



# COVID-19 and its future

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Currently our world is gripped by the pandemic of COVID-19, which has affected the majority of the world. The confirmed mortality has exceeded half a million. We aim to present an overview of COVID-19 diseases and speculate its future.

In December 31 2019, an unusual cluster of cases of pneumonia was reported in hospitals in Wuhan, Hubei, China.<sup>1</sup> The Huanan Seafood Wholesale Market was identified as the origin of the infection. Researchers subsequently identified the cause being a novel coronavirus labeled as Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), the affliction is called coronavirus disease 2019 (COVID-19).<sup>2,3</sup>

## Transmission and infectivity

COVID-19 is a rapidly transmissible disease.<sup>4</sup> Transmission is from close contact and droplets. There is insufficient evidence to suggest airborne transfer.<sup>5</sup>

The mean incubation period is around 3–9 days<sup>6, 7, 8, 9, 10</sup>, with a range between 0–24 days.<sup>11</sup> One can become contagious before the symptoms are present (around 2.5 days before the start of symptoms)<sup>9</sup>.

Around 18% of cases remain asymptomatic.<sup>13, 14, 15</sup> The potential of asymptomatic patients infecting others is proven by multiple studies concerning clusters.<sup>16, 17</sup> Younger patients tend to remain asymptomatic whilst the elderly tend to show symptoms.<sup>7, 15</sup> It is calculated that around 86% of infections have remained undocumented, and around 55 % of those cases were contagious.<sup>18</sup> Symptoms usually tend to resolve after 10 days.<sup>21</sup>

## Clinical features

Most cases are seen in those aged between 30–79 years.<sup>22</sup> The symptoms are summarised in the following:

Fever (82.2%), Cough (61.7%), Fatigue (44%), Dyspnoea (41%), Anorexia (40%), Productive Sputum (27.7%), Sore Throat (15.1%), Nausea (9.4%), Dizziness (9.4%), Diarrhoea (8.4%), Headache (6.7%), Vomiting (3.6%), Abdominal Pain (2.2%).

There are suggestions that there may be long term sequelae of this infection. Some reports suggest prolonged fatigue, paresthesia and breathlessness persist even after the resolution of early inflammatory symptoms.

## Laboratory findings

### Common laboratory diagnostic tests

Laboratory values that suggest COVID-19 infection include lymphopenia, prolonged prothrombin time (PT), elevated lactate dehydrogenase (LDH), elevated alanine aminotransferase (ALT), elevated aspartate aminotransferase (AST), elevated D-dimer, elevated neutrophils, eosinopenia, elevated C-reactive protein (CRP), and elevated troponin (including high-sensitivity troponin).<sup>11, 23, 24, 25, 27, 28, 29</sup>

### Reverse transcriptase – polymerase chain reaction

RT-PCR remains the gold standard for diagnosing COVID-19. While its specificity is nearly 100 %<sup>31</sup>, the sensitivity is low at 64 %.<sup>19, 20, 32</sup>

Some studies have employed chest CT scans for screening. CT scans have a sensitivity of 98 %, despite a lower specificity.<sup>20</sup>

## Image findings

Imaging modalities may serve as a surrogate to diagnose COVID-19. Chest x-ray abnormalities are seen in 33 %–60 % of patients and CT scans are even more likely to be abnormal.<sup>33, 34</sup> Chest CT scans of COVID-19 cases present with bilateral ground-glass opacification or consolidation.

## Complications

### Acute respiratory distress syndrome

About 41.8 % of patients develop acute respiratory distress syndrome (ARDS).<sup>36</sup> Diabetes mellitus is a factor associated with the development of ARDS.<sup>36</sup> Other associated comorbidities include hypertension, cardiovascular disease, and chronic kidney disease.<sup>36, 37</sup>

Patients greater than 65 years of age present with worse degrees of ARDS and have a higher mortality likelihood.<sup>37</sup> Laboratory markers predicting mortality of COVID-19 ARDS patients include low albumin, elevated blood urea nitrogen, and elevated LDH.<sup>36, 37</sup>

### Myocardial injury

The most common COVID-19-related deaths are associated with the lungs and heart diseases.<sup>25</sup> Myocardial injury includes acute coronary syndrome, heart failure, myocarditis, hypotension, shock, and sepsis.<sup>38, 39</sup>

Cardiac arrhythmias occur in severe COVID-19 cases.<sup>30, 38, 40</sup> Malignant arrhythmias, including ventricular tachycardia and fibrillation, occur at a rate of 5.9 %, and arise more frequently in patients with elevated troponin levels (17.3 % of patients with elevated troponin).<sup>40</sup>

Heart failure is most commonly seen in severe cases of COVID-19, regardless of previous cardiac history.<sup>38, 40</sup> This presents with elevated levels of N-terminal pro-B-type natriuretic peptide (NT pro-BNP) and troponin levels.<sup>41</sup>

## Acute kidney injury

Acute kidney injury presents with elevated urea and cystatin-C levels in severe COVID-19 infection.<sup>36, 37, 42, 43</sup>

## Prognosis

The case-fatality rate (CFR) continues to change as the pandemic continues. Being older than 60 is considered a mortality risk factor.<sup>12, 25, 44</sup>

## Prognosis predictors

Comorbidities associated with severe COVID-19 cases include elderly age, hypertension, cardiovascular disease, cerebrovascular disease, and chronic kidney disease.<sup>12, 23, 26, 27</sup> Cardiovascular disease presents with a 10.5 % CFR (case fatality rate). Other diseases that present with a high CFR include diabetes (7.3 %), chronic lung diseases (6.3 %), hypertension (6.0 %), and cancer (5.6 %).<sup>12</sup>

Laboratory values contribute to survival predictions. These include elevated LDH, elevated high sensitivity-CRP, and lymphopenia.<sup>46, 47</sup> Other laboratory values that suggest a high mortality risk if elevated include aspartate aminotransferase (AST), alanine aminotransferase (ALT), D-dimer, neutrophil count, prothrombin time, procalcitonin, and high-sensitivity and regular cardiac troponin.<sup>12, 23, 24,25,26,27, 28, 45, 46, 47.</sup> Low monocytes, platelets, and albumin also suggest high mortality risk.<sup>12, 24, 25, 27, 48</sup>

Architectural distortion, traction bronchiectasis, intra-thoracic lymph node enlargement, and pleural effusions suggest high risk for mortality in COVID-19 although they are rare.<sup>35</sup>

## Management

There is no specific antiviral treatment effective in COVID 19 infection. Treatment is mainly supportive. The preliminary data from RECOVERY trial suggested survival benefit with low dose Dexamethasone.

Most patients develop bronchopneumonia and suffer hypoxia. Incremental oxygen supplementation to maintain target oxygen saturation would be the mainstay of management. Some patients would need ventilatory support.

Many severely ill patients are dehydrated and need intravenous fluid supplement. Thromboembolic complications are well recognised in COVID 19 infections and all patients should have thromboprophylaxis. Many units are using high dose thromboprophylaxis. One may consider giving treatment dose heparin in selected cases.

Many other treatment agents are being trialled and the early results are mostly negative. Remdesivir, initially developed to treat Ebola infection, has had emergency US FDA authorisation as it was shown to decrease length of hospital stay. There was also tendency toward some survival benefits although it did not achieve statistical significance.

## Future

The future course of the current pandemic is uncertain.

We think the virus is here to stay with us for the foreseeable future. Several vaccine trials are ongoing. Effective vaccine will reduce mortality associated with COVID-19 but it is likely that the virus will mutate and the vaccine programme will need to catch up on an ongoing basis, as is done with flu vaccines.

It is also possible that the virulence of the virus would alter as people increase their exposure to the virus. There are

anecdotal reports of newer cases having lower mortality and indolent course of illness.

It is also possible that the new mutation or another completely new virus will have higher virulence leading to increased mortality and higher transmissibility. It is therefore advisable that we as a society should prepare for this. We have a few suggestions in this regard, summarised in the following:

1) Infection control: Proper infection control practices are difficult in

communal wards of traditional hospitals. Ideally these patients need to be nursed in a single room with appropriate infection control measures and personal protective equipment.

2) Outpatient consultation: We need to look at how healthcare professional's contact with patients can be minimised to reduce the risk of transmission. Telephone/video consultations have been very successfully used in NHS hospitals and these could prove useful in managing the majority of patients in the future.

3) Inpatient support: One could explore remote ward rounds by using robotics to minimise doctor- patient contact. Robots can also be used to provide personal care to patients/supply food etc.

4) Evidence based learning: It has taken a long time to find an effective management strategy in the current COVID 19 epidemic. Maybe a future collaborative strategy to see how different countries can collaborate and get evidence to find ideal preventive/management strategy at the earliest possible opportunity. We hope the WHO will take a lead on this.

5) Development of Community based care: Community based management strategy with a focus on an individual's wellbeing and infection control for the community would be better qualitatively and more affordable. Each country/setting could develop their own pathway but guidance from WHO would also be helpful.

## Conclusion

COVID 19 is a highly transmissible disease caused by the novel corona virus SARS COV2, which is affecting the majority of countries. Mortality figures have exceeded half a million. Whilst most patients have no or minor symptoms, some patients display severe symptoms, thus need hospital admission and support. Treatment is mostly supportive but recently a UK based trial has suggested mortality benefits with low dose Dexamethasone in severe cases needing oxygen supplement.

We need to prepare our society and services to manage such illnesses/pandemics in the future as it is likely that there will be other such infections in the future.

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