

COVID-19 outcomes in patients with heart diseases

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Abstract

The COVID-19 pandemic has led to devastating mortality worldwide. More severe forms of COVID-19 are common in people with underlying diseases such as diabetes, coronary artery disease and high blood pressure. Therefore, the aim of this study is to investigate the implications of COVID-19 in patients with heart disease. The above study is a descriptive cross-sectional study that patients with cardiovascular problems are admitted to the Shohada Tajrish Hospital. These patients responded to two types of demographic questionnaire and researcher checklist in the field of medical field (type of cardiovascular disease and history of COVID-19). Statistical calculations were descriptive statistics and was performed by SPSS25 software. The results of this study indicate that high percentage of people with underlying diseases, especially cardiovascular problems, have more severe symptoms. Of the diseases that had more percentages, HTN, IHD, DM. Finally, it can be concluded that there seems to be a relationship between Covid-19 and cardiovascular problems.

Keywords: COVID-19, Cardiovascular problems, Underlying diseases

1 Introduction

Coronaviruses are a diverse group of viruses that infect a variety of animals and can also cause mild to severe respiratory infections in humans (Hu et al., 2021). In December 2019, health centers in Wuhan, China, reported patients with severe lung problems of unknown cause (Zhu et al., 2019). Similar to SARS and MERS viruses, the newly discovered virus also causes symptoms of viral pneumonia, including fever, cough and chest discomfort, and in severe cases, shortness of breath and bilateral lung infiltration (Hu et al., 2021). As a new coronavirus, SARS-CoV-2 has 79% of the SARS-CoV genomic sequence and 50% with MERS-CoV (Lu et al., 2020). After entering the body, the new SARS-CoV-2 virus uses the same SARS-CoV receptor, the angiotensin-converting enzyme 2 (ACE2) (Hu et al., 2021; Hoffmann et al., 2020), and the use of this receptor indicates that it is likely to have a wide host range. And the different functions of ACE2 in different animals may indicate different susceptibility to SARS-CoV-2 infection (Hu et al., 2021). COVID-19 has significantly surpassed SARS and MERS in terms of the number of people it can infect and epidemic areas. The rapid outbreak of COVID-19 poses a serious threat to global public health (Deng and Peng, 2020; Han et al., 2020). It has been observed that all age groups of the population are susceptible to COVID-19 infection and the average age of infection is about 50 years (Hu et al., 2021). However, clinical manifestations vary at different ages. In general, men over the age of 60 with comorbidities are more likely to develop severe respiratory illnesses that require hospitalization or even higher risk of death, while most young people and children have a mild form of the disease or are asymptomatic (Wu and McGoogan, 2020; Guan et al., 2020; Lu et al., 2020). In SARS-CoV-2 infection, the most common symptoms are fever, fatigue and dry cough. Less common symptoms include: sputum production, headache, hemoptysis, diarrhea, anorexia, sore throat, chest pain, chills, nausea and vomiting (Hu et al., 2021). Most people showed symptoms after a latency period of 1-14 days (usually about 5 days) and dyspnea and pneumonia developed within an average of 8 days from the onset of the disease (Wu and McGoogan, 2020).

The COVID-19 pandemic has led to devastating deaths worldwide. More severe forms of COVID-19 are common in people with underlying diseases such as diabetes, coronary artery disease and high blood pressure (Zhou et al., 2020; Wang et al., 2020). There is growing evidence of cardiac injury, thrombosis, and ventricular dysfunction that may increase the risk of cardiovascular disease (Shi et al., 2020; Bilaloglu et al., 2020). Patients with atherosclerosis will be more vulnerable to ischemia due to inflammatory pathways regulating SARS-CoV-2 and defective coagulation. This could explain the pathological effects of SARS-CoV-2. In addition, increased expression of ACE-2 receptors in myocardial cells may explain the correlation between COVID-19 and heart health (Naz and Billah, 2021). A notable feature of COVID-19 is the presence of higher levels of cardiac biomarkers in the presence of the virus (Akhmerov and Marban, 2020). In addition, 40% of deaths in a group in Wuhan, China, due to myocardial injury and heart failure were, in some cases, associated with respiratory failure (Naz and Billah, 2021). A study published in March 2020 found that 19.7% of patients with COVID-19 had cardiac injury and that heart damage was associated with an increased risk of death. It was seen that in patients with cardiac injury, severe acute illness was observed compared to patients without cardiac injury (Shi et al., 2020).

The association between underlying cardiovascular disease and infection with COVID-19 is not fully understood, although numerous reports have shown a two-way effect between cardiovascular disease and more severe manifestations of COVID-19, so, the aim of this study is to investigate the association between COVID-19 disease in patients with underlying heart disease.

2 Materials and Methods

The present study is a cross-sectional descriptive approach, in which the statistical population consisted of all patients admitted in the CCU section of Shohada Tajrish Hospital in 2022 year (for 1 months) with a diagnosis of heart problems.

The instruments used in this study included a demographic information questionnaire and a researcher-made checklist including the patient's medical and pharmacological status, clinical symptoms and treatment methods. The demographic questionnaire included information on age, sex, marital status, occupation, and level of education. The researcher-made checklist included the patient's medical and pharmacological information, which was completed using patient records and included information on Covid-19, clinical symptoms of Covid-19, history of underlying and heart disease, and history of smoking. , Chest x-ray status, length of hospital stay, level and medications prescribed to the patient.

The collected data were analyzed using descriptive statistics (frequency, percentage, mean) by SPSS25 software.

3 Results and Discussions

According to the results of the present study, 36% of patients with cardiovascular problems infected with COVID-19 virus were admitted in the CCU section, of which 60% had severe symptoms that were used to treat these patients, in addition to the use of injectable drugs from other auxiliary treatments, including ventilators or BIPAP or CRRT. Symptoms seen in these patients include fever, chills, chest pain, dyspnea, swelling, and headache. And 40% had moderate symptoms that did not need to receive an injectable drug and intravenous antibiotics, and less than 30% (About 15%) of their lungs were involved and their O₂ SAT levels were over 90%, and showed marked symptoms with less intensity (Table 1).

In our study, the most common cardiovascular complications that patients with both cardiovascular problems and COVID-19 had were: 50% HTN, 36% IHD, 29% DM, and 21% of all three cardiovascular complications.

Table 1. Statistics of heart patients and complications of COVID-19 in them

COVID-19 infection	Hospitalization	Duration of the disease	Symptoms	lung conflict rate
Yes (28%)	Yes (36%)	2 weeks	Severe (60%) Moderate (40%)	15-45 (%) 15 (%)
	No (64%)	From 1 to 6 weeks	Mild (44%) Moderate (56%)	0 (%) 10-15 (%)
No (72%)	-	-	-	-

Table 2. Statistics of heart patients as a percentage of the type of vaccination and percentage of vaccination complications

Vaccination	Percentage (%)	Vaccination complications
–	10%	–
Two doses of Sinopharm (BBIBP-CorV)	66%	Fever , Chills , Headache , body pain , Runny nose , Hands swelling (15%) No complications (85%)
Three doses of Sinopharm (BBIBP-CorV)	10%	Joint's pain (20%) No complications (80%)
Two doses of AstraZeneca	8%	No complications (100%)
Two doses of COVIRAN Barekat	4%	No complications (100%)
Two doses of Sputnik V + One doses of AstraZeneca	2%	Dyspnea (100%)

COVID-19, caused by SARS-CoV-2, is an evolving global disease. Cardiovascular disease is more common in patients with Covid-19 and these patients are at higher risk of death (Clerkin et al., 2020).

People with CVD, such as coronary artery disease (CAD) and HF, and especially those with serious complications such as high blood pressure, diabetes and obesity, are prone to severe infections, and this raises concerns that there may be The heart is a direct target of the virus and is most at risk if it becomes more vulnerable (Chilazi et al., 2021). Cardiovascular disease, as the most common underlying disease, may potentially exacerbate COVID-19. COVID-19 is, in fact, a predominantly lung disease in which primary local injury can be associated with severe and relatively late cytokine storm due to imbalance of T cells activation with irregular release of IL-6, IL-17, and other cytokines (Siddiqi and Mehra, 2020).

It has been stated that the affected that are elderly and have underlying diseases were more susceptible to developing COVID-19 and were seen to fall severely ill, especially in the patients that had DM, hypertension and CHD (Wei, 2020), which is consistent with the results of our study. Furthermore, in the presence of cardiovascular disease, acute inflammatory responses may lead to ischemia (Shi et al., 2020).

The data of the Chinese National Health Commission showed that 35% of patients with COVID-19 had high blood pressure and 17% had cardiovascular disease (Clerkin et al., 2020). In another study, Szekely and colleagues, Stated that right ventricular dysfunction (RV) was the most common echocardiographic disorder in hospitalized patients due to COVID-19, which was about 40% (Szekely et al., 2020). On the other hand, a number of patients and case studies also show the relationship between COVID-19 and postural tachycardia syndrome (POTS) (Chilazi et al., 2021). In addition, the prevalence of underlying diseases, especially CVD, was much higher in cases of severe disease and mortality due to COVID-19, which indicates that having CVD disease can cause undesirable results in SARS-CoV-2 infection. In addition, the presence of CVD may also sustenate patients than the MI caused by SARS-COV-2. Therefore, it has been guessed that the SARS-COV-2 infection in patients with CVD may exacerbate the damage in the cardiovascular system (Fan et al., 2021).

On the other hand, in patients with atherosclerosis infected with the SARS-COV-2 virus, it

seems that inflammatory activity in the atherosclerotic coronary artery plaque is intensified, and make them more sensitive. An occlusive thrombus may be formed on a ruptured coronary plaque, which results from inflammation due to endothelial dysfunction and increase the activity of the blood procagulant, and hence the hypothesis that cardiovascular disease is associated with inflammatory response, may lead to cardiac damage in patients with COVID-19 (Naz and Billah, 2021).

According to other mechanisms of the action proposed to explain this correlation of cardiac complicity with COVID-19, including cytokine storms, which are due to the imbalance in response in T-helper cells, as well as apoptosis in heart myocytes, induced through hypoxia-induced excessive intracellular calcium (Clerkin et al., 2020).

In general, in discussing the symptoms of the virus, in the study of Halpin and colleagues in UK, patients who need special care in the intensive care unit, more than general departmental patients for reporting continuous fatigue symptoms (72% vs 60.3%) And respiration (65.6% vs 42.6%) after purification (Halpin et al., 2021). Another larger group in Michigan realized that 159 of 488 (33%) patients with continuous cardiovascular symptoms include coughing and dyspnea in 60 days (Chopra et al., 2021), that are consistent with the results of the present study.

4 Conclusion

Finally, it can be said that evidence of various studies shows that there seems to be a relationship between COVID-19 and cardiovascular problems. An acceptable hypothesis may be that the virus leads to inflammatory pathways and distributed in circulation, and explains the acute pathological effects of the virus. In addition, the possible argument in the correlation between COVID-19 and cardiovascular health may be due to the high expression of ACE-2 receptors in myocardial, which may be part of the heart damage observed in patients with SARS-COV-2 (Naz and Billah, 2021).

5 Conflict of interests

The authors state that there are no conflicts of interests regarding the publication of this article.

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