



Coronavirus Outbreaks: Literature Review

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Research Article

Abstract

Coronaviruses are observed in birds and mammals and can be transmitted to humans, leading to outbreaks and pandemics. Among the most recent ones are SARS-CoV, MERS-CoV, and COVID 19. Thus, the objective was to describe a discussion about coronaviruses, with an emphasis on Sars-Cov-2. From the data collected, it can be seen that the current pandemic has had impacts on public health and socioeconomic life in more than 170 countries worldwide, to date, with tens of millions of people infected and hundreds of thousands of deaths. In this regard, prevention actions must be intensified, especially among the most vulnerable patients (the elderly and those with comorbidities that affect immunity). In addition, new studies should be carried out so that vaccines and antivirals can be implemented for application to COVID-19.

Keywords: Coronavirus, COVID-19, Outbreaks, SARS, MERS, Review

1. Introduction and Morphology

Coronaviruses can be observed in birds and wild mammals (birds, bats, rodents, and primates) and can be transmitted to domesticated animals, such as camels. From these animals, they can contaminate the human being, resulting in respiratory, intestinal, liver, and neurological infections. [1, 2, 3, 4] These clinical conditions, lead to restrictions on the circulation of people and closing of shops, despite the low lethality, but high dissemination, result in socioeconomic impacts in the affected regions.

This virus belongs to the Coronaviridae family, being described as the etiological agents of the most recent infections (SARS-CoV, MERS-CoV, and COVID 19), belonging to the subfamily

Betacoronavirus. [5] (Brasil, 2020) Thus, the objective was to describe a discussion about the coronavirus, with emphasis on COVID - 19.

Morphologically, they appear as spherical or plomorphic enveloped particles - Figure 01 [6,7, 8]. Anchored in the structure of the viral envelope, glycoproteins are observed, responsible for binding to the host cell receptor, as well as hemagglutinin, which contributes to recognition and binding to the target cell. These, together with the viral envelope, involve a nucleus that contains a positive sense RNA chain associated with nucleoproteins. [6, 7, 9]

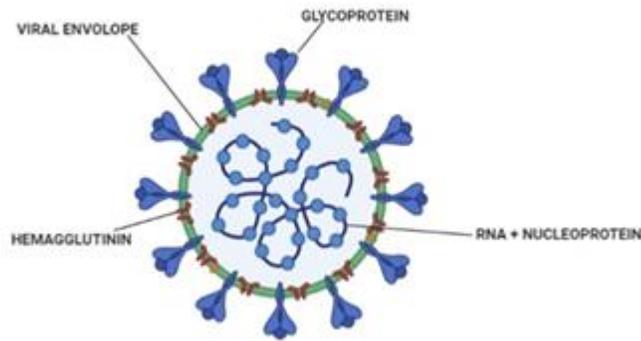


Figure 1: Basic structure of the Coronavirus.

Source: BioRender.com

2. History of Recent Virus Outbreaks

Recent viral outbreaks by the coronavirus are believed to be associated with the zoonotic transmission (Figure 02), presenting a natural host, such as bats, which transmit to intermediate hosts, primates, camels, and other mammals. [4,10] Considering the most recent outbreaks:

- Severe Acute Respiratory Syndrome (SARS) occurred between 2002-2003 in Guangdong, China, reaching 37 countries, with patients experiencing high fever, headache, body pain, cough, and most patients developed viral pneumonia. During this period, more than 8,000 people were symptomatic, resulting in approximately 800 deaths.[11, 12]

- Middle East Respiratory Syndrome (MERS) started in the Middle East, spreading to 27 countries between 2012 and 2015. The main symptoms seen among 1300 infected people were high fever, muscle pain, cough, and a severe respiratory infection that can progress to pneumonia.[1, 11]

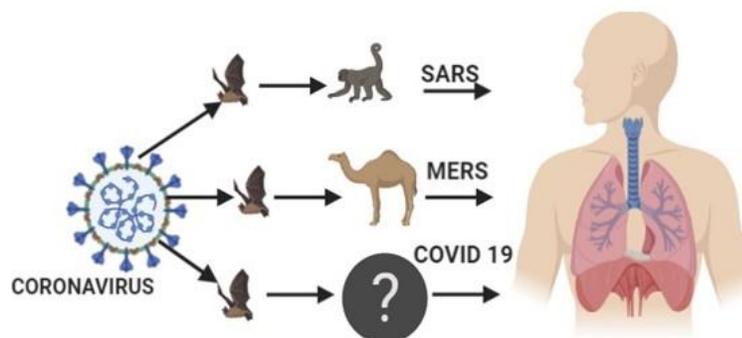


Figure 2: Coronavirus-associated respiratory syndromes

Source: BioRender.com

Coronavirus Syndrome 2019 (Sars-Cov-2) started in Wuhan, China, apparently spreading from a "wet market" to several cities and provinces in China. Being disseminated to dozens of countries in the world, the infection is ongoing, affecting tens of millions of people infected and hundreds of thousands of deaths. [2, 13]

3. Transmission and Viral Physiopathology

Coronavirus is commonly transmitted between people from viral particles present in droplets of saliva or mucus, expelled through the mouth or nostrils when the person coughs or sneezes. Transmission by fecal material containing viral particles is also reported in the literature. Transmission can also occur due to the presence of viral particles in the hands or objects touched by the patient. [5, 14]

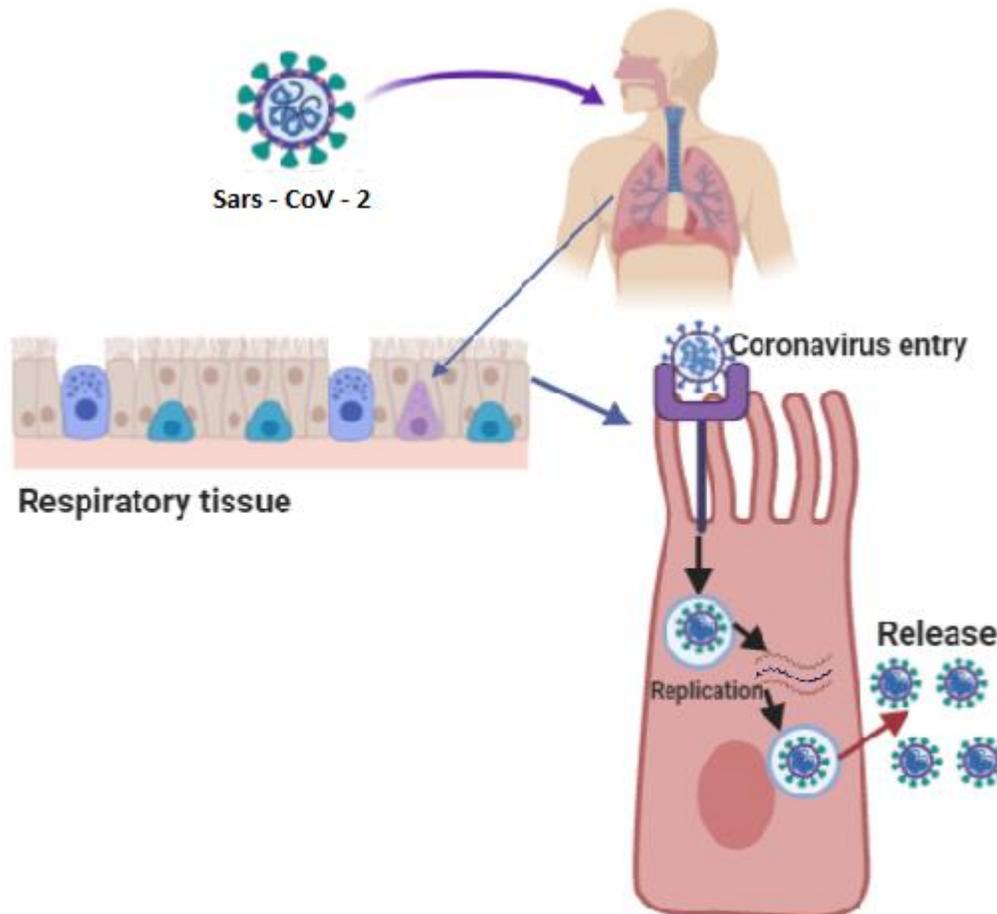


Figure 3: Replication of the coronavirus

Source: BioRender.com

After the initial contact with the viral particle, as shown in the illustration of the airway in figure 03, the virus connects to the target cell receptors through the glycoprotein and hemagglutinin, present in the viral envelope. Among the target cell receptors is aminopeptidase-N and a receptor containing sialic acid. After this adhesion, the virus is internalized and the viral genome is released, followed by its transcription and translation. Then the virus is assembled and the viral particle is externalized by sprouting, in which the incorporation of the viral envelope takes place. [6, 7, 9] These new particles can invade new cells and spread in the body, generating symptoms.

4. Symptomatology and Epidemiology

Coronaviruses after the first contact that result in initial replication, and may be incubated for a period between 03 to 07 days, on average. The symptoms start similar to a cold, with a runny nose, sneeze, and cough. With the clinical evolution of the disease, fever, cough, body weakness/muscle pain and breathing difficulties can be observed - Figure 04. [7, 10, 15]

In more severe cases, viral pneumonia can be observed leading to life-threatening, among the groups at greatest risk are elderly patients, patients with comorbidities that reduce immunity, such as HIV, cancers, and diabetes. [2, 12, 23]

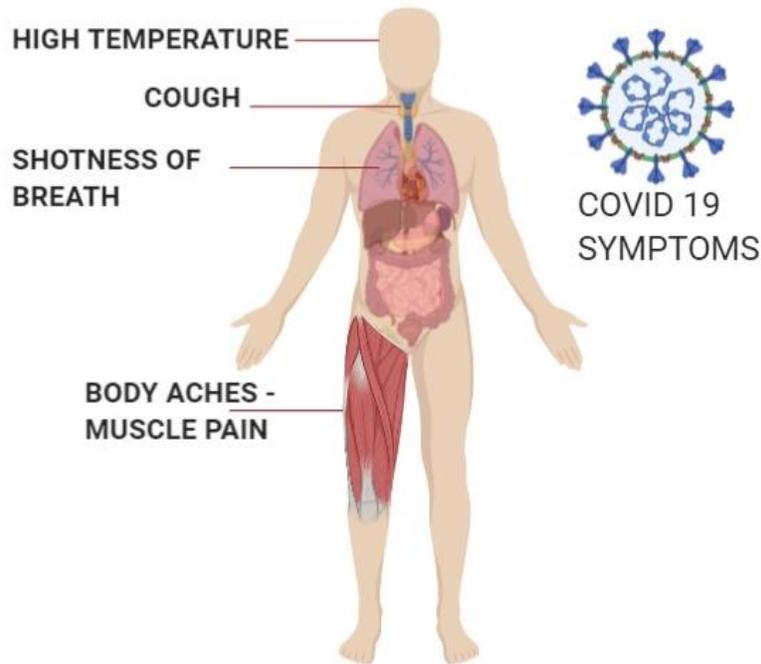


Figure 4: Most frequent symptoms of COVID-19

Source: BioRender.com

To date, 12,282,275 cases have been reported with 554,586 deaths, with 65.50 %% of cases concentrated in 10 countries listed in Table 1.

Table 1: Confirm Cases and. Deaths by Country - COVID -19

Country	Total cases	Total Deaths
World	12,282,275	554,586
USA	3,189,112	135,355
Brazil	1,727,279	68,355
India	794,855	21,623
Russia	707,301	10,843
Peru	312,911	11,133
Chile	306,216	6,682
Spain	300,136	28,401
UK	287,621	44,602
Mexico	275,003	32,796
Iran	250,458	12,305

Source: 25. Consulted at <https://www.worldometers.info/coronavirus/#countries>.

It is believed that in many countries, underreporting of cases occurs so that the number of cases can be between 5 to 10 times greater than those officially registered. This is justified by the low level of testing performed in the population.^[13, 17, 24]

5. Treatments and Prevention

The treatment of COVID - 19 infections does not have, until the moment, specific therapy. Being guided by the World Health Organization the home isolation of patients with mild symptoms, keeping them under strict monitoring, due to the risk of worsening in the clinical picture. For those with clinical complications, supportive treatment that includes mechanical ventilation and renal support can be used ^[5, 16,17]

Although there is currently no specific, effective antiviral therapy, some studies have investigated the potential use of lopinavir, ritonavir, and favipiravir. Lopinavir and ritonavir are protease inhibitors and are used mainly in antiretroviral therapy, for example in the treatment of HIV. The protease inhibition of COVID 19 would occur so that viral replication would be minimized, being useful mainly in cases of viral pneumonia. ^[18, 19]

Favipiravir in turn is converted in the body to ribofuranosyl triphosphate, which starts to inhibit viral RNA polymerase, being used for example in some influenza infections. ^[20] Through the inhibition of viral RNA polymerase, this drug can be used at the beginning of the disease, mitigating the risks of clinical worsening, such as viral pneumonia. ^[19, 21]

There are also recommendations regarding therapeutic restrictions, among which the use of corticosteroids, except in clinical indications, as it can increase the time of elimination of the virus. In addition, there is evidence that the application of corticosteroids in patients with SARS, pulmonary inflammation could be improved, on the other hand, immune suppression occurred, so that the severity of the infection occurred, requiring a longer hospital stay with mechanical ventilation and renal support. ^[17, 22]

Regarding prevention, so far there are no vaccines for COVID-19, and WHO recommends active surveillance of new cases and strict monitoring of their contacts. In addition to the home isolation of patients with mild conditions and educational campaigns aimed at the general public, which include: frequent hand washing, cough and sneeze etiquette, avoid consumption of raw or undercooked animal products, avoid close contact, and use personal protective equipment (eg masks) when visiting public places. Such care should be reinforced for more vulnerable individuals with the elderly and those with comorbidities that lead to reduced immunity ^[5, 13, 22, 24]

In addition to the clinical symptoms, to be classified among a possible infected person, the individual must have traveled to the places where the virus is most spread or have contacted an infected person or a suspected case. Thus, it is recommended that biosafety measures be taken by professionals and perform procedures for the disposal of other diseases.

In addition, some countries have already implemented measures to restrict the movement of people, close borders, and trade, resulting in negative socioeconomic impacts in these locations, with the health authorities considering essential measures to spread COVID-19.

6. Conclusion

From the data collected in this study, it was possible to present points about the biology, replication, transmission, and therapy of the coronavirus, focusing on COVID - 19. This pandemic, already affects hundreds of countries, with thousands of deaths being observed, in addition to the impacts socio-economic conditions resulting from restrictions on the movement of people, closing borders, and trade.

In this regard, prevention actions must be intensified, especially among the most vulnerable patients (the elderly and those with comorbidities that affect immunity). In addition, new studies

should be carried out so that vaccines and antivirals can be implemented for application to COVID-19.

Conflicts of Interest: The authors declare no conflict of interest.

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