

# The Novel Coronavirus-19: A Mini Review

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Received 26 March 2020; Accepted April 26, 2020; Online Published June 30, 2020

## Abstract

Coronavirus infection is a pandemic, caused by Coronavirus, a member of Coronaviridae viral family. The Coronaviridae family has positive single stranded viruses and is characterized by crown-like surface projections under an electron microscope. Coronavirus was first discovered in 1965 and became familiar in 2002 after an epidemic outbreak of pneumonia in China. The Coronavirus infection is transmitted through respiratory droplets or direct contact with patients. The wild animals like bats and civets act as a reservoir of CoV. This virus is clinically manifested by cough, fever, malaise with respiratory disorder like acute respiratory distress. The patients are diagnosed with RT-PCR by collecting blood and urine. Currently, there is no proper specific treatment for this infection, however guidelines are provided and some drugs like favilavir have been approved as investigational therapy. The coronavirus is considered as a great concern to the global health scenario today due to its wide dissemination.

**Keywords:** Pneumonia, Pandemic, rRT-PCR, Global Hazard, COVID-19.

## Introduction

Coronavirus is a member of Coronaviridae family of positive single stranded viruses. They belong to the order Nidovirales <sup>1</sup> and the subfamily is categorized into genera alpha, beta, gamma and delta. The human coronavirus belongs to the genera alpha and beta.<sup>2</sup> The corona virus is named after their crown-like spikes under an electron microscope. This virus can cause a variety of diseases including gastroenteritis and respiratory illness in animals and respiratory tract diseases<sup>3</sup> in humans.

There are seven strains of human coronavirus identified so far, such as HCoV-229E, HCoV-OC43, SARS-CoV, MERS-CoV, HCoV-NL63, HKU1 and SARS-CoV-2. The most pathogenic viruses SARS-CoV and MERS-CoV cause respiratory syndrome in humans and the other four viruses cause mild upper respiratory disease in immunocompromised human beings such as infants, young children and the elderly.<sup>4-6</sup> The coronavirus mostly infects and circulates in animals mainly bats, civets, rats, etc. Actually, the animals act like a reservoir for coronavirus.

## History

The human coronavirus was first discovered in 1965 by Tyrrell and Bynoe<sup>7</sup> when they found a virus named B814. The virus was found in human embryonic tracheal culture of an adult having a common cold. In the late 1960's, Tyrrell and a group of virologists worked with human strains and animal viruses which had been demonstrated to be morphologically same as seen in electron microscopy.<sup>8</sup> These new group of viruses were named the coronavirus<sup>9</sup> due to the crown-like appearance of the surface projections.

Until now, various coronaviruses have been studied in detail. The HCoV-229E and HCoV-OC43 were the first

discovered coronaviruses in mid-1960's<sup>10</sup> from chickens and nasal cavities of human patients with a common cold. There was an outbreak of atypical pneumonia in Guangdong province of China around November 2002. By the end of February 2003, a cluster of patients and health care workers with pneumonia were noted in Hong Kong, Vietnam and Canada.<sup>11</sup> The syndrome was designated as "Severe Acute Respiratory Syndrome" SARS in March, 2003.<sup>12</sup> In late 2002 and 2003, the epidemic SARS-CoV affected more than 8,000 people with 750 deaths. There is also a report that suspects animals as a reservoir for the ancestors of SARS-CoV, since SARS-CoV like viruses were isolated from Himalayan palm civets.<sup>13</sup>

The HCoV-NL63 was the fourth identified coronavirus isolated from a seven month old infant suffering from bronchiolitis and conjunctivitis.<sup>10</sup> This HCoV-NL63 was originated in Netherland and has been consequently identified in various countries indicating a worldwide distribution. They mainly affect the children and immunocompromised individuals.<sup>14</sup> In 2012, an unknown coronavirus (MERS-CoV) was isolated from the sputum of a patient with pneumonia in Jeddah, Saudi Arabia.<sup>15</sup> As of May 2014, there were 635 confirmed cases of MERS-CoV with 193 deaths<sup>16</sup> reported to the World Health Organization (WHO). The MERS-CoV affected more than 21 countries all over the World.

The new coronavirus has been identified in pneumonia cases that occurred in Wuhan city of Hubei province, China by the end of December 2019.<sup>17</sup> This new coronavirus infection is caused by SARS-CoV-2 and has named to be COVID-19. Till date, there are more than 5.24 million confirmed cases with more than 339,000 deaths and 2.07

million recovered cases all over the world.

## TRANSMISSION

The wild bats are the most possible host of the SARS-CoV-2 but it requires further confirmation whether they are directly transmitted or transmitted through an intermediate host. Until now, the main infection source of SARS-CoV-2 is pneumonia patients. The main route of transmission is respiratory droplet and it can also transmit through contact. An increasing number of cases prove the human to human transmission.<sup>18</sup>

## SYMPTOMS

### Early Symptoms

The latency period of SARS-CoV-2 is generally from 3-7 days, with the maximum of 14 days. The SARS-CoV-2 infected patients have flu-like symptoms such as fever, cough, runny nose, and malaise at initial stages.<sup>18</sup> After 3-6 days, a combination of the initial signs along with nasal congestion or other upper respiratory symptoms are clinically manifested.<sup>19</sup>

### Late Symptoms

In severe conditions, patients may have dyspnea, moist rales in lungs, weakened breath sounds, dullness in percussion and tactile speech tremor.<sup>20</sup>

## DIAGNOSIS

The Reverse Transcription Polymerase Chain Reaction (RT-PCR) is a technology that combines RNA Reverse Transcription (RT) with polymerase chain amplification (PCR) of cDNA. Real time RT-PCR is a method used as a preliminary test to identify the SARS-CoV-2 virus.<sup>21</sup> The infected individuals are also diagnosed with CT Scan, blood test, blood gas analysis,<sup>22</sup> etc.

## PREVENTION

Those with close contact and suspicious exposure should have a 14-day health observation period from the last day of contact with the infected patients and environmental exposure. Individuals are advised to use surgical or face mask covering nose and mouth and keeping hands clean with alcohol-based hand rub<sup>20</sup> or soap for preventing this infection.

## TREATMENT

Up to now, there is no specific antiviral treatment for SARS-CoV-2. The symptoms based treatment is given all over the world along with some Chinese medicines. According to the guidelines, Interferon alpha (5 million U/ BID Inh), Lopinavir or Ritonavir (400 mg or 100mg BID PO)<sup>21</sup> and Arbidol (0.2 g TID PO)<sup>23</sup> are recommended for SARS-CoV-2 as antiviral therapy. Hong Kong scholars have found that patients treated with lopinavir or ritonavir and ribavirin as a combination had lower risk of respiratory distress syndrome (ARDS).<sup>21</sup> The duration of antiviral treatment is 6-15 days.<sup>20</sup> In addition, patients were given supportive care for symptomatic relief. This includes:

- Oxygen therapy such as high flow nasal oxygen therapy, non-invasive ventilation or invasive mechanical ventilation (Initial flow 5L/min) is given for severe respiratory infection and respiratory distress.<sup>20</sup>
- Antibiotic therapy to prevent future infections.<sup>24</sup>
- Antipyretic such as Ibuprofen (0.2 g Q6H) to reduce body temperature.
- Selective anticholinergic drugs to relieve airway spasm and improve pulmonary ventilation.<sup>20</sup>
- Nutrition support and IV administration to maintain electrolyte balance.

As investigational therapy for COVID-19, an antiviral drug, favilavir used for influenza<sup>25</sup> was recently approved by the National Medical Products Administration of China.

## Chinese Treatment

For the treatment of hypodynamia with gastrointestinal upset or fever, Chinese patent medicines such as HuoxiangZhengqi capsules, JinhuaQinggan granules, LianhuaQingwen capsules, ShufengJiedu capsules or FangfengTongshengpills<sup>20</sup> are used.

## VACCINE

So far, there is no specific licensed vaccine for any coronavirus discovered, although clinical trials have been initiated for MERS-CoV. The RBD-based vaccine is expected to be safer and more effective. This vaccine candidate is expected to induce antibody production that can neutralize the SARS-CoV-2<sup>22</sup> virus. If this is confirmed, this vaccine has great potential to be further developed for public health welfare.

## BIOTERRORISM

The coronavirus is a category C,<sup>26</sup> emerging agent which can be engineered for mass dissemination and destruction because of its easy availability, production, high mortality rate or ability to cause major health impacts.

## CLINICAL RESEARCH

The S protein is the major vaccine target which has been evaluated by different vaccines for the coronavirus infection. Liu et al. analyzed and accessed the possibility of developing universal vaccines against the coronavirus infection. Although, SARS-CoV-2 is genetically similar to SARS-CoV, vaccines against SARS-CoV is not effective<sup>22</sup> in recognizing SARS-CoV-2. However, there are several limitations for the current research of vaccines against the coronavirus infection. This includes, Lack of animal models for vaccine evaluation.

- Mutation in the S protein may cause virus to escape.
- DNA viruses may undergo recombination with other viruses.
- Elimination of vaccine by pre-existing immunity.
- Low or no investment due to slow return on investment.

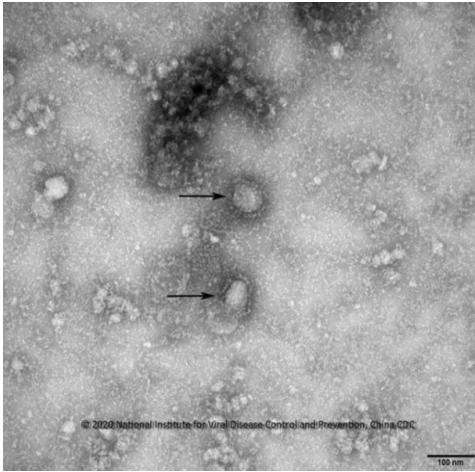


Figure-1. Electron microscope of SARS-CoV-2.<sup>27</sup>

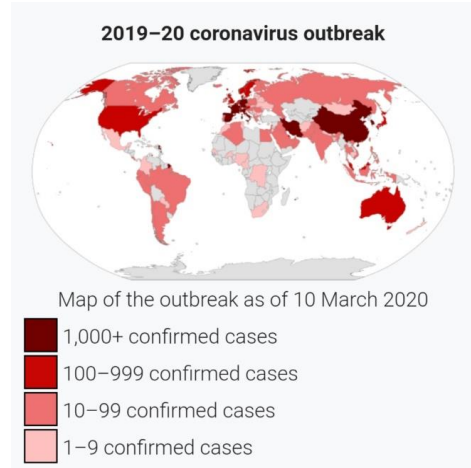


Figure-2. SARS-CoV-2 Outbreak map.<sup>28</sup>

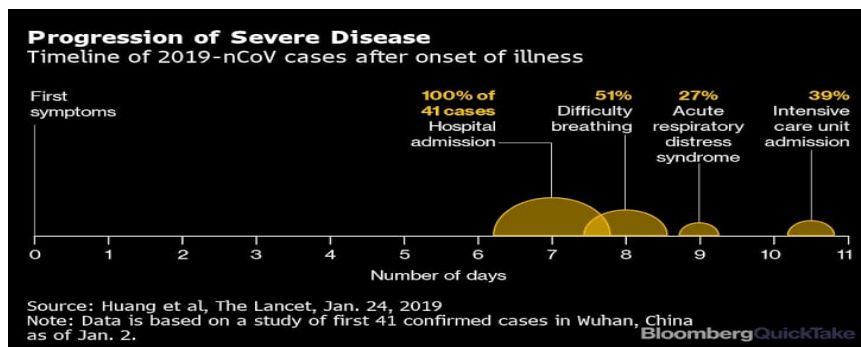


Figure-3. Progression of COVID-19.<sup>29</sup>

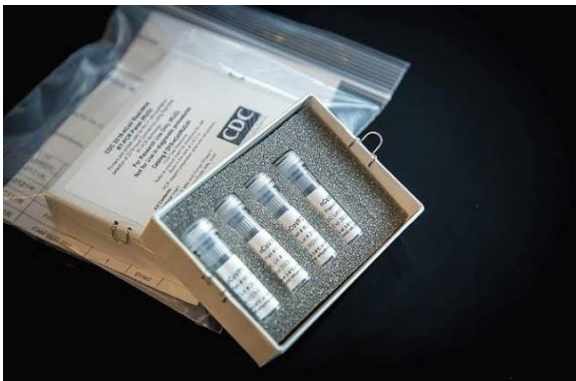


Figure-4. CDC's laboratory test kit for SARS-CoV-2.<sup>30</sup>



Figure-6. Medical staff treating the victim at Zhongnan hospital, Wuhan.<sup>31</sup>



Figure-5. People using masks to prevent the coronavirus infection



Figure-7. Doctors using life support machines to replace lung function.<sup>32</sup>

## Conclusion

The main goals currently being addressed with the n-CoV 2019 infection are finding methods of treatment and safe and effective vaccination to prevent further spread. If a licensed vaccine could be developed for the SARS-CoV-2 virus, it would save many people from severe respiratory diseases caused by n-CoV 2019 infection. Although it has come into control by preventing the spread, the recovery of confirmed cases is more difficult to treat.

## Acknowledgement

The authors would like to thank, Dr. S.Mohan and Mrs. Marypriya of the Karpagam College of Pharmacy for their timely co-operation and guidance.

## Authors' Contribution

All authors pass the four criteria for authorship contribution based on the International Committee of Medical Journal Editors (ICMJE) recommendations.

## Conflict of Interests

The authors declared no potential conflict of interests with respect to the research, authorship, and/or publication of this article.

## Funding/Support

The authors received no financial funding or support for the research.

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