



## Review Article

# Novel Coronavirus infections: a review

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### ABSTRACT

The novel Coronavirus disease has now spread all over the world over the last few months, and leads to mortality especially in the elderly and the infants. Affection of the lower respiratory tract can lead to a lot of severity. Some new therapeutic options have been devised for the disease, but a vaccine has yet not been found. The disease was first reported in China but now the epicentre is in Europe.

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## 1. Introduction

Human Coronaviruses have traditionally been thought to be innocuous pathogens and only associated with cough and common cold, until the discovery in 21<sup>st</sup> century of two new highly pathogenic strains from animal reservoirs, namely SARS and MERS coronaviruses.<sup>1</sup> Since 2019 a new genus of coronavirus has been reported and is the topic of this discussion.<sup>1</sup>

### 1.1. Epidemiology

A cluster of new pneumonia cases were discovered in Wuhan, China in 2019, which was formally named as novel Coronavirus and finally as SARS-Coronavirus 2 on 11 February 2020 by the International Committee on Taxonomy of Viruses.<sup>2</sup> The originating event remains unclear to date, but a intermediary host animal may have played a role in transmission to man in the wild animal market of Wuhan.<sup>3</sup> There was 96% sequence homology with bat coronavirus, hinting it possible origin from bat.<sup>2</sup>

### 1.2. The virus

The virus is a single stranded, enveloped, positive sense beta Coronavirus.<sup>2</sup> There are 4 genera, alpha, beta, gamma and delta Coronaviruses, of which alpha and beta coronaviruses are important in causing human disease.<sup>1</sup> Four HCoV (HCoV 229E, NL63, OC43, and HKU1) alone have been reported to cause 10-30% of upper respiratory infections in man.<sup>1</sup>

### 1.3. Clinical features

The incubation period ranges from 1 to 14 days, mostly 7-10 days.<sup>2</sup> Studying the initial cases, the commonest clinical feature was Fever, followed by cough and myalgia; less common features were headache, hemoptysis and diarrhoea.<sup>4</sup> More than half of the patients had dyspnoea.<sup>4</sup> Diarrhoea and sore throat are less common features, though.<sup>5</sup> Diarrhoea and vomiting, according to latest research, is found in about 3.8% and 5% cases, respectively.<sup>2</sup> Cough, when appears, is typically dry, and symptoms are somewhat similar to seasonal flu.<sup>5</sup> Also, about 80% of the infections are mild and only 20% are critical.<sup>5</sup> The cases can spread the infection even during latency.<sup>2</sup> According to evidence, anosmia (loss of

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smell) and aguesia (loss of taste) are very early specific clinical features of COVID 19 disease, especially in European patients, and they return to normalcy after 8-10 days.<sup>6</sup> In high-risk groups like the elderly, those having Diabetes mellitus, COPD or Hypertension, complications develop, like acute respiratory distress syndrome, septic shock, metabolic acidosis that is difficult to correct, and coagulation dysfunction.<sup>2</sup> The fatality is much lesser than that caused by SARS-CoV and MERS-CoV.<sup>1</sup>

#### 1.4. Pathogenesis

Transmission is believed to be due to close person to person contact, and aerosols. The viral envelope promotes viral assembly; also, the Non-structural protein or NSP blocks the host innate immune response.<sup>7</sup> It is believed that in the host the virus leads to cytokine storm, and in particular there is excess release of the cytokine IL-6 (Interleukin 6), and other cytokines and acute phase proteins are elevated too, causing multi-organ failure.<sup>7</sup> Research has also been shown that Acetylcholine Converting Enzyme 2 or ACE2 as receptor for entry of SARS-CoV 2 into pulmonary and vascular endothelial cells.<sup>8</sup> The S glycoprotein of the virus binds to the ACE2 ligand; The S protein has 2 subunits S1 and S2.<sup>2</sup> S1 subunit binds actively and decides tropism, whereas S2 subunit helps in fusion of virus envelope and target cell membrane.<sup>2</sup>

#### 1.5. Explanation of severity in hypertension and diabetes mellitus

It has been postulated that in hypertensive patients taking Angiotensin Converting Enzyme inhibitors, ACE2 is upregulated on lung tissue and endothelium. This also happens in Diabetes mellitus. Hence the binding of the virus with the tissue is more in these conditions.<sup>9</sup> However the explanation is still controversial and has been challenged.<sup>9</sup>

#### 1.6. Study of public knowledge about the disease

According to our experience (unpublished data), close contact and fomites were the principal factors responsible for dissemination of the disease according to general public. People also thought that mortality is quite high in the elderly, and the virus originated from bats, pangolins and snakes.

#### 1.7. Diagnosis

Diagnosis is commonly done with the help of real time PCR from nasopharyngeal swab samples. A case is defined as positive in case of positive result of real-time PCR in respiratory tract samples and then confirmed by next-generation sequencing.<sup>2</sup> Diagnosis should be prioritized, and testing done for only 3 groups, like (a) Those having history of travel to or from endemic areas, (b) Highly

vulnerable people, (c) Contacts of all positive cases and people attending the same congregation(10). There is need to involve Private sector or Academic institutes also in diagnostics.<sup>10</sup>

#### 1.8. Treatment

Interferon nebulization been tried for therapy of management of novel coronavirus infection, and Remdesivir along with Chloroquine.<sup>11</sup> Agents like Nafamostat, Nitazoxanide, Ribavirin, Penciclovir, Favipiravir, Ritonavir are also reported to be effective for treating infection.<sup>11</sup> A combination of Lopinavir and Ritonavir has also been tried successfully.<sup>2</sup> Chloroquine is a new drug, and also has immunomodulatory effect and can inhibit viral replication.<sup>12</sup> Newer drugs for treatment have been suggested, like Hydroxychloroquine with Azithromycin, based on effects on the virus in tissue culture.<sup>13</sup> However the access and sale of the latter drugs should be restricted or closely monitored.<sup>13</sup>

#### 1.9. Prevention

A vaccine is the need of the hour to protect mankind from COVID-19 disease. For making a vaccine, several possible candidate targets or moieties and vectors are being tried, like in Adenovirus vector and LNP encapsulated mRNA, which are in Phase I trial.<sup>14</sup> A DNA vaccines are also under clinical evaluation.<sup>14</sup> Other general preventive measures like frequent handwashing, avoiding touching face often, respiratory hygiene, covering mouth and nose while sneezing and coughing, and social distancing of 1 metre or more has been said to protect from SARS-CoV 2 infections.<sup>15</sup> Entry screening was being done initially in USA and South Korea for flights coming from Wuhan.<sup>1</sup>

#### 1.10. New discoveries and future research

New evidence is coming up regarding the virus survival outside the human body. It has been shown that the SARS-COV2 virus is able to survive in aerosol for 3 hours, on Copper for 4 hours, on stainless steel for 48 hours and for 72 hours on plastic surfaces.<sup>16</sup> More research needs to be done regarding the pathogenetic mechanism of the Novel Coronavirus infections and immune reaction to the virus. Host-animal interactions and kinetics need to be studied also.

## 2. Conclusion

The Novel Coronavirus infection is now a pandemic and has grave public health and economic implications. More and more information is being revealed as research continues to unravel the new mysteries surrounding the virus and its immunopathogenesis.

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None.

### 4. Conflict of Interest

None.

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