

An Emergent Infectious Disease, Severe Acute Respiratory Syndrome Corona Virus (SARS COV-2): A Mini Review

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ABSTRACT

Recently, a novel coronavirus (2019-nCoV-2) associated severe acute respiratory syndrome (SARS-CoV) has emerged in December 2019 in Wuhan, China. This novel coronavirus disease (SARS-CoV-2) is characterized by pulmonary infection and mostly leads to a wide range of clinical manifestations ranging from asymptomatic, mild, and moderate to severe. The severe cases present with pneumonia, which can progress to acute respiratory distress syndrome. Despite the containment measures, the spread of this virus is ongoing. In this review, we highlight the epidemiology, symptoms, transmission, treatment and control, of this fatal disease. It is a challenge to global public health therefore, a special attention and efforts to protect or reduce transmission should be applied in susceptible populations including children, health care providers, and elderly people. Public health authorities should also keep monitoring the situation closely, as the more we can learn about this novel virus and its associated outbreak, the better we can respond.

Keywords: Coronavirus, COVID-19, Novel, SARS-COV-2

INTRODUCTION

Coronaviruses (CoVs) are found in different animals that include aves and mammals species. They are generally categorized into four genera including Alphacoronavirus, Betacoronavirus,

Gammacoronavirus, and Deltacoronavirus.¹ The novel coronavirus (SARS-CoV-2) is the newest addition to other human coronaviruses that include 229E, OC43, HKU1, NL63, severe acute respiratory syndrome (SARS) CoV, and Middle East respiratory syndrome (MERS) CoV. It belongs to the genus Betacoronavirus and was first reported in Wuhan, China in December 2019.² This newly identified type of coronavirus (SARS-CoV-2) has caused a recent outbreak of respiratory illness worldwide and highly contagious, with major clinical symptoms that include fever, dry cough, weakness, myalgia and dyspnea.³⁻⁵ The virus was named as SARS-CoV-2 by international committee of Taxonomy of Viruses (ICTV).⁶ Currently, the virus has penetrated into more than 213 countries with more than 20,162, 474 confirm cases and a death toll of 10,254.⁷ The countries include Taiwan, Thailand, Vietnam, Malaysia, Nepal, Sri Lanka, Cambodia, Japan, Singapore, Republic of Korea, United Arab Emirates, United States, The Philippines, India, Australia, Canada, Finland, France, and Germany e.tc.

Since the emergence of novel coronavirus (COVID-19) in December 2019, bats have been the suspect of harbouring emerging virus. Phylogenetic analyses of the novel coronavirus (SARS-COV-2) have revealed that it is genetically

related to two bat coronaviruses (SARS-COV and MERS-COV).^{8,9} Previous studies have also reported that Corona viruses (COVs) in various animals including aves and mammals.¹⁰

Despite recent efforts on novel coronavirus (SARS-COV-2) research and its containment, there is still no vaccine against coronaviruses for use in humans (this includes SARS and MERS).¹¹⁻¹³ Hence, the lack of preventive vaccines for clinical use in humans against such viruses makes emerging influenza and coronaviruses a serious global threat. This review summarizes the clinical aspects such as epidemiology, transmission, treatment, control, and clinical presentation of the novel Betacoronavirus infection (SARS-COV-2).

Epidemiology of COVID-19

The earlier outbreaks of coronaviruses (CoVs) include the severe acute respiratory syndrome (SARS)-CoV and the Middle East respiratory syndrome (MERS)-CoV which have been previously considered as agents of great public health risk. In December 2019, patients were admitted to hospitals with an initial diagnosis of pneumonia of an unfamiliar etiology. These patients were epidemiologically connected to a seafood and wet animal wholesale market in Wuhan,

Hubei Province, China.^{14,15} However, early reports projected the onset of a potential coronavirus outbreak given the estimate of a reproduction number for the 2019 Novel coronavirus (COVID-19), which was later named as COVID-19 by WHO on Feb 11, 2020 and declared as global pandemic on March 11, 2020¹⁶. Since then numbers of infections due to SARS-CoV-2 continued to grow since its emergence to date.^{14,17} According to situation report-205 published by W.H.O, as of 12th August 2020 there are altogether 20,162, 474 confirmed cases of COVID-19 with 243, 401 deaths globally. Two hundred and thirteen countries from seven regions of the world including Africa, America, Eastern Mediterranean, Europe, South-East Asia, and Western Pacific have reported cases. America is having the highest cases of 10,799,062.¹⁸ Among the 213 countries around the world with the confirmed cases of COVID-19, United States, Brazil, India, Russia, Spain, Iran, United Kingdom have been reported to have recorded most of the cases (figure 1), with United States having the largest number of patients with COVID-19, followed by Brazil (3123109), India (2395471) and Russia (902701). To date, reported number of death is 737 417 out of which 393727 are from Americans.¹⁹

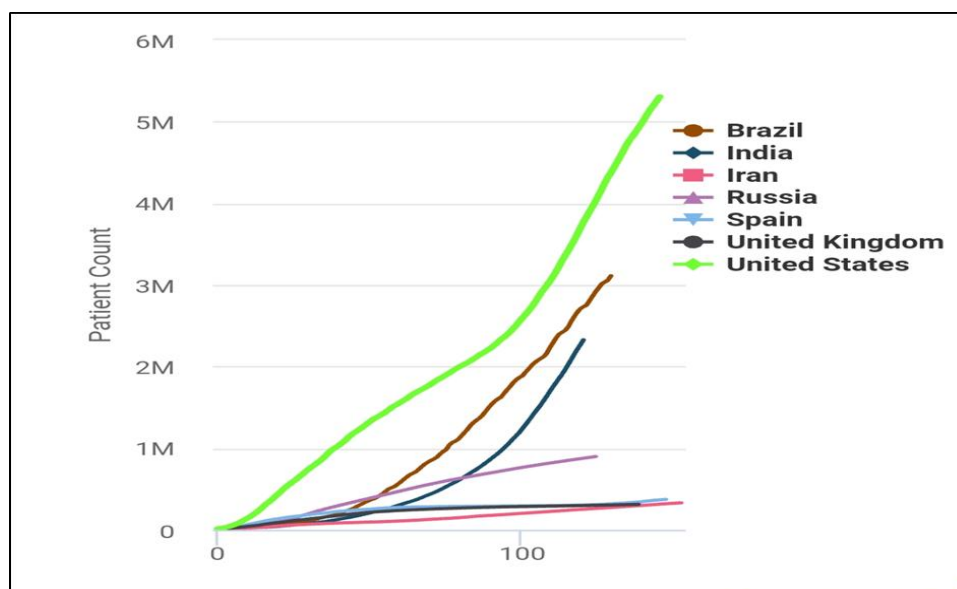


Figure 1. Shows the cumulative number of cases (by number of days since 10,000 cases)

Source: Worldmeter-www.worldmeter.info

Origin and transmission of SARS-COV-2

The previously reported coronavirus diseases such as, severe acute respiratory syndrome (SARS-CoV) which emerged in China in 2002-2003,²⁰⁻²² that is responsible for large-scale epidemic with about 8000 infections cases and 800 deaths, and the Middle East respiratory syndrome (MERS-CoV) that also cause persistent epidemic in the Arabian Peninsula in the year 2012 are both believed to be originated from bats and camels before crossing species barriers to infect humans.^{10,23,24} However, the source of the novel coronavirus (SARS-Cov-2) is still unidentified. Though, the increasing outbreak of this epidemic has been linked to the Huanan South China Seafood Market.²⁵ Many researchers are trying to find the animal host of this novel coronavirus (SARS-COV-2) with the hope of containing the spread of this deadly virus. Most sources agree that the possible host of the SARS-COV-2 is bats, pangolins, or seafood.^{14,15,26,27}

The transmission of SARS-Cov-2 to humans occurs through direct contact with reservoir host (bat) or intermediate host (pangolins) or consumption of wild animals (figure 2).²⁸ Several studies have revealed that person-to-person transmission is likely one of the most important route of spread of SARS-COV-2 infection within community.^{28,29} Person-to-person transmission occurs primarily through a direct contact or through droplets spread by coughing or sneezing from an infected individual.²⁷ This transmission usually occurs between family members, including relatives and friends who closely contacted with patients or incubation carriers. So far, there is no evidence of airborne transmission of the SARS-CoV-2, however precautionary measures are recommended due to the lack of information excluding this mode of transmission.³⁰ Therefore, there is need for further investigations on the transmission mode of COVID 19 in order to determine and understand the extent of this mode of transmission.

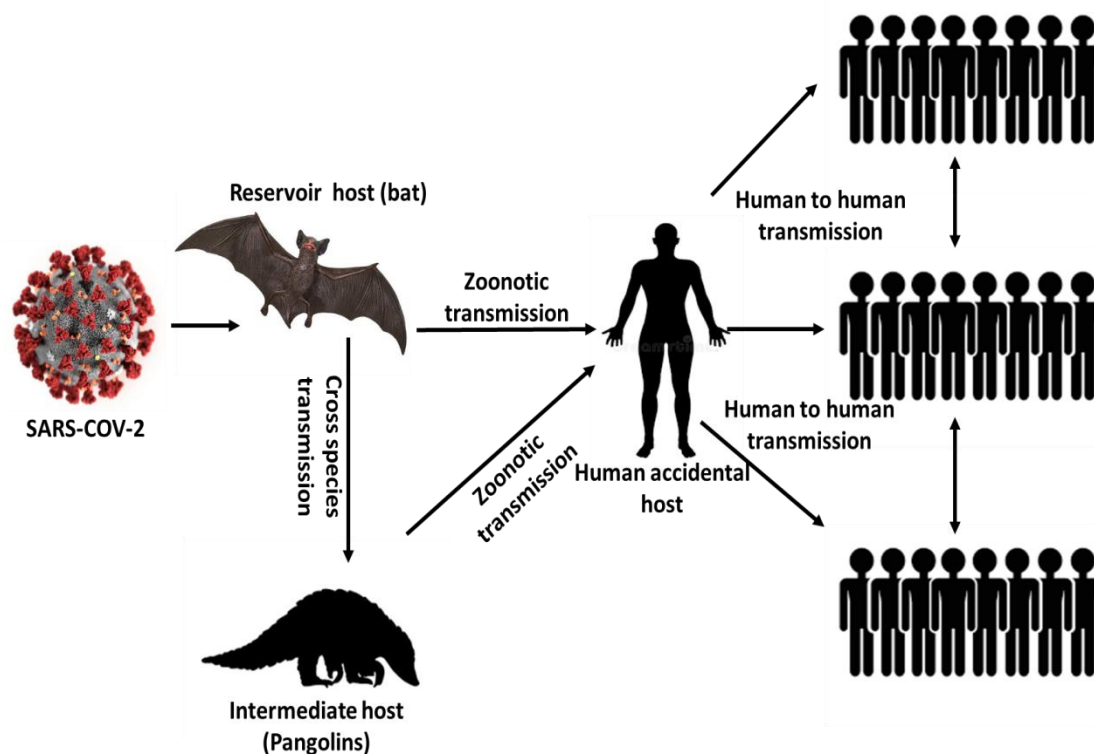


Figure 2. Represent the transmission chain of SARS-COV-2 through the intermediate and reservoir host to humans

Source: Adapted and modified from Muhammad Adnan Shereen et al, 2020.
<https://www.sciencedirect.com/science/article/pii/S2090123220300540>

Symptoms of COVID-19

Generally, the symptoms of coronavirus disease (COVID-19) appear in infected person mostly after the incubation period of the virus. However the symptoms from the onset period to death could range from mild to severe signs and even lead to death depending on the age of the patient and in patient's immune system.³¹ The most common symptoms appear at the onset period are fever, cough, and fatigue, whereas other symptoms that include sputum production, headache, haemoptysis, diarrhoea, dyspnoea, and lymphopenia were also reported previously (figure 3).³¹⁻³³ Previous study have reported 41- patients

positive for COVID-19 that were also presented with clinical features revealed by a chest CT scan presented as pneumonia, but however, there were abnormal features such as RNAemia, acute respiratory distress syndrome, acute cardiac injury, and incidence of grand-glass opacities that led to death been reported.^{33,34} Globally, the clinical features in humans infected with SARS-CoV-2 have ranged from mild (no or minor) to severe signs and symptoms including death. It was reported that the first instance of COVID-19 related pneumonia cases, whether linked to the Huanan Seafood Market or not, occurred between 6 and 15 December 2019.³⁰

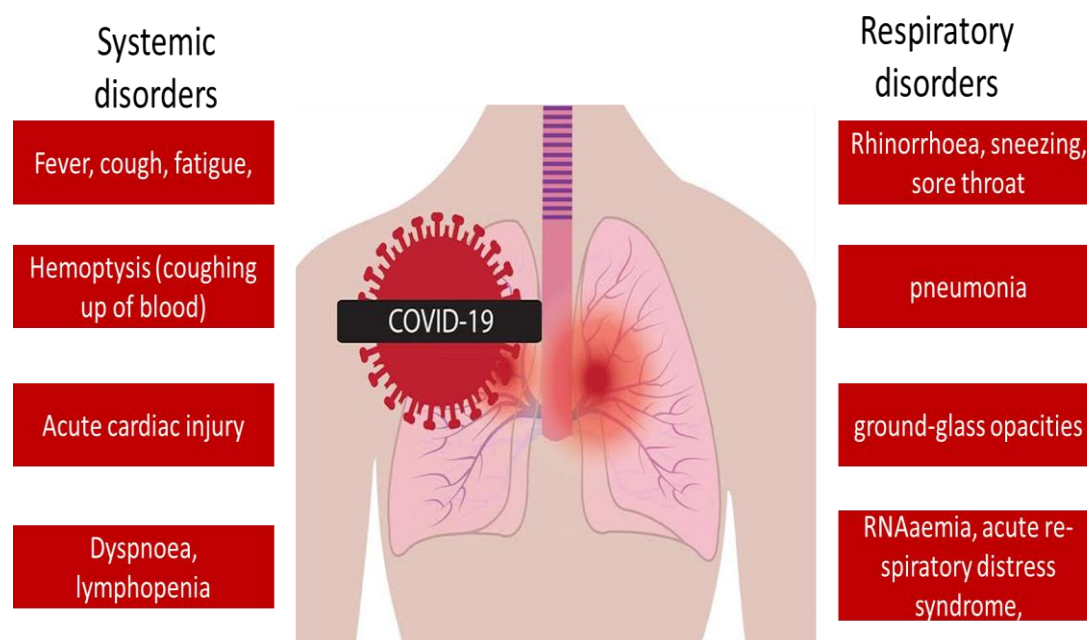


Figure 3. The systemic and respiratory disorders caused by COVID-19 infection.

Source: Adapted and modified from Hussin A Rothan et al, 2020. <https://pubmed.ncbi.nlm.nih.gov/32113704/>

Treatment of COVID-19

To date there are no specific antiviral drugs or vaccine against COVID-19 infection for potential therapy of humans.¹³ However, the current clinical practice includes infection prevention measures and supportive care, including supplemental oxygen and, mechanical ventilatory support.³⁵ So far, the only option available is using broad-spectrum antiviral drugs like Nucleoside analogues and also HIV-protease inhibitors that could attenuate virus infection until the specific antiviral

becomes available.³⁶ Hydroxychloroquine and chloroquine are oral prescription drugs that have been used for treatments of malaria, but however these two drugs are under investigation in clinical trials for the cure of COVID-19 infection, presently reports have showed that this broad-spectrum antiviral remdesivir and chloroquine are highly effective in the control of 2019- nCoV infection in vitro.³⁷ Moreover, there are number of other compounds that are still under investigations. These include the clinical

candidate EIDD-2801 compound that has shown high therapeutic potential against seasonal and pandemic influenza virus infections and this represents another potential drug to be considered for the treatment of COVID-19 infection.³⁸ It is obvious that more research needed urgently to identify the therapy of novel coronavirus and in order to develop pre-and post-exposure prophylaxis against COVID-19, there is an urgent need to establish an animal model to replicate the severe disease currently observed in humans.

Prevention and control of COVID-19

Measures to reduce person-to-person transmission of novel coronavirus infection (COVID-19) are required to control the present outbreak. More attention and efforts to prevent the transmission of novel coronavirus (COVID-19) should be applied in vulnerable people such as children, health care providers, and elderly people.²⁷ In most countries of the world countries including China, US, Italy etc. have applied main prevention and control measures including travel screenings to control further spread of the virus since the outbreak. Furthermore, since the outbreak of the virus WHO have recommended some infection control interventions to reduce the risk of transmission of the virus, the measures includes avoiding close contact with people suffering from acute respiratory infections, frequent hand-washing especially after direct contact with ill people or their environment, and avoiding unprotected contact with farm or wild animals. On the other hand it is also recommended that people who show the symptoms of COVID-19 should practice cough etiquette, which is to maintain distancing, cover coughs and sneezes with disposable tissues or clothing, and wash hands, and within healthcare facilities enhanced standard infection prevention and control practices are recommended in hospitals, especially in emergency departments.¹⁸

CONCLUSIONS

The recent outbreak of novel coronavirus diseases (COVID-19) has become a public health threat to the general public and healthcare workers across the globe. However, knowledge about this novel virus remains limited. Currently, the preventive measures applied against the spread of novel coronavirus is primary intervention, therefore, there is need for public health authorities to monitor the situation closely, and develop effective antiviral therapy and vaccination.

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