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COVID-19 Infection: A Novel Fatal Pandemic of the World in 2020

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EPIDEMIOLOGY

A respiratory syndrome with a novel coronavirus called COVID-19 was diagnosed on November 17, 2019 for the first time in Wuhan, China¹ and it was reported to WHO (World Health Organization) on December 31, 2019.² In a short time, the infection with this virus spread and was reported from other countries; and in less than a few months a pandemic has happened and many countries were involved with the COVID-19 virus. Corona infection outbreak was reported from more than 210 countries³ and most cases were reported from Europe and America although every part of the globe was involved too. According to the last updated report of WHO, the highest prevalence of the infection has occurred in several countries including the United States, India, Brazil, France, Russian Federation, Spain, United Kingdom, Argentina, Italy, and Colombia.⁴

According to the genetic data, it seems that the COVID-19 virus is related to two other viruses including Middle East Respiratory Syndrome coronavirus (MERS-CoV) and Severe Acute Respiratory Syndrome coronavirus (SARS-CoV).⁵ The symptoms of these two viruses are more severe, but COVID-19 can spread faster and infect more patients in comparison with MERS-CoV and SARS-CoV.⁶

SIGNS AND SYMPTOMS

The virus can infect the cells by using the receptors of the angiotensin-converting enzyme (ACE) that is connected with the renin-angiotensin-aldosterone system (RAAS).⁷ The incubation period has a wide range, from 0 to 24 days and the average time is 3 days.⁸

COVID-19 infection may present large spectrum of signs and symptoms. On the one hand, it can occur as an asymptomatic infection, and on the other hand, severe life-threatening pneumonia may happen.⁹

Pneumonia is one of the first ominous findings in corona infection.¹⁰ Fever and cough are the most common symptoms. Other common clinical manifestation includes fatigue, myalgia, and dyspnea. Some patients may experience pharyngalgia, headache, diarrhea, rhinorrhea, and sore throat.¹¹ Pneumonia can gradually become worse and the patient may suffer severe respiratory distress⁸ and in the cases with severe hypoxia mechanical ventilator may be necessary although it is recommended not to use ventilator support as far as possible. Some studies showed that coronavirus infection can deteriorate faster in elderly patients and the time between the beginning of the disease until death is shorter in comparison with young patients.¹² Young patients may experience gastrointestinal symptoms or may even be completely asymptomatic¹⁰ (Figs. 40.1 and 40.2).

In the first months of the pandemic, a Chest CT (computerized tomography) scan was used for screening COVID-19 infection in the suspected patients.^{13,14} The findings of the CT scan include ground-glass opacity (GGO), consolidation, and interlobular septal thickening. In many CT scans, multiple lesions are seen.¹⁵ With improvement in the experience of COVID-19 some data suggested that RT-PCR (reverse transcription polymerase chain reaction) is superior in comparison with chest CT scan.¹⁶ However, several studies reported false-negative results from RT-PCR.¹⁷ Although technology is improving, clinical judgment plays an important role in controlling the pandemic. Health-care providers should not rely on imaging or laboratory tests alone. Early diagnosis even with negative paraclinical data and quarantining the patients soon can effectively prevent the spreading of the disease¹⁶ (Figs. 40.3 and 40.4).



FIG. 40.1 Pneumonia is one of the first findings and is common in patients with COVID-19 infection.

TREATMENT

The definite treatment for COVID-19 infection is not clear yet. In some studies, empirical therapy, Oseltamivir, Ganciclovir, and Lopinavir/ritonavir were used.^{11,18,19} Several studies suggest interleukin-6 antibody blockers (e.g., Tocilizumab in severe disease), convalescent plasma transfusion, and stem cell therapy to control the cytokine storm of the infection.^{20,21} Other studies suggested nucleoside analogs, HIV-protease inhibitors,²² and remdesivir.²³ Several other drugs are under study and more clinical trials should be done for introducing an effective drug and also a vaccination for this pandemic life-threatening infection.

COVID-19 AND CARDIOVASCULAR DISEASE

According to some unpublished research, COVID-19 may damage the heart in up to 20% of the patients. It is still unclear if the virus attacks the heart directly. Although concentration in the COVID-19 pandemic is on the respiratory system with providing good ventilation, many physicians in the front line are talking about its effects on the cardiovascular system and death due to cardiac arrest. There is much data from China, Italy, and other countries that show this disease can infect heart muscle with subsequent heart failure and death.

The risk of mortality and morbidity is higher in patients with underlying cardiovascular disease.^{24,25} It is unclear if the virus or body response to virus injury may introduce cardiovascular disorders although it is difficult to conclude that the virus by itself can affect a

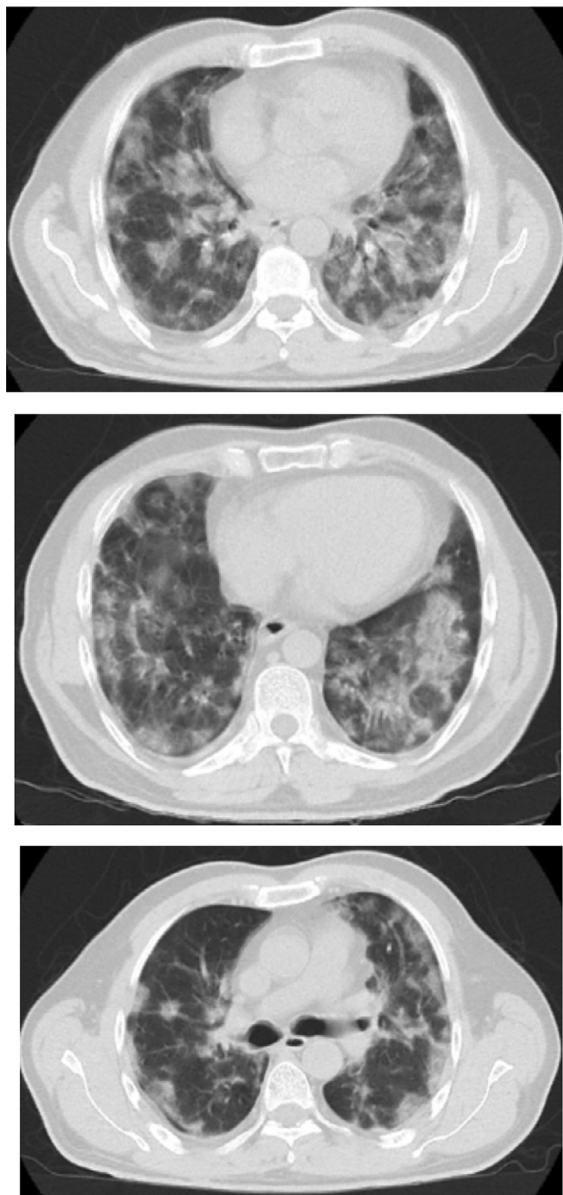


FIG. 40.2 The CT scan of a 67-year-old male who was presented with fatigue and cough, showed multifocal multilobar dense ground-glass opacities with peripheral extension. He was admitted in a COVID-19 center.

healthy heart. It is almost clear that preexisting heart problems can aggravate the disease with the acceleration of congestive heart failure. In addition, the infection causes some difficulties in heart transplants and the management of the patients after surgery.²⁴

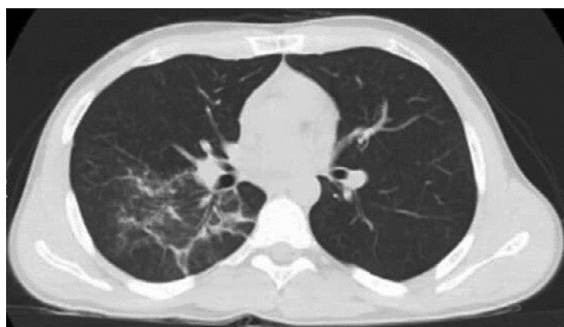


FIG. 40.3 The CT scan of a 31-year-old male showed a ground-glass opacity in the upper lobe of the right lung. He was treated with the diagnosis of COVID-19 infection.

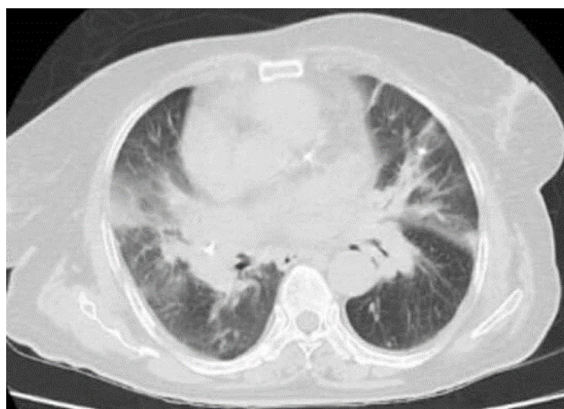


FIG. 40.4 A 76-year-old female with fever, dyspnea, and cough was admitted to the hospital. In the CT scan, bilateral subpleural ground-glass opacity with central extension was seen. She was treated with the diagnosis of COVID-19 infection.

As mentioned in the previous sections, the infection can occur by using ACE receptors by the virus. In addition, this receptor plays an important role in cardiovascular diseases, hypertension, and diabetes mellitus.²⁶ Inhibition of the RAAS by using ACE inhibitors or angiotensin-receptor blockers (ARB) can upregulate the ACE receptors and lead to severe infection.²⁷ Several studies revealed that the risk of infection with COVID-19 and also the severity of the disease is higher in the patients with hypertension, diabetes mellitus, coronary heart disease, and cerebrovascular disease who were under treatment with ACE inhibitors before the infection.^{28–30} The corona virus attaches itself to some receptors in the lungs; the same happens in heart muscle as

well. According to some data that must be proved, if a patient is using these drugs, it is advisable to choose other antihypertensive drugs such as calcium channel blockers (CCB).³¹

In addition to ACE receptors, cytokine storm,^{32,33} respiratory distress and hypoxia in COVID-19 infection can cause myocardial damage. In addition, the patients should be monitored for probable cardiovascular complications due to antiviral or antimicrobial drugs such as hydroxychloroquine which may cause malignant arrhythmia due to long QT arrhythmia; and also, they should be followed up for latent cardiovascular disease.²⁷ It must be pointed out that after hopeful termination of such a pandemic situation many patients may suffer heart problems as one of the worst late complications due to COVID-19 and cardiologists must prepare themselves for diagnosis, treatment, and follow up of these patients.

It is known that since many years ago and according to several studies, a condition like pneumonia and any kind of widespread inflammation in the body may damage the heart and even lead to plaques in the arteries or making them unstable with subsequent heart attacks. Furthermore, myocarditis and cardiomyopathies are among the results of these kinds of inflammations and perhaps COVID-19.

New protocols should be implemented in the patients with suspected COVID-19, especially in heart attacks, which may mimic acute ST-elevation or non-ST-elevation myocardial infarction to avoid an unnecessary rush to catheterization laboratory or providing facilities for primary PCI (percutaneous coronary intervention).

Interestingly, some reports show that the mortality rate from heart damage due to myocarditis in patients with a previous healthy heart is more than in patients with preexisting heart damage. It is also worth noting that the patients with preexisting heart problems had less mortality than the ones with normal cardiovascular disorders who developed myocarditis due to COVID-19. It will be valuable if a risk score can be developed for clinicians to help them better observe the patients, who may develop heart failure during the disease.

Some clinicians recommend daily electrocardiography, echocardiography, and measurement of biomarkers to identify patients at risk of developing cardiovascular disease due to corona infection as a part of a routine management of the disease. Although according to some data evaluating these patients may increase additional staff into the room and more exposure, especially in the era of limited masks or protective equipment.

It is emphasized that the physician must pay a lot of attention to the patients with COVID-19 infection who had a history of cardiovascular disease. This special group of the patients is at a higher risk of cardiac complications including cardiovascular events.³⁴

Managing the patients with STEMI (ST-elevation myocardial infarction) is an issue. On the one hand, several studies suggested thrombolytic therapy during the corona pandemic^{35–37} for preventing transmission of the virus. On the other hand, primary PCI is recommended for the patients with definite criteria for COVID-19 and STEMI. A study in a tertiary center for cardiovascular disease by Firouzi et al. showed that although corona infection is common due to the recent pandemic, primary PCI is still the gold standard for managing the patients with STEMI even in those who have definite criteria for COVID-19. Personal protective equipment is essential and is the first step to approach to these patients.³⁸ In addition, several studies showed that during the COVID-19 pandemic, the delay for the patients' referral and treatment was increased significantly.^{39,40}

Asymptomatic carriers are one of the serious sources of the infection and can play an important role in spreading the infection for many people silently,⁴¹ and evaluating the patients and health-care providers before any interventional procedures is essential.

In conclusion, there is not any specific treatment or vaccination for COVID-19 infection; so, prevention plays an important role in controlling the burden of the disease. Simple actions like isolating the patients, using suitable masks, better personal hygiene, and good ventilation can prevent the infection.⁴²

It is emphasized that the health-care provider's role for controlling this pandemic is early diagnosis of the patients with COVID-19 infection. Getting a complete history of the symptoms and underlying diseases, careful physical examination with full protection for themselves and history of the recent exposure with other patients with corona infection plays an important role in early diagnosis. The suspected patients must be quarantined as soon as possible and the physicians should not postpone their management until doing the paraclinical evaluations. In addition, educating all the members of the society for self-care is essential in preventing this serious infection.

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