

# The dissemination of covid-19: an expectant and preventive role in global health

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## Abstract

**Background:** Coronaviruses (CoV) make up a large family of viruses, known since the mid-1960s, which received this name due to the spikes on its surface, which resemble a crown (from the Latin corona). CoV infections can cause everything from a common cold to severe respiratory syndromes, such as severe acute respiratory syndrome (SARS-CoV) and Middle Eastern respiratory syndrome (MERS-CoV). COVID-19 (SARS-CoV2) is a new variant of the coronavirus, and its isolation occurred in China on January 7th, 2020. COVID-19 has stood out with a high impact on public health due to the high number of cases with infection in a short period of time. However, it is possible to observe that 17% of patients confirmed with COVID-19 have severe infections and about 2.5% of these patients die. Current studies have shown that the number of mild and asymptomatic cases may be even greater. Thus, the challenges for controlling unreported cases of patients with mild symptoms that are spreading the virus and interfering with the magnitude and real data of the cases stand out. The transmission of the coronavirus occurs between humans, and it can occur from person to person through the air, through coughing or sneezing, by touching or shaking hands or by contact with contaminated objects or surfaces, followed by contact with the mouth, nose or eyes. Given the fluctuation in the incidence and the lethality rate, it is essential to stand out the precepts of health promotion in search of reorienting hygiene practices, considering that there is validity in health care models, still with a curative approach and the current situation experienced by the world population requires a preventive stance.

**Keywords:** SARS-CoV-2, 2019 novel coronavirus, COVID-19, health promotion, public health, epidemy.

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## Authors summary

### Why was this study done?

Due to the sudden pandemic of the coronavirus, COVID-19, being a new fact with international repercussion, with social, economic and health outcomes very harmful to human beings and countries, especially in developing countries

### What did the researchers do and find?

The combination of information published in scientific articles from various databases and general guidelines from the World Health Organization was provided to outline a profile of information on COVID-19.

### What do these findings mean?

COVID-19 is a serious global public health problem. All human beings are susceptible to host this virus, however, those with comorbidities, chronic diseases and older than 60 years are more easily affected by the severity of the disease COVID-19. There is still no specific treatment for the disease today and worldwide efforts are being made to develop vaccines and more effective treatment to combat and control COVID-19.

## INTRODUCTION

### SARS-CoV2: The new Coronavirus

Coronavirus is a family of viruses that cause respiratory infections, being SARS-CoV2 the seventh coronavirus in this family. The new coronavirus agent was reported on December 31st, 2019 with cases registered in China. Most people are infected with common coronaviruses throughout their lives, but only four of them cause common cold symptoms: alpha coronavirus 229E and NL63 and beta coronavirus OC43, HKU1 (V)<sup>1</sup>. There are still two more serious ones, with a high mortality rate<sup>1</sup>.

Currently, there is a widespread of this pandemic, called COVID-19, across all continents. Thus, we aim to describe key topics of COVID-19: The new Coronavirus (SARS-CoV2) and its advances in the world population.

### First reports

On January 7th with COVID-19 being the seventh coronavirus in this family. Chinese researchers isolated the virus and three days later shared data from the viral genome internationally, calling it a new Coronavirus<sup>2</sup>.

The genomic sequences from nine patients who were among the first cases of this serious infection (COVID-19) are almost genetically identical, which suggests the very recent appearance of this Coronavirus in humans<sup>3</sup>. Current data from this virus genome sequencing has demonstrated the existence of small mutations, but the rate of them is apparently low.

### “Pneumonia of unknown etiology” (COVID-19)

Na Zhu *et al.*<sup>4</sup> conducted a study with the first 4 reported cases from December 31st, 2019 identified by local hospitals in Wuhan, China, the complete analysis of the genomes revealed a new coronavirus – SARS-CoV2 a highly pathogenic Sarbecovirus of the subgenus Betacoronavirus<sup>3,5,6</sup>.

COVID-19 is closely related to betacoronaviruses of bat origin, indicating that these animals are the probable reservoir hosts for this emerging viral pathogen, in addition to the association between the pneumonia outbreak and exposures in the Huanan wholesale market suggest a possible zoonosis<sup>3,5</sup>. Many hope that genetic testing of animals or environmental sources, such as cages and containers, from the Wuhan market will reveal clues as to the ultimate origin of the virus<sup>7,8</sup>. In addition, it is not yet clear whether a currently unknown animal species

acted as an intermediate host between bats and humans<sup>3</sup>.

Coronaviruses (CoV) make up a large family of viruses, known since the mid-1960s, which received this name due to the spikes on its surface, which resemble a crown (from the Latin corona). Coronaviruses are enveloped RNA viruses that are widely distributed among humans, other mammals and birds, which cause respiratory, enteric, liver and neurological diseases<sup>4</sup>.

Other six species of coronavirus are known to cause human disease, four of them cause common cold symptoms. The other two, of zoonotic origin, more serious, were associated with the emergence of infections with a high impact on public health due to their lethality<sup>7</sup>, they are: coronavirus of severe acute respiratory syndrome (SARS-CoV) the causal agent of the outbreaks in 2002 and 2003 in Guangdong province, China, and the other coronavirus of the Middle East respiratory syndrome (MERS-CoV) responsible for the severe outbreaks of respiratory diseases in 2012 in the Middle East<sup>4</sup>.

### COVID-19, SARS and MERS

The emergence of coronavirus infections with a high impact on public health began between 2002-2003 with the SARS-CoV outbreak and then in 2012 with the MERS-CoV.

Thus, the COVID-19 virus was isolated and is genetically similar to SARS-CoV (about 79.0% nucleotide identity) and MERS-CoV (51.8%)<sup>3,7,9</sup> and thus called SARS-CoV2. In both SARS-CoV and MERS-CoV, bats acted as a natural reservoir, with another host animal (Himalayan Palm Civet) for SARS-CoV and dromedary camels for MERS-CoV, but the origin of SARS-CoV2 needs further investigation for the discovery of a possible intermediate host<sup>10</sup>.

Similar to the 2002/2003 SARS outbreak in Guangzhou, China, Wuhan City is also a rapidly expanding capital of Hubei province and a hub for central China. In addition, both outbreaks were initially linked to “wet markets”, where game animals and meat were sold<sup>7,10</sup>.

High lethality was one of the main characteristics that differentiated the SARS and MERS coronavirus outbreaks from the other four species known to cause common cold symptoms. In particular, COVID-19 has stood out with a high number of reported cases in just three months since its first notification.

The case fatality rate reported is close to 3%. Thus, COVID-19 does not appear to be as lethal as SARS<sup>11</sup> and MERS<sup>12</sup>. However, it is reiterated that the total number

of cases of COVID-19, as well as the absolute number of deaths<sup>13</sup> is already greater than the two previous infections - SARS<sup>11</sup> and MERS<sup>12</sup> (Table 1).

**Table 1:** Comparison between COVID-19, SARS and MERS coronaviruses.

	COVID-19	SARS	MERS
	New Coronavirus- 2019	Severe Acute Respiratory Syndrome Coronavirus <sup>10</sup>	Middle East Respiratory Syndrome Coronavirus <sup>11</sup>
Local	Wuhan, China	Guangzhou, China <sup>10</sup>	Middle East <sup>11</sup>
Host/Source	Bat? <sup>9</sup>	Cats 'palm civets'	Dromedary Camels
Year	2019-2020	2002-2003	2012
	Rising mainly in China	No more reports	There are still reports of intermittent sporadic cases <sup>26</sup>
	87.137 human cases and 2977 deaths <sup>27</sup>	8.422 human cases and 774 deaths.	2499 cases and 861 deaths.
Countries	More than 100	29	27 <sup>26</sup>
Incubation period (days)	2-14 mean of 6,4 <sup>28</sup>	2-7	5
Frequent signs and symptoms	Fever, cough, dyspnoea <sup>8,9,12,14</sup>	Fever, cough and chills <sup>11</sup>	Fever, cough, dyspnoea, chills <sup>11</sup>
Laboratory Tests	high lactate, dehydrogenase, lymphopenia and leukopenia <sup>15,16</sup>	high lactate, dehydrogenase, lymphopenia, thrombocytopenia and leukopenia <sup>16</sup>	high lactate, dehydrogenase, thrombocytopenia, lymphopenia and leukopenia <sup>16</sup>
Imaging Exams	Presence of bilateral hilar infiltrates, lobar opacity, ground-glass imaging and possible pleural effusions, with lower lobe involvement generally more affected than the upper lobes <sup>9</sup>	Typical findings of unilateral/bilateral ground glass, opacities or focal unilateral/bilateral consolidation. Abnormalities tend to progress towards bilateral consolidation in hospitalized patients <sup>9</sup>	Irregular or infiltrated densities, bilateral hilar infiltration, segmented/lobar, opacities, ground-glass opacities and possible small pleural effusions. Lower lobes generally more affected than the upper lobes <sup>9</sup>
Lethality	+/- 3%	10%	34.4% <sup>26</sup>
Nucleotide similarities with COVID-19	0	79% <sup>2,6,8</sup>	51.80% <sup>2,6,8</sup>

### Clinical presentation

In China, the reported cases indicate that the majority of infected patients were male and average age of 55 years, with no cases in individuals under 15 years old<sup>13,14</sup>. In cases detected outside of China the average age is 45 years old, ranging from 2 to 74 years old and 71% of the cases were male.

The incubation period is between 2 and 14 days, with potential asymptomatic transmission<sup>2,7,11</sup>, the duration of the onset of the disease until the first medical consultation was estimated at approximately 5 days, the average duration from the beginning until hospitalization was estimated at 12.5 days among cases with onset of the disease before January 1st, after this period the average decreased to 9 days<sup>14</sup>.

Common symptoms of this disease has shown that the virus's confirmations varied in asymptomatic people or with mild symptoms to seriously ill people.

The symptoms ranged from a common cold to the presence of fever, dry cough, dyspnoea, myalgia or fatigue, followed by less common symptoms, such as sputum production, headache, hemoptysis and diarrhea<sup>9,10,13,15,16</sup>, in addition to lymphocytes, platelets and hemoglobin below the reference standard for normality<sup>10,16</sup>. Lymphocyte labeling and quantification is a reference marker in the diagnosis of coronavirus infections<sup>10</sup>. Intensive care patients have high levels of lymphocytes<sup>13</sup>.

In addition, of the confirmed, suspected and asymptomatic cases of COVID-19 in China, about 80.9% of infections are mild (with flu-like symptoms), 13.8% are serious<sup>17</sup>. The clinical evolution of these patients includes acute respiratory distress syndrome, acute cardiac involvement and secondary infection<sup>10,13</sup>.

In the epidemiological analysis, it is observed that male individuals (4.7%), elderly people over 80 years old

(21.9%) and those patients with associated comorbidities, such as cardiovascular diseases, are more likely to die (13.2%), diabetes (9.2%) and chronic respiratory diseases (8.0%)<sup>16</sup>.

### Diagnostic

Clinical evaluation is essential in the diagnosis of COVID-19. The most frequent symptoms associated with the infection are those elucidated in the clinical presentation. However, the clinical characteristics are not specific and may be similar to those caused by other respiratory viruses.

The most frequent symptoms associated with COVID-19 infection are: fever, cough and difficulty breathing. Sore throat, runny nose, headaches and/or muscle and tiredness can also occur. In more severe cases, it can lead to severe pneumonia with acute respiratory failure, kidney and other organ failure, and eventual death.

On imaging examination, there are foci of bilateral pneumonia, multiple spots and glass opacity and, in some cases, the evolution to pneumothorax<sup>10,16,17</sup>. Based on the clinical evaluation, laboratory tests and PCR Polymerase Chain Reaction and Genetic finger print are performed<sup>18</sup>.

### Magnitude

The first cases (66%) were exposed to the wholesale seafood market in Huanan, but there was an increase in the number of unrelated cases as of the end of December<sup>13,14,19</sup>.

The spread of COVID-19 disease by asymptomatic individuals seems to be the major challenge for controlling this pandemic<sup>20</sup>. Evidence of the presence of this virus in asymptomatic people has raised doubts about the onset of this disease and also about the real numbers of existing cases<sup>20</sup>.

Data on initial outbreaks continues to grow. It is estimated that each individual can spread their viral load to about 2 to 7 people, with the magnitude of the disease reaching exponential levels in the notification rate<sup>1,14,21</sup>.

There are three parameters to be understood to assess the magnitude of the risk posed by this new coronavirus, which are the transmission rate, lethality and asymptomatic transmission.

In COVID-19 there is a rate of attack or transmissibility (the speed with which the disease spreads) of 1.5 and 3.5<sup>17</sup>. Confirmed cases demonstrate that possibly asymptomatic transmission has been possible, which directly interferes with confirmed case numbers and lethality rates. We can highlight that even if it is not possible to determine the real mortality rate of this new coronavirus, global health care stands out due to its attack rate and the possibility of asymptomatic transmission. Thus, the World Health Organization declared the coronavirus outbreak as a Global Public Health Emergency<sup>17</sup>.

The probability of risks related to the disease propagation trip was suggested<sup>7,22-24</sup> and indicated the potential for regional and global propagation. Numerous countries confirmed cases associated with travel, however, in addition to a tourist and economic route, we can highlight initially a mapping of cases in developed countries that had colder climates<sup>25</sup>.

The cases notified by the World Health Organization (WHO) exceed the 100,000 confirmed cases worldwide and spread over more than 100 countries. These data reinforce that COVID-19 has shown a high prevalence, with the majority of them presenting mild symptoms (approximately 82% of the cases) and with a lower lethality to the MERS and SARS coronavirus.

### Treatment

So far, there are no known useful treatments for the disease caused by this new coronavirus<sup>26</sup>, so contact and respiratory precautions are the only effective measures to prevent infection of this emerging virus<sup>18</sup>.

### Control measures

During previous outbreaks of MERS and SARS coronaviruses, human-to-human transmission occurred through droplets, contact and fomites, suggesting that the mode of transmission of COVID-19 may be similar. Thus, limiting human to human transmission, including the reduction of secondary infections between close contacts and healthcare professionals, preventing transmission amplification events has been a principle to reduce the overall risk of transmission including measures such as: avoiding close contact with people who suffer from acute respiratory infections; frequent hand washing, especially after direct contact with sick people or the environment<sup>27</sup>.

Also, when coughing or sneezing, cover mouth and wash hands immediately, and in the health units provide the improvement of infection prevention and control practices<sup>28</sup>.

As measures to contain the transmissibility of the virus, an active search for symptoms suggestive of respiratory insufficiency is carried out during or after travel, especially air travel, encouraging travelers to seek medical attention and share their travel history.

In turn, the global health authority (WHO) has provided the strategy to identify, isolate and care for patients early, including providing optimized care to infected patients, as well as identifying and reducing the transmission of animal source.

There are incentives for the development of diagnostic tests and therapeutic approaches, including the development of vaccines<sup>28,29</sup>.

Finally, it is highlighted that the concept of health has been transformed from the historical moments experienced, reflecting on the appearance of new formulations on thinking and doing health and new proposals for changes in health care models<sup>30</sup>. Given the fluctuation in the incidence and the lethality rate, the importance of hygiene care is reinforced, which are, at this moment, the most effective measure to prevent new infections from happening, followed by a reduction of places with crowded people.

These are non-pharmacological and health promotion measures, which are fundamental for reducing direct contagions in the population, especially those most vulnerable. This is a real global public health problem.



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## Resumo

Os coronavírus (CoV) compõem uma grande família de vírus, conhecidos desde meados da década de 1960, que receberam esse nome devido às espículas na sua superfície, que lembram uma coroa (do latim corona). As infecções pelo CoV podem causar desde um resfriado comum até síndromes respiratórias graves, como a síndrome respiratória aguda grave (SARS-CoV) e a síndrome respiratória do Oriente Médio (MERS-CoV). O COVID-19 (SARS-CoV2) é nova variante do coronavírus, sendo que o seu isolamento ocorreu na China em 07/01/2020. O COVID-19 tem se destacado com alto impacto na saúde pública devido ao elevado número de casos com a infecção em um curto período de tempo. Entretanto, é possível observar que apenas 17% dos pacientes confirmados com COVID-19 apresentam infecções graves e cerca de 2,5% destes pacientes morrerem. No entanto, os estudos atuais tem evidenciado que o número de casos leves e assintomáticos podem ser ainda maiores. Dessa forma, destacam-se os desafios para o controle dos casos não notificados de pacientes com sintomas leves que estão espalhando o vírus e interferindo na magnitude e nos dados reais dos casos. A transmissão do coronavírus acontece entre humanos, podendo ocorrer de pessoa a pessoa pelo ar, por meio de tosse ou espirro, pelo toque ou aperto de mão ou pelo contato com objetos ou superfícies contaminadas, seguido pelo contato com a boca, nariz ou olhos. Dada a oscilação da incidência e da taxa de letalidade reforça-se a importância dos preceitos da promoção da saúde em busca da reorientação de práticas de higiene, considerando que há vigência nos modelos assistenciais em saúde, sendo hegemônico o curativismo e a atual situação vivenciada pela população mundial exige postura preventiva.

**Palavras-chave:** SARS-CoV-2, 2019 novel coronavirus, COVID-19, promoção da saúde, saúde pública, epidemia.

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