagnosis and Treatment

The main sign of patients hospitalized with COVID-19 is pneumonia. The most common symptoms of SARS-CoV-2 include fever, cough, and shortness of breath. In some cases, there may also be a decrease in smell and taste, chills, sore throat, headache, general weakness, diarrhea, or vomiting. Various injuries to the skin, chest, or fingers and toes have also been observed, usually in children and adolescents without other symptoms. Children and adolescents are the most asymptomatic. Observations made so far show an incubation period of five days for the virus [1]. In addition, most infected persons may show symptoms within 12 days of infection [2]. Research shows that it spreads from person to person among those in close contact, specifically within 2 meters). It is transmitted by respiratory droplets that are released when someone with the virus coughs, sneezes or speaks. If a person touches a surface where the virus is found and then touches his or her mouth, nose, or eyes, it is also quite possible that he or she will become infected.

The infection can become complicated and lead to severe illness with shortness of breath and severe chest symptoms, resulting in pneumonia [3]. Among the most prominent signs of this pneumonia are a decrease in oxygen, gas deviations in the blood, or changes visible through chest x-rays.

Published studies of hospitalized patients, mainly in Wuhan, China, have suggested that the average age is in the 50s, with a slight predominance of men. Approximately 25% of patients have severe complications and require intensive care, and approximately 10% require mechanical ventilation [4]. These data are generalized, although we found particularities according to the region.

Patients over 60 years of age are at greater risk of infection, and are the most vulnerable to the virus, along with those patients with some type of previous pathology.

In addition, the possibility of inter-human transmission during the asymptomatic period must be taken into account [5]. The possibility has been raised that children, who normally present a subclinical picture or milder symptoms, may spread the infection to the rest of the community [6].

In African countries, outbreaks of new and re-emerging diseases such as the current epidemic of IDUV-19 can potentially bring health systems to a complete standstill, as they have fewer resources than in other countries.

Many questions remain about the ease of virus spread, but like other respiratory viruses, it appears that the main mode of transmission is via the airborne route from secretions (droplets) of infected subjects. Other possible routes under study are environmental contamination and the faecal-oral route [7]. The R0 value, which is between 1.4 and 6.47 [8], estimates the number of secondary cases generated in a susceptible population from an infected individual, and R0>1 is considered to allow epidemic spread.

The WHO has indicated different scenarios according to severity and classifies the disease as: a) mild pneumonia; b) severe, if the pneumonia is accompanied by fever, tachypnea, respiratory distress and/or oxygen saturation <90%; c) acute respiratory distress if respiratory symptoms worsen and radiological images show bilateral opacities or nodules or pulmonary edema is observed; d) sepsis when signs of organic dysfunction are also present; and finally e) septic shock as the most severe scenario [9].

The first phase of the disease would consist of early infection, with symptoms such as malaise, fever and dry cough, then variable degree pulmonary involvement (without or with hypoxia), and finally extra-pulmonary systemic inflammation. The early and mildest stages are a consequence of the damage to the lungs caused by the virus and are usually accompanied by markers such as lymphopenia and increased prothrombin, D-dimer and LDH time [5].

As far as the therapeutic management of the infection is concerned, at present no treatment has definitively proven its efficacy. Some of the treatments proposed have been lopinavir/ritonavir and remdesivir, nucleoside analogues, neuraminidase inhibitors, tenofovir, lamivudine and chloroquine [9].

In addition, some studies suggest the possibility of designing a drug that acts by blocking the angiotensin-converting enzyme 2 receptor [10]. Currently, antiviral drugs for adult patients infected with COVID-19 mainly include the combination lopinavir/ritonavir (to which interferon can be added) and remdesivir.

As regards the possibility of immunoprevention, the spicule protein receptor has been identified as a possible antigenic candidate for the design of a vaccine [11]. In the meantime, it is recommended to apply usual support measures such as oxygen and fluid therapy with admission to the Intensive Care Unit for more severe cases. In the systemic hyperinflation phase, steroids and cytokine inhibitors such as tocilizumab or anakinra may be considered.

## Conclusion

Cases of early death due to COVID-19 have occurred mostly in older people, due to a weak immune system that allows for faster progression of the virus. Public services and facilities should provide decontamination reagents for cleaning hands on a routine basis, and work with sanitary equipment that protects against the disease. However, in some countries there is currently a shortage of sanitary materials, preventing workers from taking the necessary protective measures, putting their lives and those of those around them at risk.

Through this article we have tried to show a brief and updated vision, until now, of the main characteristics of the new SARS-CoV-2. The evolution of the pandemic can be very volatile and many changes are likely to be adopted by health authorities. The evolution of the pandemic can be very volatile and many changes are likely to be adopted by health authorities. Over time, we will learn more details about the virus and its pathology, which may allow other, more effective, therapeutic measures to be adopted, pending the arrival of a vaccine.

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